Graduate unemployment, Higher Education access and success, and teacher production in South Africa

by

Hendrik van Broekhuizen

Dissertation presented for the degree of Doctor of Philosophy in Economics in the Faculty of Economic and Management Sciences at Stellenbosch University

Department of Economics
Stellenbosch University
Private Bag X1, Matieland 7602
South Africa

Supervisor: Prof. Servaas van der Berg
Co-supervisor: Prof. Rulof Burger

December 2015

Declaration

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Abstract

In the context of South Africa's socio-economic challenges, Higher Education (HE) has a key role to play, not just in terms of producing sufficient numbers of graduates and the scarce skills that are required for economic development and growth, but also in terms of providing opportunities for social mobility and restitution. This dissertation examines the extent to which the public HE system fulfils these roles by investigating three topics within the nexus between the secondary schooling system, HE, and the labour market in South Africa.

Chapter 2 of the dissertation investigates graduate unemployment by focussing on the associations between HE institutions and the expected employment and unemployment outcomes for graduates from different race groups. Using a probabilistic approach to link labour force and HE data, the chapter estimates the associations between the probability of having graduated from a particular type of HE institution and the likelihood of being unemployed or employed. The results indicate that graduate unemployment in South Africa is neither high, nor rising rapidly over time and that much of the observed inter-racial variation in graduate unemployment rates may be explained by differences in the types of HE institutions that different race groups have historically been likely to attend.

Chapter 3 investigates HE access and success in the Western Cape, with specific emphasis on the roles that demographics, academic performance, and school-level factors play in explaining the extent of, and the differentials in, HE participation and throughput among matric learners in the province. By explicitly linking learner records from matric examination data with student records from HE data, the chapter estimates the marginal contributions and relative importance of various pre-entry correlates and HE-level factors for observed HE outcomes among learners in the Western Cape and illustrates the respective roles that HE access rate and HE throughput rate differentials play in explaining observed racial differentials in HE graduations. The findings reveal that HE access, throughput, and dropout rates are strongly correlated with matric performance and that much of the observed racial differentials in HE access and dropout in the Western Cape can be explained by differences in matric performance levels between race groups. It is argued that the persistent HE completion rate premiums for White students may partly be driven by differential conditional selection into HE.

Lastly, Chapter 4 focusses on the production of Initial Teacher Education (ITE) graduates by the public HE system between 2004 and 2013 and its implications for teacher supply in South Africa. Using aggregate Higher Education Management Information System (HEMIS) data, the chapter provides a comprehensive descriptive analysis of the trends and underlying correlates of first-time enrolments and graduations in ITE programmes. Despite the fact that enrolments and graduations in ITE programmes have risen significantly since 2004, the findings suggest that South Africa is currently not producing sufficient numbers of teacher graduates. Projections indicate that the system could begin to produce sufficient numbers of graduates to satisfy projected teacher demand within the next decade, conditional on current enrolment growth and programme throughput rates. The chapter concludes that, in order to address South Africa's teacher supply shortfall, greater emphasis is needed on ensuring that ITE students complete their programmes, specialise in high-demand subject areas and phases, and transition into the teaching profession with minimal delay.

Opsomming

Binne die konteks van Suid-Afrika se sosio-ekonomiese uitdagings het Hoër Onderwys (HO) 'n belangrike sleutelrol om te vervul, nie net wat die produksie van genoegsame gegradueerdes en die daarstelling van skaars vaardighede (wat benodig word vir ekonomies ontwikkeling en groei) betref nie, maar ook om geleenthede vir sosiale mobiliteit en restitusie te bied. Hierdie proefskrif ondersoek die mate waartoe die openbare HO sisteem hierdie rolle vertolk deur die navorsing van drie temas binne die neksus tussen die sekondêre skoolsisteeem, HO, en die arbeidsmark in Suid-Afrika.

Hoofstuk 2 van die proefskrif bestudeer gegradueerde werkloosheid deur te fokus op die verband tussen HO instansies en die verwagte indiensneming- en werkloosheidsuitkomstes vir gegradueerdes uit verskillende rassegroepe. Deur gebruik te maak van 'n waarskynlikheidsbenadering om arbeidsmark en HO data aan mekaar te koppel, word the verband beraam tussen die waarskynlikheid dat 'n gegradueerde aan 'n spesifieke tipe HO instansie afgestudeer het en die waarskynlikheid dat hy/sy werkloos of in diens geneem is. Die resultate dui daarop dat gegradueerde werkloosheid in Suid Afrika nóg hoog is, nóg besig is om dramaties oor tyd te styg en dat 'n groot deel van die waargenome variasie in gegradueerde werkloosheidskoerse tussen rasse verduidelik kan word deur die feit dat sekere rassegroepe meer waarskynlik is om aan sekere HO instansie te studeer.

Hoofstuk 3 onderstoek HO toegang en sukses in die Wes-Kaap, met spesifieke klem op die rolle wat demografie, akademiese prestasie, en skoolfaktore speel deur die mate van, en die verksille in HO deelname en deurvloeie onder matriek-leerders in die provinsie te verduidelik. Deur leerder-rekords uit matriekeksamendata direk te koppel met studenterekords uit HO data, word die marginale bydraes en relatiewe belangrikheid beraam van verskeie voor-intrede korrelate vir HO uitkomstes onder leerders in die Wes-Kaap. Die hoofstuk illustreer ook die onderskeie rolle wat verskille in HO toegangskoerse en HO deurvloeikoerse speel in die verduideliking van waargenome rasseverskille in HO graduasies. Die bevindings dui daarop dat HO toegang-, deurvloei-, en uitvalkoerse sterk korreleer met matriekprestasie en dat 'n groot deel van die verskil in HO toegang en uitval tussen rassegroepe in die Wes-Kaap verduidelik kan word deur onderliggende verskille in matriekprestasievlakke. Dit word beredeneer dat die volgehoue HO deurvloekoerspremies vir Wit studente gedeeltelik gedryf word deur verskille in die voorwaardelike HO seleksie-meganisme.

Hoofstuk 4 van die proefskrif sluit af deur te fokus op die produksie van gegradueerdes met *Initial Teacher Education (ITE)* kwalifikasies in die openbare HO sisteem tussen 2004 en 2013 en die gevolge wat huidige en toekomstige produksievlakke inhou vir die aanbod van onderwysers in Suid-Afrika. Deur gebruik te maak van saamgestelde *Higher Education Management Information System* (HEMIS) data, bied die hoofstuk 'n omvattende beskrywende analise van die tendense en onderliggende korrelate van nuwe inskrywings en graduasies in ITE programme. Ten spyte van die feit dat inskrywings en graduasies in ITE programme beduidend sedert 2004 gestyg het, dui die bevindings daarop dat Suid-Afrika tans nie genoeg gegradueerde onderwysers produseer nie. Indien inskrywings aanhou groei en huidige deurvloeikoerse volgehou kan word, word daar beraam dat die HO-sisteem binne die volgende dekade kan begin om genoeg ITE gegradueerdes te produseer om te voldoen aan die beraamde aanvraag na nuwe onderwysers. Die hoofstuk maak die gevolgtrekking dat, ten einde die tekort aan Suid-Afrikaanse onderwysers aan te spreek, groter klem gelê moet word op die noodsaaklikheid dat ITE studente hul kursusse moet voltooi, dat hul moet spesialiseer in hoë aanvraag vak-areas en fases en dat die oorgang in die onderwysprofessie sonder vertraging moet plaasvind.

Acknowledgements

This dissertation would not have been possible without the support of a number of people.

First, to my supervisors, Prof. Servaas van der Berg and Prof. Rulof Burger, thank you for your guidance, assistance, and encouragement over the past four years. I feel privileged to have had the opportunity to learn from you and to be part of such a dynamic group of researchers. In particular, I owe an enormous debt of gratitude to Prof. van der Berg for his mentorship and support throughout my postgraduate studies. Thank you for seeing the potential in your students and for investing in their development. You have broadened the horizons of many and I am thankful to be among them.

I thank my friends and fellow researchers in the Research on Socio-Economic Policy group for their support and encouragement. In particular, I thank Dieter von Fintel, Gideon du Rand, and Anja Smith for the many coffee breaks and stimulating conversations at work. You have all invariably influenced my thinking and my research and I am thankful for your inputs.

I am grateful to the ATKV, DAAD, the NRF, the Department of Economics, and to Prof. van der Berg who provided funding for various parts of my undergraduate and postgraduate studies.

To my parents, Gawie and Susan van Broekhuizen, thank you for your unwavering love and support throughout the years. Thank you for investing in my education, for fostering in me a desire to learn, and for never telling me that math wasn't supposed to be fun. I am immensely grateful for all you have done and continue to do for me. I love you both.

To Jenny Schnepper, I say thank you for the many hours of helping me study, for listening to me drone on about economics, and for sharing in my joy of all things science. Thank you for challenging me and for challenging the way that I think. Most of all, thank you for your unceasing love and support, your patience, your understanding, and your companionship. Without your encouragement, I would not be where I am today. I love you very much.

Lastly, to every teacher and lecturer who has offered up their time and energy to invest in their students and instil in them a passion for learning and reason, I say thank you. I am fortunate to have had so many wonderful teachers in my life and I have great admiration and gratitude for the important work that you do. This dissertation, I dedicate to you.

Contents

[1] See Gujarati (2003:178 - 181)

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Acronyms and Abbreviations

ACE	Advanced Certificate in Education
BCM	Business, Commerce and Management
BEd	Bachelor of Education
CASS	School-based Continuous Assessment
CESM	Classification of Educational Subject Matter
CESM1	First-order CESM code
CESM2	Second-order CESM code
CESM3	Third-order CESM code
CED	Cape Education Department
CHE	Council on Higher Education
CHET	Centre for Higher Education Transformation
CPTD	Continuing Professional Teacher Development
DBE	Department of Basic Education
DET	Department of Education and Training
DHET	Department of Higher Education and Training
DoE	Department of Education
FLBP	Funza Lushaka Bursary Programme
FTE	Full-Time Equivalent
FTEN	First-time Enrolment(s)/First-time Enrolling
GER	Gross Enrolment Ratio
HAI	Historically Advantaged Institution
HDI	Historically Disadvantaged Institution
HE	Higher Education
HEDA	Higher Education Data Analyzer
HEI(s)	Higher Education Institution(s)
HEMIS	Higher Education Management Information System
HEQF	Higher Education Qualification Framework
HG	Higher Grade
HOD	House of Delegates
HOR	House of Representatives
HSRC	Human Sciences Research Council
HSS	Humanities and Social Sciences
ITE	Initial Teacher Education
LFP	Labour Force Participation
LFS	Labour Force Survey
LPM	Linear Probability Model
NER	Net Enrolment Ratio
NQF	National Qualifications Framework
NSC	National Senior Certificate
NSFAS	National Students Financial Aid Scheme
PGCE	Postgraduate Certificate in Education
QLFS	Quarterly Labour Force Survey
SAQA	South African Qualifications Authority
SC	Senior Certificate
SCE	Senior Certificate Examination
SET	Science, Engineering, and Technology
SG	Standard Grade
Stats SA	Statistics South Africa
TEQ	Teacher Education Qualification
WCED	Western Cap Education Department

Chapter 1

Introduction and research questions

Two decades since the end of Apartheid, South Africa's labour market remains characterised by persistently high levels of unemployment, substantial earnings inequality, a surplus of unskilled labour, and acute skills shortages in areas that are key for economic growth (Scott *et al.*, 2007:5). To a large extent, the country's adverse labour market outcomes are rooted in an ailing schooling system where access to quality education is still inequitably distributed along the lines of race and socio-economic background (Branson and Zuze, 2012). The poor quality of education that is generally available to historically disadvantaged groups, in particular, means that large segments of the population are effectively excluded from participating in economic opportunities. Instead, inequalities in the education system inevitably perpetuate existing inequalities in the labour market, serving both to undermine the country's economic development goals and impede social transformation.

Given South Africa's significant socio-economic challenges, the Higher Education (HE) system has a central role to play, not just in terms of producing sufficient numbers of graduates and the types of high-level skills that are required for economic development and growth, but, perhaps more importantly, also in terms of providing inclusive opportunities for social mobility and restitution (DoE, 2001:9 - 11). In this context, there is a need to better understand to what extent the HE system provides, has provided, and will continue to provide functional pathways into the labour market (Fisher and Scott, 2011; Filmer, 2012:1). Yet, it is not only necessary to understand how participation in HE in South Africa relates to labour market outcomes, but also how HE outcomes, in terms of HE access and success, differ between groups and across HE institutions (HEIs). In addition, it is crucial to evaluate the degree to which the HE system is succeeding in supplying the labour market with graduates who have been trained in specific scarce-skills areas.

Relative to the extensive literature on the performance of the primary and secondary schooling systems and their links with the labour market, the body of microeconometric research on HE outcomes in South Africa remains comparatively small. In part, this is understandable given the historically limited and racialised access to HE in the country and the fact that South Africa's pool of graduates has therefore remained small in relation to, and not demographically representative of, the overall population (Moleke, 2010:89).

South Africa's tertiary gross enrolment ratio (GER)[1] of 19% remains low in comparison to other middle-income countries and despite improvements in access to HE and rising average educational attainment levels since

[1] The tertiary gross enrolment expresses the total number of all individuals enrolled in tertiary education in a given year as a percentage of all 20-24 year-olds in the population (CHE, 2014*b*:iv).

1994, the percentage of working-age South Africans holding tertiary education qualifications only rose above 10% for the first time in 2011 (Fisher and Scott, 2011; CHE, 2014*b*:5).[2]

In addition to the small relative size of South Africa's HE-educated population, it is well-established that, on average and with all else held constant, individuals with HE qualifications have significantly better labour market prospects than individuals with only completed primary or secondary education in terms of being more likely to procure and retain employment, experiencing lower incidence and intensity of unemployment, and receiving better compensation for their labour (Fisher and Scott, 2011; Bhorat and Mayet, 2012).

Collectively, the aforementioned factors imply that that the analysis of HE and its relationship with the labour market in South Africa has traditionally had relatively low priority on both government policy and academic research agendas. However, the rapid expansion of enrolments and graduate outputs in the public HE system over the past 20 years along with apparent deepening skills shortages and the emergence of pervasive skills-mismatches in the economy means that education policy is increasingly shifting its focus towards the HE sector, providing the impetus for new research on HE outcomes.

The number of studies examining the nature and underlying correlates of HE participation, throughput, graduate production, and graduate labour market prospects in South Africa has grown rapidly since the early 1990s (Koen, 2006:1-5). Despite this proliferation, however, the scope of the extant quantitative research on HE outcomes remains limited, largely due to the restricted availability of timely and representative HE data and a near-complete lack of any integration between data on secondary schooling, HE, and labour market outcomes. McLoughlin and Dwolatzky (2014:584) refer to this as the *information gap* in HE, noting that it constitutes perhaps the single most significant barrier to the understanding of observed HE outcomes in the country. This information gap is exacerbated by the fact that the credibility and external validity of the findings from existing economic research on HE participation, student throughput, graduate production, and graduate labour market outcomes in South Africa is often undermined by methodological shortcomings and insufficient methodological transparency. As a result, many critical questions pertaining to the nature of the linkages between the secondary schooling system, HE, and the labour market in South Africa remain unanswered.

This dissertation seeks to contribute to the extant body of quantitative research on HE in South Africa by investigating three topics that fall within the broad ambit of HE access, HE success, and HE output. Its foremost contribution is to reduce the aforementioned HE information gap by linking information on HE outcomes with information on secondary schooling and graduate labour market outcomes and by improving upon some of the methodological shortcomings in the existing literature.

Each of the three topics investigated focus on distinct, yet interrelated aspects of the nexus between the secondary schooling system, HE, and the labour market in South Africa and are presented in three corresponding chapters.

Chapter 2 investigates graduate employment and unemployment in South Africa since 2000 and focusses on the associations between the types of HEIs attended and the expected employment and unemployment outcomes for graduates from different race groups. Chapter 3 investigates HE access and success in the Western Cape, with a specific emphasis on the roles that academic performance and school-level factors

[2] Author's own calculations using Statistics South Africa's (Stats SA) 1995 - 2007 Labour Force Survey (LFS) and 2008 - 2011 Quarterly Labour Force Survey (QLFS) data series. The population of working-age is defined as all individuals between the ages of 15 and 64.

play in explaining the extent of, and the differentials in, HE participation and throughput among secondary school leavers in the province. Lastly, Chapter 4 focusses on the production of Initial Teacher Education (ITE) graduates in the HE system over the past decade and its implications for teacher supply in South Africa.

1.1 Graduate unemployment and Higher Education Institutions in South Africa

It is widely acknowledged that investments in Higher Education (HE) yield significant private and social returns (Greenaway and Haynes, 2004:310 - 313). Relative to other educational cohorts, university graduates commonly enjoy a host of economic and non-pecuniary benefits, particularly in terms of better labour market outcomes pertaining to employment probabilities, remuneration, and overall job security (Fisher and Scott, 2011:1).

In South Africa, pervasive skills shortages imply that the demand for skilled labour is disproportionately high (Bhorat, 2004; DRPU, 2006). Moreover, in light of the relative scarcity of HE graduates, the demand for high-level skills suggest that the labour market returns to HE qualifications in the country should also be relatively high. It is therefore disconcerting that a large number of studies have found that graduate unemployment in South Africa is either high or rising rapidly over time and that the increasing prevalence of adverse graduate labour market outcomes are indicative of a general decline in graduate employability.[3]

Given that the rationale for investments in HE and arguments in favour of the expansion of HE access are generally premised on the notion that graduates face significantly better labour market outcomes than their non-graduate counterparts, it is fitting that this dissertation should commence with an evaluation of the extent of graduate employment and unemployment in South Africa as well as an analysis of the demographic and institutional dimensions along which graduate employment outcomes are found to vary.

Chapter 2 of the dissertation argues that the emerging consensus regarding high and rising levels of graduate unemployment in South Africa in recent years has primarily been based on a select number of prominent studies, the findings of which are potentially misleading owing to common methodological shortcomings. These shortcomings range from deficient and inconsistent definitions of the term *"graduates"* to the use of outdated, incomplete, or unrepresentative data. Moreover, because of significant heterogeneity in the quality of HE in South Africa, existing findings regarding graduate unemployment in the country, even if accurate, are likely to mask the substantial variation in labour market outcomes for graduates from different HEIs. Given the historically fragmented nature of the public HE system and the persistent correlation between race and the types of HEIs that individuals are likely to attend, it is argued that these institutional considerations play an important part in explaining the observed racial differentials in graduate labour market outcomes in the country.

The empirical analysis in Chapter 1 seeks to further the current understanding of graduate labour market outcomes in South Africa by examining graduate unemployment and employment with specific emphasis on the associations between the types of HEIs that graduates are likely to have attended and their employment statuses. Its primary contribution is to incorporate potential measures of HEI type in the estimation

[3] See, for example, Bhorat (2004:957 - 961), DRPU (2006), Scott *et al.* (2007:5), Altman (2007:11), Pauw *et al.* (2008), Kraak (2010), Maharasoa and Hay (2010), Van der Merwe (2010), Naong (2011), NPC (2011:317), Bhorat and Mayet (2012:30 - 31), Bhorat *et al.* (2010), CHEC (2013:7 - 10), Baldry (2015), and Kraak (2015).

of graduate unemployment and employment likelihoods by using common time-invariant characteristics to probabilistically link graduates from Statistics South Africa's (Stats SA) 2000 - 2007 Labour Force Survey (LFS) and 2008 - 2015 Quarterly Labour Force Survey (QLFS) datasets with graduates from the Higher Education Management Information System (HEMIS) data for the years 2000 - 2013.

The analysis shows that graduate unemployment in South Africa, when defined as unemployment among degreed university graduates, is neither high in general, nor rising rapidly over time. However, significant racial differentials in the extent of graduate unemployment remain evident, with the unemployment rate for Black graduates still being two to three times higher, on average, than it is for White graduates. The regression results suggest that at least part of this differential may be explained by underlying differences in the types of HEIs from which Black and White graduates are likely to have graduated. Despite the fact that the probabilistic linking methodology used is likely to introduce measurement imprecision, it is found that there is a statistically significant association between the types of HEI which graduates are likely to have attended and the probability of employment/unemployment. This association would also appear to explain much of the variation in the observed unemployment rates among Black and Coloured graduates, in particular.

1.2 Higher Education access and success in the Western Cape

In the context of South Africa's broader socio-economic challenges, the HE system is meant to serve multiple purposes (DoE, 1997:3 - 4). Not only is it charged with developing new high-level intellectual knowledge and ensuring that the country progresses towards a knowledge-based economy with enlightened and socially responsible citizenry (DHET, 2012:44), but it is also expected to significantly expand opportunities of access to a more diverse and representative subset of the population and equip individuals with the skills and competencies required for success in the labour market (CHE, 2013:27).

The degree to which these functions are fulfilled ultimately hinges on the extent to which the HE system is able to convert the inputs that it receives from the secondary schooling system, in the form of first-time entering undergraduate students, into quality outputs, in the form of highly skilled university graduates. Yet, there is a relative paucity of quantitative research on transitions into and through HE from the secondary schooling system in South Africa and of the ways in which HE participation, throughput and dropout are predicated on factors pertaining to demographics, socio-economic status, academic performance, school quality, and HE institutional considerations. While the first topic investigated in this dissertation is broadly concerned with the extent of employability among graduates produced in different parts of the HE system, the second topic therefore focusses on issues of HE access and subsequent HE success among secondary school leavers.

The third chapter of this dissertation examines HE access, throughput, and dropout among secondary school leavers by following the cohort of learners who wrote the 2005 matric examinations in Western Cape schools into and through the public HE system between 2006 and 2009. This is achieved by explicitly linking data on matric performance, learner characteristics, and school-level factors from the Western Cape Education Department's (WCED) Senior Certificate database with HE enrolment and graduation data from the Higher Education Management Information System (HEMIS) database.

Chapter 3 commences with an overview of HE access and throughput in South Africa with specific emphasis on the metrics that are commonly used to measure HE access and the methodological shortcomings present

in much of the existing literature. The empirical analysis starts with a description of the extent and patterns of HE access, throughput, and dropout among the learners in the Western Cape before turning to the observed associations between learner demographics, matric performance, school-level factors and HE access, completion, and dropout rates. In the multivariate analysis, linear probability models (LPM) are to estimate the marginal contributions of various pre-entry correlates to HE access and success among the learners from the cohort. In addition, Shapley-Owen decompositions are used to estimate the relative importance of demographics, matric performance, school-level factors, and HE-level factors for explaining observed HE access, completion, and dropout rates. The analysis concludes with an evaluation of the relative importance of HE access and HE success in explaining observed racial differentials in HE graduations.

The findings in the chapter reveal that HE access, throughput, and dropout rates are strongly correlated with matic performance and that observed racial differentials in HE access and dropout in the Western Cape can, to a large extent, be explained by underlying differences in matric performance levels between race groups. However, undergraduate completion rates for White students remain considerably higher than those for other race groups, even after differences in matric performance, school type, and HE-level factors have been controlled for. The chapter argues that persistent racial differentials in HE completion rates may be explained by differential selection into HE, whereby the process of screening out HE applicants with low probabilities of HE success is more effective for Whites than it is for other race groups.

The findings imply that the equitable expansion of HE access in South Africa is insufficient to ensure equitable outcomes in terms of HE graduations. Instead, it is necessary to drastically improve undergraduate throughput rates, particularly among historically disadvantaged students. Doing so will require significant improvements in the quality of education provided in the primary and secondary schooling systems as well as concerted efforts from HEIs to ensure that students receive the academic support they need to successfully complete their undergraduate studies.

1.3 Initial Teacher Education (ITE) graduate production and teacher supply in South Africa

South Africa's HE outcomes are, to a large degree, a reflection of the outcomes produced by its primary and secondary schooling systems. As is discussed in Chapter 3, a large number of studies have argued that there is a significant articulation gap between secondary schooling and HE in South Africa and that first-time entering undergraduate students are generally inadequately prepared to cope with the demands of HE study (Sheppard, 2009:8). As a result, low throughput rates, high dropout rates, and other perceived failings in the HE system are often attributed to the failings of the primary and secondary schooling systems (Pauw *et al.*, 2008:52).

It is clear that the performance of the HE system is critically dependent on the performance of the pre-tertiary schooling system. However, primary and secondary schooling outcomes are also functions of HE outcomes, given that the HE system is solely responsible for the production of what is arguably the single most important resource in South African schools, namely teachers.

It is through the channel of teacher graduate production that the outcomes produced by the HE system become, in many ways, self-reinforcing. If the HE system fails to supply sufficient numbers of appropriately

qualified, quality new teachers to the primary and secondary schooling systems, it remains unlikely that the secondary schooling system will produce prospective students who are adequately prepared for HE study and, consequently, that the articulation gap between secondary and higher education will decrease.

It is commonly recognized that South Africa has a severe shortage of adequately qualified and competent teachers, owing in part to the insufficient production of qualified new teachers by the higher education system (CDE, 2015). The fourth chapter of this dissertation therefore focusses on the degree to which the HE system is succeeding in supplying the labour market with graduates who have been trained as teachers. Specifically, Chapter 4 uses aggregate data from the Higher Education Management Information System (HEMIS) to analyse the trends and underlying correlates of first-time enrolments and graduations in initial teacher education (ITE) programmes in the public HE system between 2004 and 2013.

The chapter investigates six research questions: (1) What are the trends in initial teacher education programme first-time enrolments and graduations? (2) Are enough individuals enrolling in initial teacher education qualification programmes? (3) Are enough qualified potential new teachers being produced to satisfy current and projected levels of teacher demand? (4) What does the demographic composition and geographic distribution of new ITE programme students and graduates look like, and how has it changed over time? (5) What are the relative roles of first-time enrolments and ITE programme throughput in explaining observed levels of teacher graduate production? (6) Which groups of ITE students have the highest/lowest completion rates and how do completion rates at distance institutions (Unisa) compare with those at contact institutions?

The findings show that first-time enrolments in ITE programmes have grown rapidly since 2006, followed also by a moderate rise in ITE programme graduations from 2008 onwards. However, while both enrolments in, and graduations from, ITE programmes appear to be on an upward trend, growth in the former has largely been restricted to Unisa, South Africa's foremost distance learning institution, which now accounts for roughly half of all first time enrolments in ITE programmes. This is potentially problematic for teacher graduate production since ITE programme throughput, while low overall in South Africa, is far lower still at Unisa than at contact institutions. It is therefore doubtful that the current rise in ITE programme enrolments will result in commensurate increases in ITE programme graduations.

Despite current growth trends in ITE programme enrolments and graduations, it is clear that South Africa is currently not producing sufficient numbers of teacher graduates. Projections indicate that the system could begin to produce sufficient numbers of graduates to satisfy projected teacher demand within the next decade, but only if current enrolment growth can be sustained without any drop in programme throughput rates. Yet, even if the country manages to produce sufficient numbers of ITE programme graduates in the next 10 years, it remains unlikely that the types of teacher graduates that are produced will be the same as the types of teachers that are most needed in the schooling system. This would be exacerbated by the fact that an ever-smaller percentage of new teacher graduates appear to enter the teaching profession in the public school system after graduating. The chapter concludes that, in order to address South Africa's teacher supply shortfall, greater emphasis is needed on ensuring that ITE students complete their programmes, specialise in high-demand subject areas and phases, and transition into the teaching profession with minimal delay.

1.4 Summary

The research questions investigated in this dissertation focus on issues relating to the performance of the HE system and the linkages between HE, schooling, and the labour market. Each of the three broad topics examined centres around a particular role that the HE system is expected to play in addressing South Africa's socio-economic challenges.

As a point of departure, Chapter 2 considers the degree of graduate unemployment in South Africa, with specific emphasis on the institutional correlates underlying the observed variation in employment outcomes for graduates from different race groups. By focussing on the extent of graduate employment/unemployment, the chapter evaluates the extent to which private and social investments in HE are likely to translate into improved labour market outcomes for graduates from different race groups and different types of HEIs.

By illustrating that HE graduates generally face far better labour market outcomes than other educational cohorts, Chapter 2 effectively highlights the fact that there is a strong economic rationale for private and social investments in HE, as well as a need to increase HE graduate outputs in the country. In light of this, Chapter 3 subsequently looks at the extent of HE access and success among secondary school learners. In particular, the focus falls on the extent to which demographics, academic performance, school-level factors, and HE-level factors either serve to promote or impede the equitable expansion of HE graduate outputs given the nature of their relationships with HE access and success.

The analysis of HE access and success among matrics in the Western Cape illustrates that HE outcomes are strongly predicated on the outcomes produced by the primary and secondary schooling systems. These outcomes are closely related to the quality of education in South African schools which, in turn, is partly a function of the quality and quantity of teachers that are available to the schooling system. Chapter 4 therefore evaluates the HE system's performance in terms of the production of ITE graduates and the degree to which the supply of new teachers is sufficient to satisfy current and projected future levels of teacher demand in the country.

The findings from the three chapters in this dissertation contribute to the extant literature on graduate labour market outcomes, HE access and success, and teacher supply in South Africa and add to the current understanding of the relationships between the schooling system, HE, and the labour market. In addition, the analysis presented highlights many of the methodological shortcomings that are commonly found in quantitative research on HE outcomes in South Africa and provides suggestions for how they can be avoided. Lastly, this dissertation makes a final contribution by illustrating how the integration of separate data sources on schooling, HE, and labour market outcomes and the analysis of under-utilised databases such as the Higher Education Management Information System (HEMIS) can be used to close the *information gap* in HE.

Chapter 2

Graduate unemployment and Higher Education Institutions in South Africa

2.1 Introduction

Since the early 2000s, new microeconomic research has increasingly suggested that the relative labour market benefits of Higher Education (HE) in South Africa may be on the decline.[1] The apparent significant rise in graduate unemployment rates between 1995 and 2005 and the extent of emerging skills-mismatches, according to which the skills that new graduate labour market entrants possess deviate from the skills that employers demand, are two areas that have received much attention, both in academic research and the media (Koen, 2006; Branson *et al.*, 2009*b*:2).

The supposed deterioration of graduate labour market outcomes in South Africa is often attributed to a combination of the HE system's lack of responsiveness to structural changes in the domestic economy since 1994 and changes in the underlying demographic composition of South Africa's pool of graduate labour force participants and the fields in which they chose to study (Bhorat, 2004; DRPU, 2006; Pauw *et al.*, 2008). In a review of the South African literature on unemployment among individuals with post-secondary qualifications, Kraak (2010) argues that this skills-mismatch has exacerbated South Africa's existing skills shortages and adversely affected the employability and subsequent labour market prospects faced by tertiary-educated individuals to a greater extent than for any other educational cohort.

Despite frequent references in the media and political statements to worsening labour market outcomes for South African graduates, the shortcomings of existing research on the relationship between HE and the labour market imply that there is still much confusion about the labour market prospects that graduates are likely to face. This confusion is exacerbated by prominent reporting of graduate employment and unemployment figures that are outdated, unverified, or taken out of context. Furthermore, it is still not well-understood why there appear to be persistent differentials in the labour market outcomes for graduates from different race groups, or how the specific higher education institutions (HEIs) that graduates attend relate to their expected labour market outcomes.

[1] See, for example, Bhorat (2004:957 - 961), DRPU (2006), Scott *et al.* (2007:5), Altman (2007:11), Pauw *et al.* (2008), Kraak (2010), Maharasoa and Hay (2010), Van der Merwe (2010), Naong (2011), NPC (2011:317), Bhorat and Mayet (2012:30 - 31), Bhorat *et al.* (2010), CHEC (2013:7 - 10), Baldry (2015), and Kraak (2015).

This chapter aims to provide clarity on some hitherto unanswered questions regarding graduate labour market outcomes by examining the relationship between HEIs and the probability of unemployment and employment in the South African labour market. By focussing on both the probability of employment and unemployment, the research aims to firstly assess the scale and scope of South Africa's apparent graduate unemployment problem in the context of other developments that have affected the domestic labour market and the HE system over time. The objective of the multivariate analysis is not only to estimate the magnitude of the labour market premiums associated with participation in HE in terms of lowering the likelihood of unemployment and raising the likelihood of employment in South Africa, but to also incorporate the effects of HEI type on employment and unemployment outcomes by probabilistically linking graduates to the known distributions of annual graduate outputs from the public HE system, based on time-invariant demographic characteristics.[2]

The results from the analysis reveal that graduate unemployment in South Africa is not rising significantly over time and that it is, in fact, low in relation to overall unemployment in the country. Given the significant changes that have occurred in South Africa's HE system over the past 25 years, the results from the multivariate analysis show that much of the unexplained differences in employment and unemployment rates between Black, Coloured, Indian, and White graduates may be attributed to differences in the types of HEIs that different race groups have historically been likely to attend. These findings suggest that graduate unemployment in the country is not a general problem and that interventions aimed at improving the employment prospects of historically disadvantaged graduates should be targeted at improving the functionality of historically disadvantaged HEIs, rather than entailing wide-scale reform of South Africa's HE system as a whole.

2.2 The literature on graduate unemployment and employment in South Africa

Despite the limited attention that has historically been given to graduate labour market outcomes and their potential implications in the context of South Africa's broader labour market challenges, a number of prominent studies released since 2000 have raised concerns that graduate unemployment may rapidly be emerging as a significant problem in the country. In one of the earliest of these studies, Bhorat (2004), using data from the 1995 October Household Survey (OHS) and March 2002 Labour Force Survey (LFS), finds that, amidst rising overall unemployment rates, the broad unemployment rate for tertiary-educated individuals increased by 139% between 1995 and 2002 – by far the largest increase in unemployment for any education cohort. More worrying, however, is the fact that these rises in unemployment rates appeared to have been greatest for individuals with degrees and post-graduate qualifications, with White and Black graduate broad unemployment rates rising by 141% and 280%, respectively, over the 7-year period (Bhorat, 2004:959).

Bhorat (2004)'s substantive findings have received support in a number of papers published since 2004. Notable among these are the studies by DRPU (2006) and later Pauw *et al.* (2008) and Kraak (2010). The results from the descriptive analysis by DRPU (2006) showed that the increase in broad unemployment rates for tertiary-educated individuals from 6.6% in 1995 to 9.7% in 2005 was the largest for all education groups, despite levels of tertiary unemployment remaining low in relative terms (DRPU, 2006:8). The DPRU report also

[2] The data on South Africa's private HE sector is hihgly fragmented, but recent estimates suggest that it accounts for only a negligible percentage of all HE graduate outputs in South Africa Blom (2011); DHET (2015). It is therefore excluded from the discussion and analysis in this chapter.

showed that graduate employment and unemployment rates varied substantially across race groups, suggesting that higher levels of unemployment among Black graduates, in particular, could at least partly be ascribed to the poor quality (or the perceived poor quality) of many HEIs in conjunction with the poor performance of the majority of the historically disadvantaged formal schooling system (DRPU, 2006:18-20). In other words, the extent of heterogeneity in the quality of HEIs may have eroded employer confidence in the productivity-signalling effect of HE qualifications, resulting in a shift in demand towards more experienced rather than more qualified employees (DRPU, 2006:21).

The finding that the employability of South Africa's HE-educated individuals, when measured in terms of the probability of being employed rather than unemployed, varies substantially by race has been emphasised in a large number of papers, most of which have relied on descriptive analyses and the use of nationally representative labour force data sources to draw inferences about changes in the employment and unemployment patterns for tertiary-educated individuals over time.[3]

More recent studies have also sought to identify the impact that HEI type and quality have on graduate employment and unemployment probabilities. Using data on seven South African universities from the Human Sciences Research Council's (HSRC) Graduate Destination Study, Bhorat *et al.* (2010) find that graduates who attended historically disadvantaged institutions (HDI) have significantly poorer labour market prospects than graduates from historically advantaged institutions (HAI), both in terms of initial absorption into employment and the ultimate incidence of unemployment. Similarly, Branson *et al.* (2009*a*) use data from the Cape Area Panel Study (CAPS) and find that the type of HEI at which individuals in the Western Cape province complete their tertiary studies has a significant impact on the labour market outcomes which they subsequently face.

2.2.1 Criticisms of the existing literature on graduate employment and unemployment in South Africa

The substantive conclusions drawn from studies noting adverse changes in the labour market prospects faced by graduates in South Africa resonate with those from international studies which have suggested that structural changes in other labour markets around the world have lead to a global trend of worsening labour market prospects for individuals with HE qualifications.[4] Consequently, the nature of the link between participation in HE and expected labour market outcomes is increasingly coming under question, both in South Africa and abroad. However, the majority of studies that have been conducted for the domestic labour market share common methodological shortcomings which mean that their findings are subject to a number of caveats.

First, few studies adequately differentiate between individuals with university degrees and individuals with post-secondary certificates and/or diplomas when analysing and drawing conclusions about the labour market prospects of the tertiary-educated, despite the fact that the two groups have been shown to differ vastly in terms of expected labour market outcomes (Koen, 2006:21). As shown in Section 2.3 below, this leads to a significant upward-biased perception of graduate unemployment and worsening graduate labour market prospects in the country.

Second, there is a tendency to draw causal inferences about the relationship between HE and labour market outcomes and strong conclusions about aggregate trends in the labour market outcomes for tertiaries from

[3] See, for example, Mlatsheni and Rospabe (2002), Kruss (2007:683), Pauw *et al.* (2008:49 - 53), Branson *et al.* (2009*a*), Maharasoa and Hay (2010:141 - 142), Kraak (2010), Moleke (2010:89 - 92), Fisher and Scott (2011) and Bhorat *et al.* (2010).

[4] See, for example, Teichler (2007), Nunez and Livanos (2010), (Wu, 2011), and (Humburg *et al.*, 2012).

descriptive analyses conducted on data which is either not representative (Branson *et al.*, 2009*a*; Bhorat *et al.*, 2010; CHEC, 2013; Baldry, 2015), incomplete (Bhorat, 2004; DRPU, 2006; Pauw *et al.*, 2008), or dated (Pauw *et al.*, 2008; Kraak, 2010). Moreover, according to Yu (2008, 2010), there is good reason to doubt the accuracy of labour market outcome information for tertiary-educated respondents in the 1995 October Household Survey - the dataset which many of the most prominent studies of tertiary labour market outcomes in South Africa have used as the reference point for their empirical analyses.

Third, few studies sufficiently emphasise the levels of uncertainty that underlie their empirical methodologies and the confidence intervals which surround their reported point estimates, despite the fact that the sample sizes on which those estimates are based are often very small and that confidence intervals are therefore likely to be large. Rarely is any attempt made to establish the statistical significance of the differences between relevant point estimates when drawing conclusions regarding the trends in, and levels of, labour market outcomes for graduates. Instead, the significance of such "trends" appear to be inferred simply by comparing the inter-temporal changes in labour market outcome point estimates for individuals with HE qualifications with those for other education cohorts.

Finally, with the exception of more recent studies like those by Branson *et al.* (2009*a*), Moleke (2010), Bhorat *et al.* (2010), CHEC (2013) and Baldry (2015), limited attention has thus far been given to the importance of heterogeneous HEI quality and historical patterns of access to HEIs in explaining racial labour market outcome differentials in South Africa, despite the fact that most studies find substantial differences in the employment and unemployment rates for tertiaries from different race groups. Consequently, little is known about the extent to which HE institutional considerations shape the labour market prospects of South African graduates.[5] Yet, in order to understand the nature of racial labour market outcome differentials and the potential causal mechanisms that drive them, it is necessary to take changes in South Africa's HE landscape and the demographic composition of its stock of graduates over time into account.

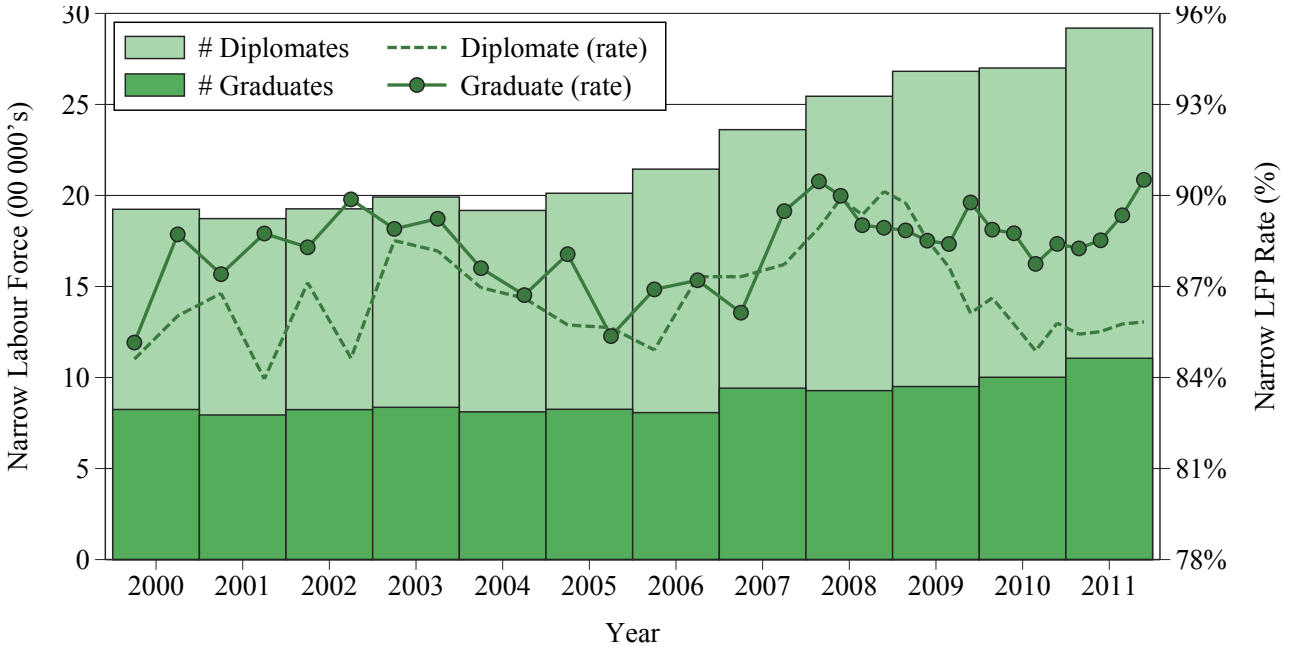
2.3 The South African graduate labour market

To understand the pitfalls of analysing the labour market outcomes for all tertiary-educated individuals as though they constitute an homogeneous group of individuals and referring to them as "graduates", it is necessary to illustrate the marked differences in labour market status outcomes for those individuals with diplomas and/or certificates from either TVET colleges or HEIs and individuals with university degrees obtained exclusively from HEIs. The former group is hereafter collectively referred to as *diplomates* and comprises all HE- or TVET-educated individuals with National Qualification Framework (NQF) exit level 5 or 6 qualifications. By contrast, the latter group is hereafter collectively referred to as *graduates*, comprising all HE-educated individuals with NQF exit level 7 or higher qualifications. The breakdown of the types of qualifications that are currently and have historically been awarded by South Africa's HEI along with their associated NQF exit level classifications is presented in Table A.1 in Appendix A.

Figure 2.1 shows the sizes of the narrow labour force and magnitudes of the narrow labour force participation

[5] Bhorat *et al.* (2010) is perhaps the only major recent study that has attempted to ascertain the impact of HEI quality on labour market outcomes in South Africa. Unfortunately, while the HSRC Graduate Destination data on which their analysis is based may be uniquely detailed, it is also inherently unrepresentative. Their results and conclusions are therefore unlikely to be reflective of the graduate labour market experience at a national level.

Figure 2.1: Narrow labour force and narrow LFP rates (%) for graduates and diplomates (2000 - 2011)



NOTES: Own estimations using Stats SA's March 2000 LFS - QLFS2011Q4 data. Estimates are weighted and are calculated only for graduates and dipolomates in the population of working-age (15 - 64 year-olds). Bars denote the respective sizes of the graduate and diplomate labour forces and have been stacked (measured on the left-hand-side vertical axis). Lines denote the respective graduate and diplomate LFP rates (measured on the right-hand-side vertical axis).

(LFP) rates for graduates and diplomates over the period 2000 - 2011.[6] Other than the fact that diplomates represent a larger share of the tertiary-educated labour force than graduates, the two groups appear to have remarkable similar narrow LFP rates. However, the differences between these two groups become evident when looking at their respective employment rates as shown in Figure 2.2.

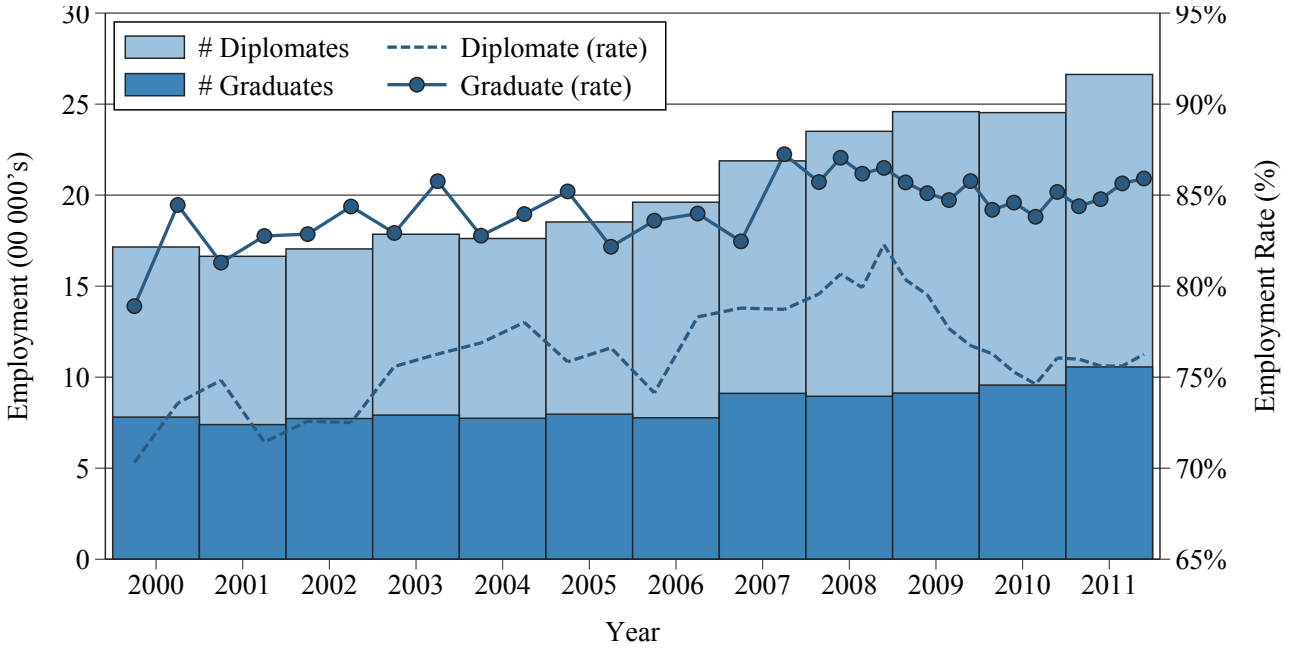
While diplomates still account for a larger share of employment among the tertiary-educated than graduates do, the graduate employment rate has consistently been between 5 and 10 percentage points higher than the diplomate employment rate over the period under consideration. The differences between the two tertiary-educated groups become even clearer when looking at narrow unemployment and narrow unemployment rates over the period.

Figure 2.3 shows that diplomates dominate narrow unemployment among the tertiary-educated. By 2011, more than 200 000 of the roughly 256 000 narrowly-unemployed tertiary-educated held diplomate-level qualifications. By contrast, not once since 2000 have graduates constituted more than 27% of the tertiary-educated narrowly unemployed. Instead, the narrow unemployment rate for graduates has consistently been 5 percentage points or more lower, on averagem than the narrow unemployment rate for diplomates.

These figures offer a simple, but compelling argument against the misguided practice of drawing inferences about the labour market outcomes faced by university graduates and degree-holders from the analysis of the labour force outcomes faced by tertiary-educated individuals as a whole. Doing so will clearly lead to upward-biased perceptions of graduate unemployment in the country. This is particularly poignant when

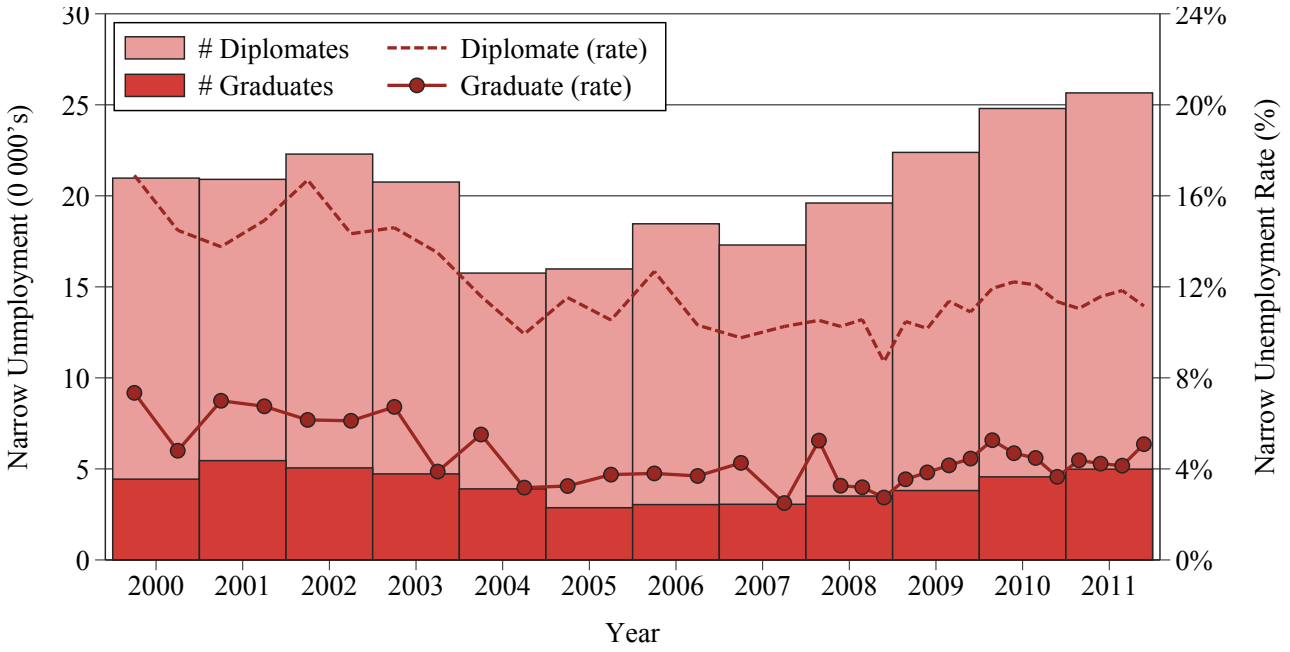
[6] Unless explicitly stated otherwise, the narrow definition of the labour force is used throughout this chapter as it is the most consistent definition used across the various Labour Force and Quarterly Labour Force survey datasets that are used in the descriptive and multivariate analysis below. The narrow labour force is defined as all employed individuals plus all individuals who are not employed, but are either actively seeking employment or are planning on returning to existing jobs or enterprises soon.

Figure 2.2: Employment and employment rates (%) for graduates and diplomates (2000 - 2011)



NOTES: Own estimations using Stats SA's March 2000 LFS - QLFS2011Q4 data. Estimates are weighted and are calculated only for graduates and dipolomates in the population of working-age (15 - 64 year-olds). Bars denote the respective numbers of employed graduates and diplomates and have been stacked (measured on the left-hand-side vertical axis). Lines denote the respective graduate and diplomate employment rates (measured on the right-hand-side vertical axis).

Figure 2.3: Narrow unemployment and narrow unemployment rates (%) for graduates and diplomates (2000 - 2011)

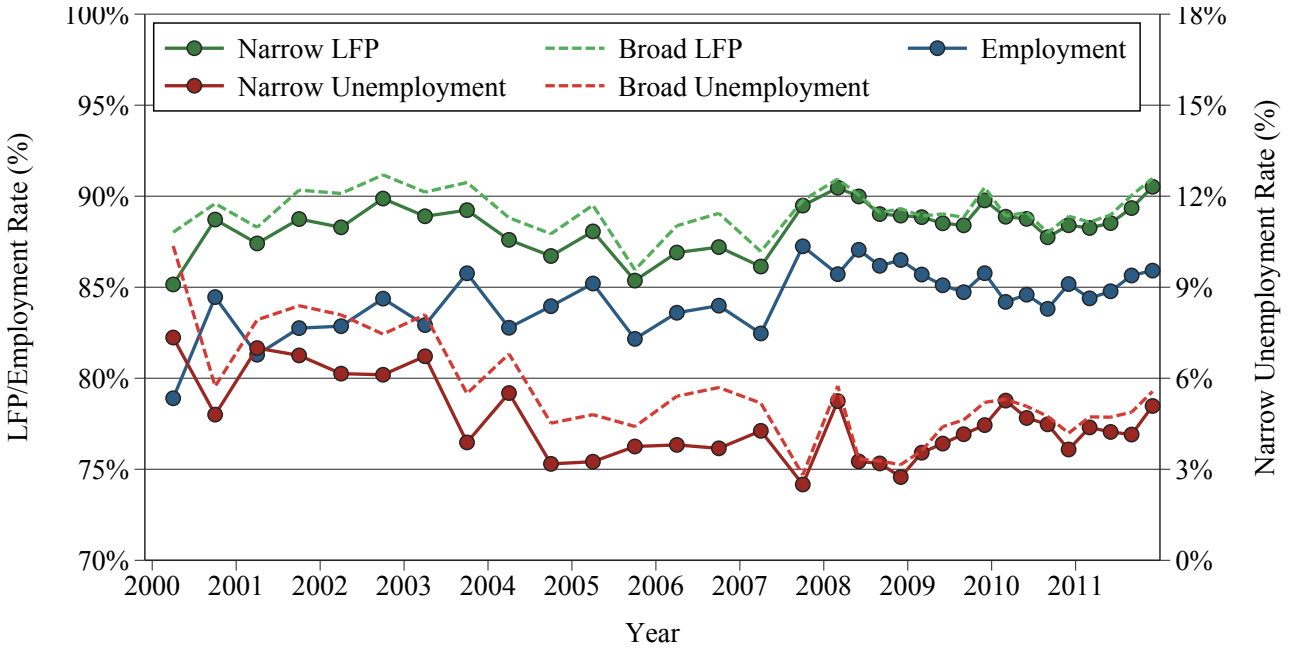


NOTES: Own estimations using Stats SA's March 2000 LFS - QLFS2011Q4 data. Estimates are weighted and are calculated only for graduates and dipolomates in the population of working-age (15 - 64 year-olds). Bars denote the respective numbers of narrowly unemployed graduates and diplomates and have been stacked (measured on the left-hand-side vertical axis). Lines denote the respective graduate and diplomate narrow unemployment rates (measured on the right-hand-side vertical axis).

one takes into account that most of the survey data on which analyses regarding employment and unemployment outcomes in South Africa are based do not enable one to distinguish between diplomates who obtained

their qualifications from HEIs and diplomates who obtained their qualifications from TVET colleges.[7] Yet, it is not only known that TVET diplomates constitute a significant proportion of all diplomates, but also that the quality of TVET college diplomas and certificates are generally lower and, therefore, less likely to improve employment prospects and reduce the probability of unemployment, than HE diplomas and certificates (Financial and Fiscal Commission, 2012; Fisher and Scott, 2011). Therefore, there is a clear case to be made for analysing the labour market outcomes faced by university graduates separately from those faced by diplomates and to use the latter only as a comparator group.

Figure 2.4: Broad and narrow graduate LFP, employment, and unemployment rates (%) (2000 - 2011)



NOTES: Own estimations using Stats SA's March 2000 LFS - QLFS2011Q4 data. Estimates are weighted and are calculated only for graduates in the population of working-age (15 - 64 year-olds). LFP and employment rates are measured on the left-hand-side vertical axis, whereas unemployment rates are measured in the right-hand-side vertical axis.

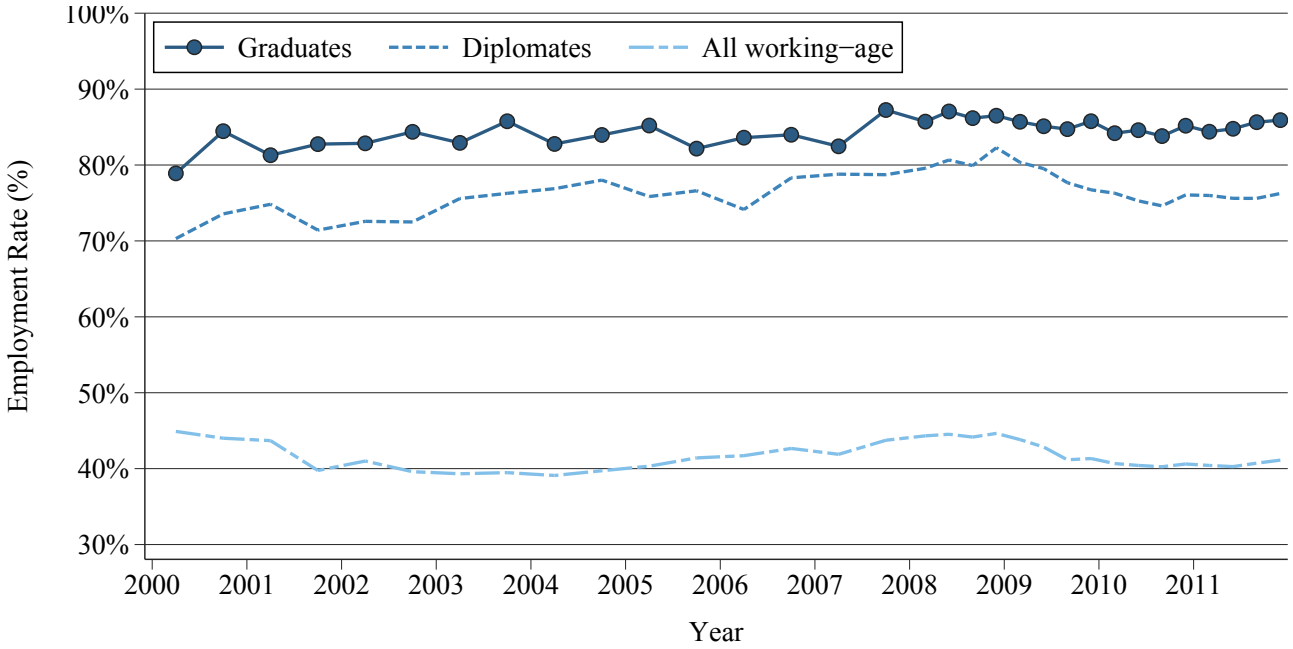
Figure 2.4 presents the broad and narrow LFP, employment, and unemployment rates for graduates between 2000 and 2011. The distinction between the broad and narrow labour force often plagues studies concerned with unemployment (Kingdon and Knight, 2006). However, as can be seen from the graph, the difference between these two definitions of LFP and unemployment are mostly negligible for graduates. Therefore, it is largely irrelevant weather one analyses unemployment outcomes for graduates in South Africa using the broad or the narrow definition of the labour force.

While graduate LFP rates have fluctuated slightly between 2000 and 2011, there is no clear evidence of a long-term upward or downward trend. By contrast, graduate employment rates appear to have risen over the period while graduate unemployment rates have fallen. However, the trends in these labour market status outcomes for graduates is of secondary concern. Of primary importance is the fact that graduate employment rates have consistently been higher than 80% since 2001 and that graduate unemployment rates have consistently been lower than 6% since September 2003.

[7] In this chapter, HE refers only to South Africa's public higher education system and thus excludes TVET colleges and private HEIs. Similarly, HEIs either refer to the 36 former technikons or general academic universities or the the 23 present-day universities that constituted South Africa's public HE system until 2014. It follows that *HE-educated individuals* refer only to those individuals who have completed either a diplomate or graduate-level qualification at one of South Africa's public HEIs.

The estimates in Figure 2.4 suggest that graduate unemployment in South Africa is not alarmingly high. In fact, it is rather low. Yet, in order to draw such a conclusion it is necessary to evaluate graduate employment and unemployment rates in the context of South Africa's overall employment and unemployment rates, as done in Figures 2.5 and 2.6. It is clear from the graphs that South Africa's overall employment rate in the population of working-age is extremely low at between 40% and 45%. Similarly, the overall narrow unemployment rate in the population of working age of around 25% is extremely high.

Figure 2.5: Employment rates (%) for graduates, diplomates, and the population of working-age (2000 - 2011)



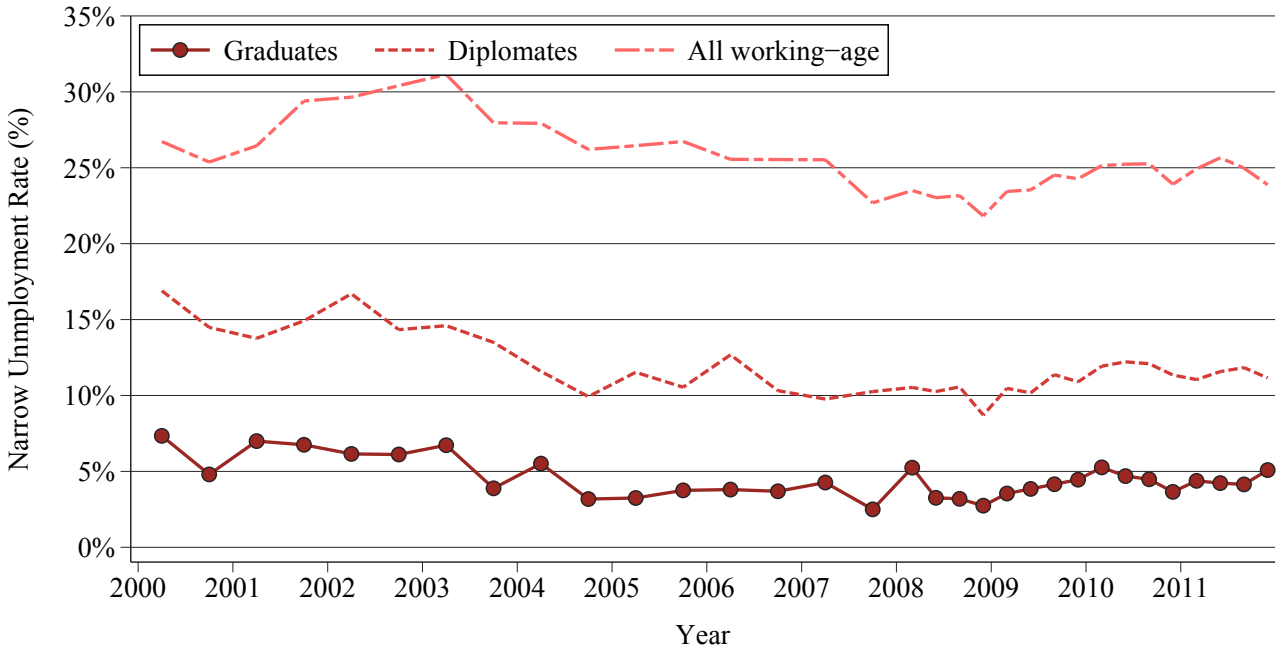
NOTES: Own estimations using Stats SA's March 2000 LFS - QLFS2011Q4 data. Estimates are weighted and are calculated only for the population of working-age (15 - 64 year-olds).

Within the context of South Africa's high overall unemployment rate and its low employment rate, it would be difficult to argue that graduate employment is low or that graduate unemployment is alarmingly high. Such assertions do not seem to have any basis in reality and are clearly not supported by the data. Crucially, however, overall figures fail to reflect the differences in graduate labour market status outcomes between race groups. Figure 2.7, for example, shows that, while the narrow LFP and employment rates for White graduates track together very closely over time, there has been a far larger difference of around 5 percentage points between the narrow LFP rate and the employment rate for Black graduates since 2004.

Despite the fact that the employment rate for Black graduates has been at least as high as the employment rate for White graduates since 2003, the fact that Black graduates have a significantly higher narrow LFP rate than White graduates means that they also have a significantly higher narrow unemployment rate. This is illustrated in Figure 2.8. While the narrow unemployment rate for Black graduates has decreased considerably over time, from an estimated high of 20% in 2000 to just under 7% in 2011, it nevertheless remains roughly twice as high as the unemployment rate for White graduates.

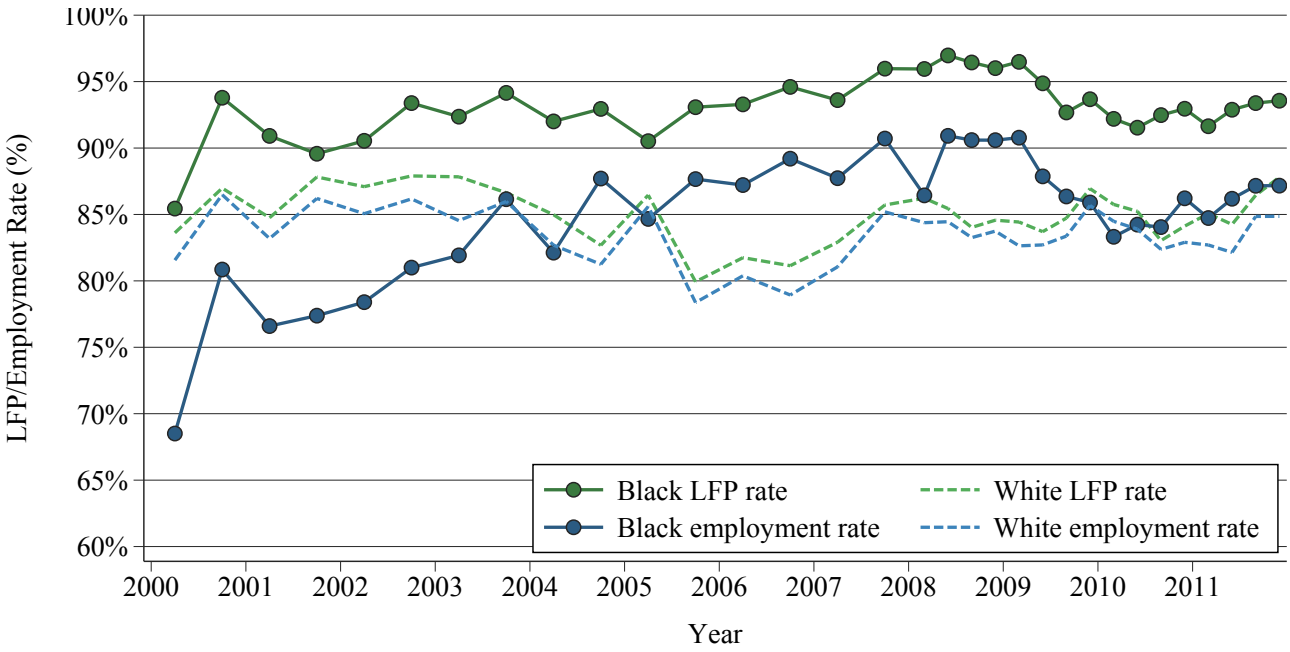
None of the findings in this section can be taken to suggest that graduate unemployment in South Africa is either alarmingly high, or that it is rising at an alarming rate. On the contrary, it appears as though graduate unemployment rates have been on a long-term downward trend since 2000 and are low in relation to overall unemployment in the country. Moreover, the gap between the unemployment rate for Black and White

Figure 2.6: Narrow unemployment rates (%) for graduates, diplomates, and the population of working-age (2000 - 2011)



NOTES: Own estimations using Stats SA's March 2000 LFS - QLFS2011Q4 data. Estimates are weighted and are calculated only for the population of working-age (15 - 64 year-olds).

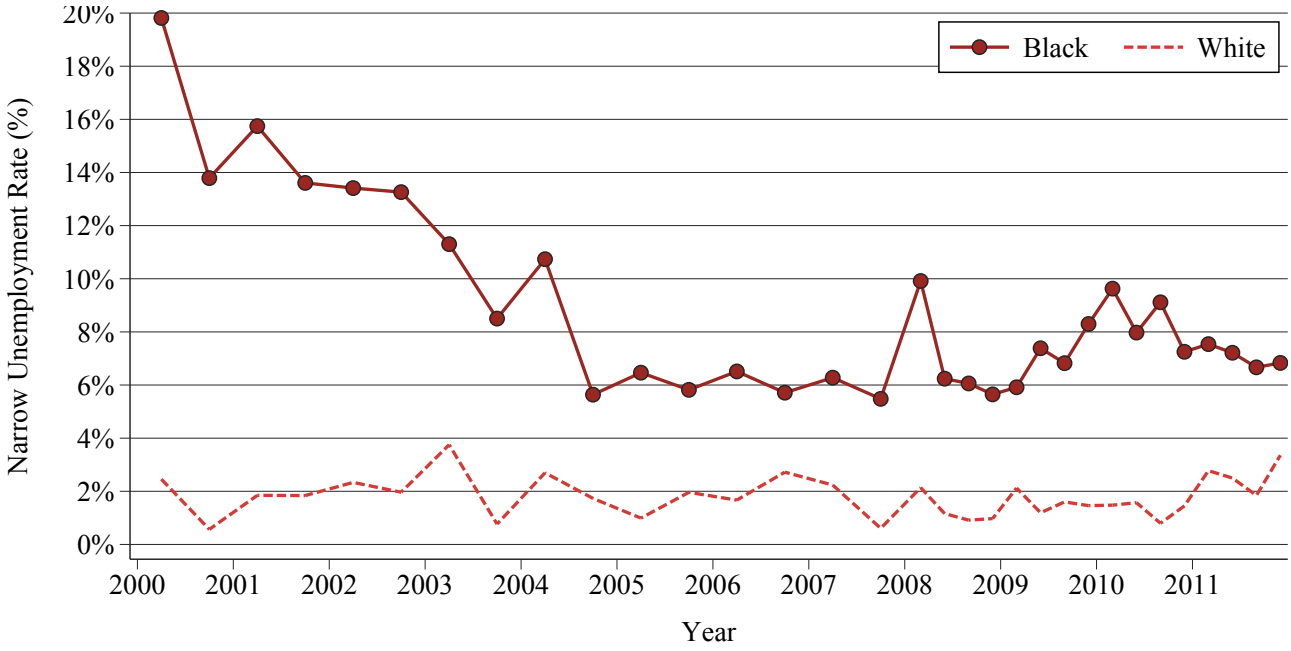
Figure 2.7: Narrow LFP and employment rates (%) for Black and White graduates (2000 - 2011)



NOTES: Own estimations using Stats SA's March 2000 LFS - QLFS2011Q4 data. Estimates are weighted and are calculated only for the population of working-age (15 - 64 year-olds). Lines denote the estimated narrow LFP and employment rates for Black and White graduates, respectively.

graduates has narrowed considerably between 2000 and 2005. Yet, the fact that such a gap still exists and that it does not appear to be narrowing after 2005 begs the question: what it is that distinguishes Black and White graduates, such that the former group is likely to face worse labour market outcomes than the latter group? More generally, it remains unclear why there are unexplained differences in the employment and unemployment outcomes for graduates from different race groups and how these differences relate to HE

Figure 2.8: Narrow unemployment rates (%) for Black and White graduates (2000 - 2011)



NOTES: Own estimations using Stats SA's March 2000 LFS - QLFS2011Q4 data. Estimates are weighted and are calculated only for the population of working-age (15 - 64 year-olds). Lines denote the estimated narrow unemployment rates for Black and White graduates, respectively.

institutional factors. The objective in the remainder of this chapter is to provide answers to this question.

2.4 The South African HE landscape

Historically, South Africa's HE landscape has been highly fragmented. Prior to 2004, the public HE system consisted of 36 HEIs, comprising 15 technikons and 21 general academic universities. While technikons operated as *de facto* vocational training institutions, focussing primarily on the application of knowledge, universities concentrated on the development of knowledge and the training of students in such scientific and scholarly disciplines as would enable them to occupy high-level professions (Bunting, 2002:37 -39). However, the HE system was not only fragmented in terms of function, but also in terms of governance, funding and, as a result, the quality of education provided by different parts of the system (CHE, 2004:24).

Under Apartheid, eight racially demarcated government departments were tasked with the administration of the 36 HEIs. Significant differences in the amount of funding and resources available to each department and the amount of developmental support they were therefore able to provide the various HEIs under their control, meant that this policy had the effect of further fragmenting the HE system into what can most accurately be described as historically disadvantaged, or Black, institutions (HDIs) and historically advantaged, or White, institutions (HAIs) (CHE, 2004:xv). The classification of each of South Africa's 36 former HEIs as either historically disadvantaged or historically advantaged is shown in Table A.2. In total, 10 of the former universities and 7 of the former technikons can be regarded as historically disadvantaged.

Following South Africa's democratization in 1994, the HE landscape was subjected to a number of significant policy changes, chief among which was the amalgamation of its 36 technikons and universities into 11 traditional universities, 6 comprehensive universities, and 6 universities of technology (CHE, 2010*a*:2).[8] This amalgamation not only reduced the total number of public HEIs from 36 to the current 23 HEIs shown in Table A.3, but also meant that some technikons merged with general academic universities and, more importantly, that some HDIs merged with HAIs.[9]

Despite the aforementioned policy changes, it is important to acknowledge that the South African HE system remains fragmented along the lines of historical advantage and disadvantage. Many HDIs are still at a significant disadvantage relative to HAIs in terms of their institutional capacities, the socio-economic backgrounds of their students, and the quality of education that they can provide. Consequently, it is reasonable to expect that HDIs and HAIs will perform differently, not only in terms of graduate outputs, but also in terms of many other performance measures (Fisher and Scott, 2011:28).

2.4.1 Changes in HE graduate outputs (1986 - 2011)

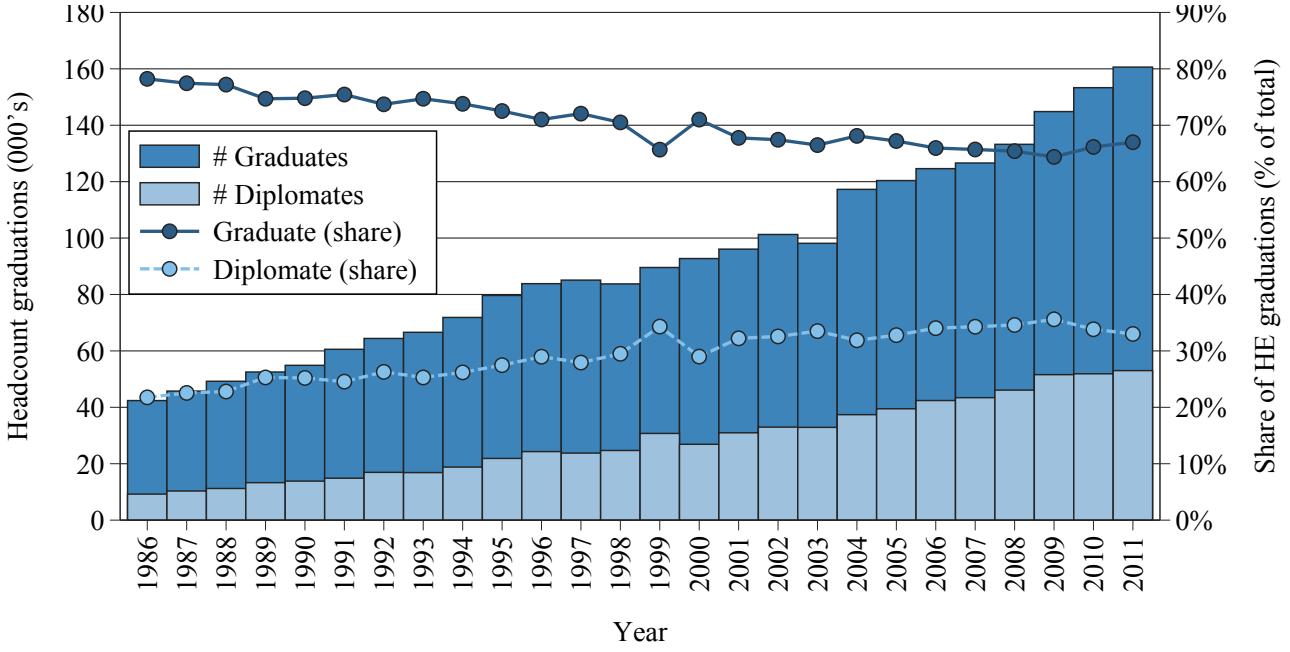
The policy changes which have altered the South African HE landscape over the three decades have coincided with a significant rise in the total number of HE graduations each year. Figure 2.9 shows that, while only just over 40 000 individuals graduated from HEIs with university or technikon qualifications in 1986, this number had more than doubled by 1996. Following a period of relative stagnation between 1996 and 2000, the number

[8] Traditional universities and universities of technology respectively resemble the pre-amalgamation general academic universities and technikons in function, with the former offering mainly theoretically-oriented diplomas and degrees and the latter mainly vocational diplomas and degrees. Comprehensive universities offer a combination of these types of qualifications .

[9] The present-day Cape Peninsula of Technology (CPUT), Durban Institute of Technology (DUT), University of Kwazulu-Natal (UKZN), North West University (NWU), and Tshwane University of Technology (TUT), for example, were all created from the merger of historically disadvantaged and historically advantaged HEIs.

of diplomates and graduates produced annually again began to rise rapidly and by 2011 South Africa's 23 universities produced just over 160 000 HE-educated individuals each year. However, as can also be seen from Figure 2.9, the number of HE-educated individuals with diplomate-level qualifications has been rising faster than the number of individuals with graduate-level qualifications. Where approximately 3.5 graduates were produced for each diplomate in 1986, this ratio had fallen to just over 2 graduates per diplomate by 2011. Thus, while graduates still represent the bulk of HE-educated individuals produced by universities each year, their relative share of South Africa's stock of HE-educated individuals is steadily declining.

Figure 2.9: Graduate- and diplomate-level graduations (1986 - 2011)

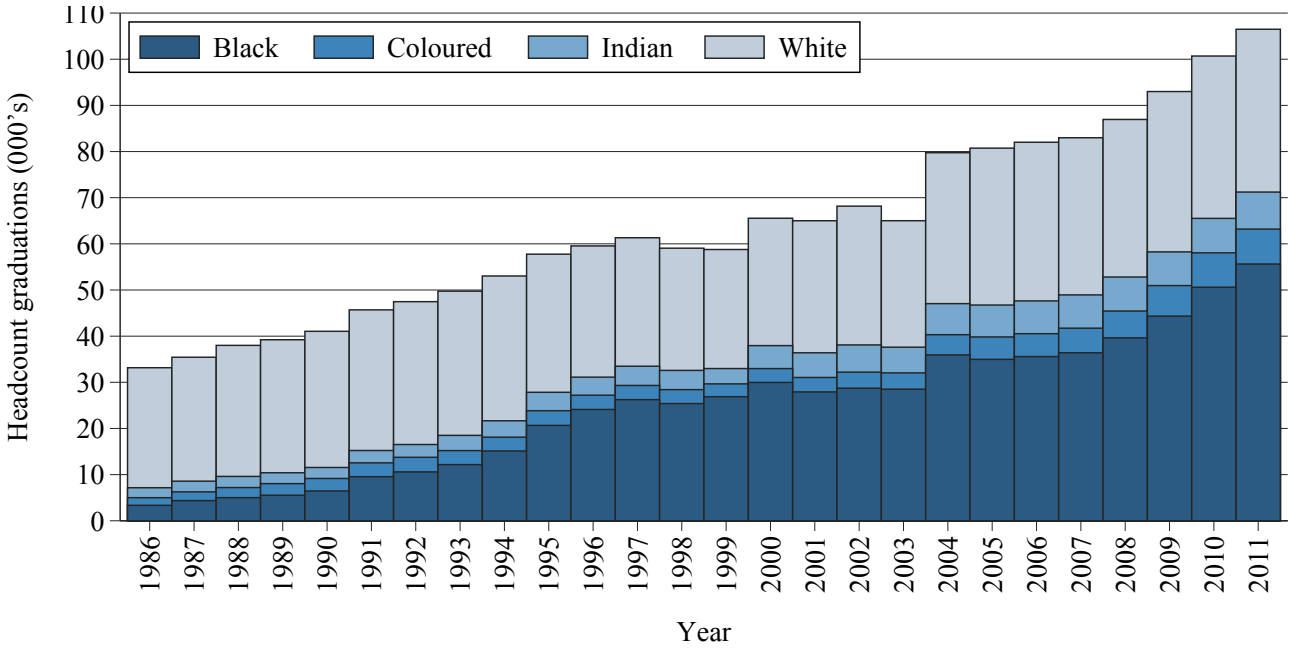


NOTES: Own calculations using aggregate HEMIS data accessed via DHET (2014*b*). Bars denote the respective numbers of diplomate- and graduate-level graduations per year and have been stacked (measured on the left-hand-side vertical axis). Lines denote the respective diplomate and graduate shares of all HE graduations in the public HE system per year (measured on the right-hand-side vertical axis)

In addition to the expansion of South Africa's yearly graduate outputs, the nature of the policy changes which have affected the HE system over the past 25 years means that the demographic composition of South Africa's stock of graduates has also changed radically over time. This is clearly evident when looking at changes in the racial composition of the graduates produced by the HE system each year. Figure 2.10 reveals that, while the number of White graduates produced annually has increased only moderately from about 27 500 to just over 35 000 in the past 25 years, the number of Black graduates produced has increased more than 16-fold from about 3 400 in 1986 to more than 55 600 in 2011. The implications of the racial differences in graduate output growth are simple: while the HE system produced 7.9 White graduates for each Black graduate in 1986, by 2011 it produced 1.6 Black graduates for every single White graduate. Figure 2.11 offers a similarly poignant illustration of the extent of change in the racial composition of South Africa's stock of graduates by showing the respective racial shares of the total number of graduates produced in each year since 1986.

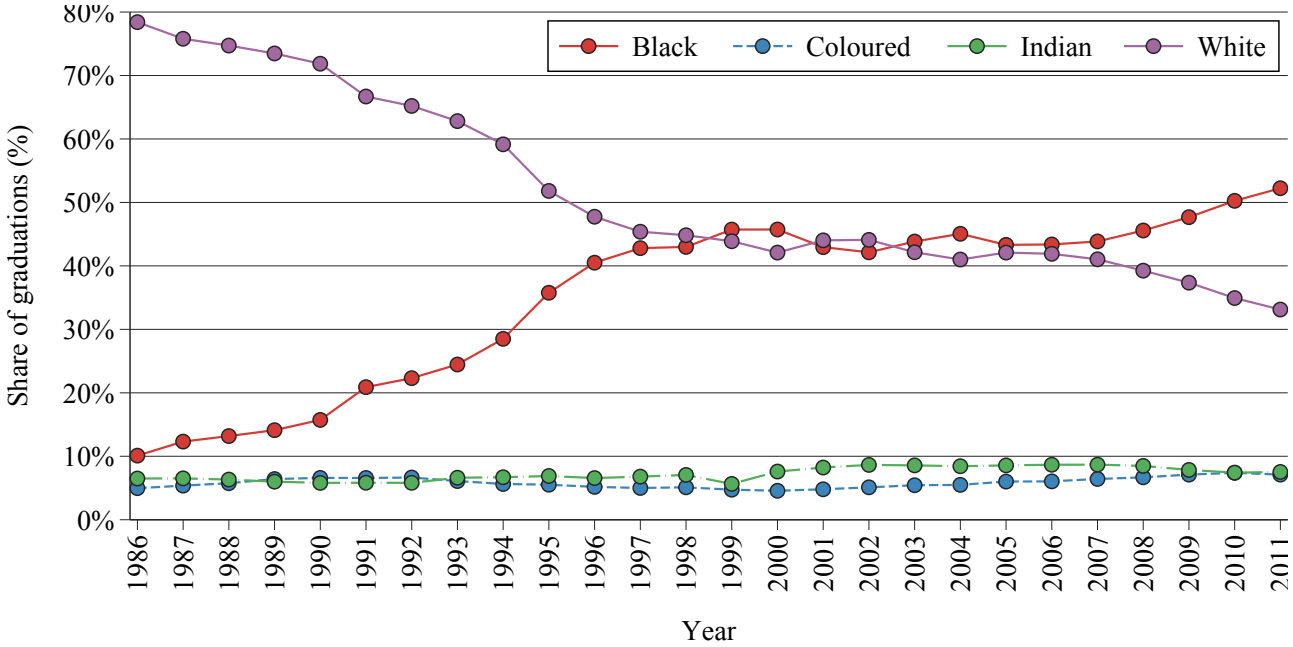
Figure 2.12 shows how the amalgamation of technikons and universities in South Africa in 2004 impacted on the relative contributions made by different types of HEIs to total annual graduate outputs. Prior to 2004, universities accounted for around 90% of all graduate-level graduations each year. However, since 2004, only about 60% of all graduations have come from traditional universities, with 30% now being produced by comprehensive universities. Given that all universities of technology either used to be technikons or were created

Figure 2.10: Graduate-level graduations, by race (1986 - 2011)



NOTES: Own calculations using aggregate HEMIS data accessed via DHET (2014*b*). Bars denote the respective numbers of graduate-level graduations in the public HE system per year for Black, Coloured, Indian, and White individuals and have been stacked.

Figure 2.11: Racial shares of graduate-level graduations (1986 - 2011)

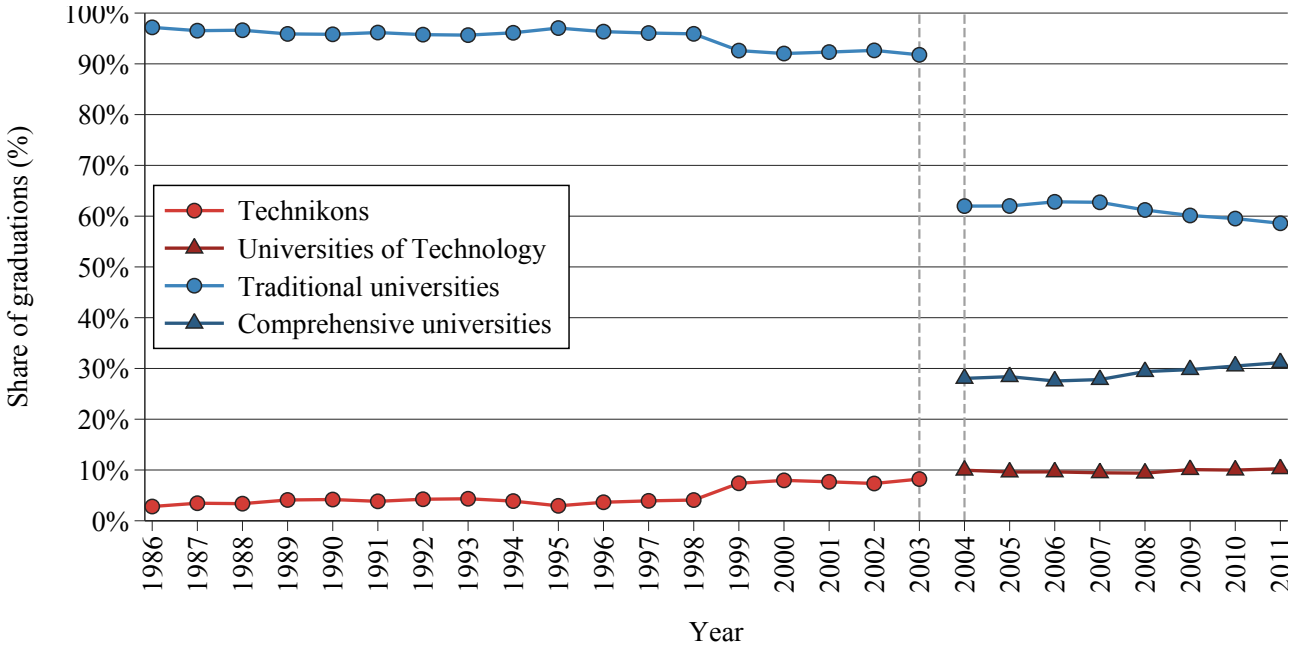


NOTES: Own calculations using aggregate HEMIS data accessed via DHET (2014*b*). Lines denote the respective racial shares of all graduate-level graduations in the public HE system per year.

through the merger of technikons, it is not surprising that this part of the HE system still contributes only about 10% of graduate-level graduations every year, just as it did before the amalgamation.

As mentioned before, the amalgamation of South Africa's 36 former HEIs not only had the effect of reducing the total number of HEIs in the country, but also entailed that some HDIs merged with HAIs. From the perspective of analysing the relative contributions of the historically disadvantaged and historically advantaged

Figure 2.12: Graduate-level graduation shares, by HEI type (1986 - 2011)



NOTES: Own calculations using aggregate HEMIS data accessed via DHET (2014*b*). Lines denote the respective shares of all graduate-level graduations per year in the public HE system for technikons, traditional universities, universities of technology, and comprehensive universities.

parts of the HE system to the total number of graduates produced each year, this is problematic since it is no longer clear to what extent these institutions can accurately be classified as either HDIs or HAIs. This problem is illustrated in Figure 2.13, which shows the respective HDI and HAI shares of graduate-level graduations.

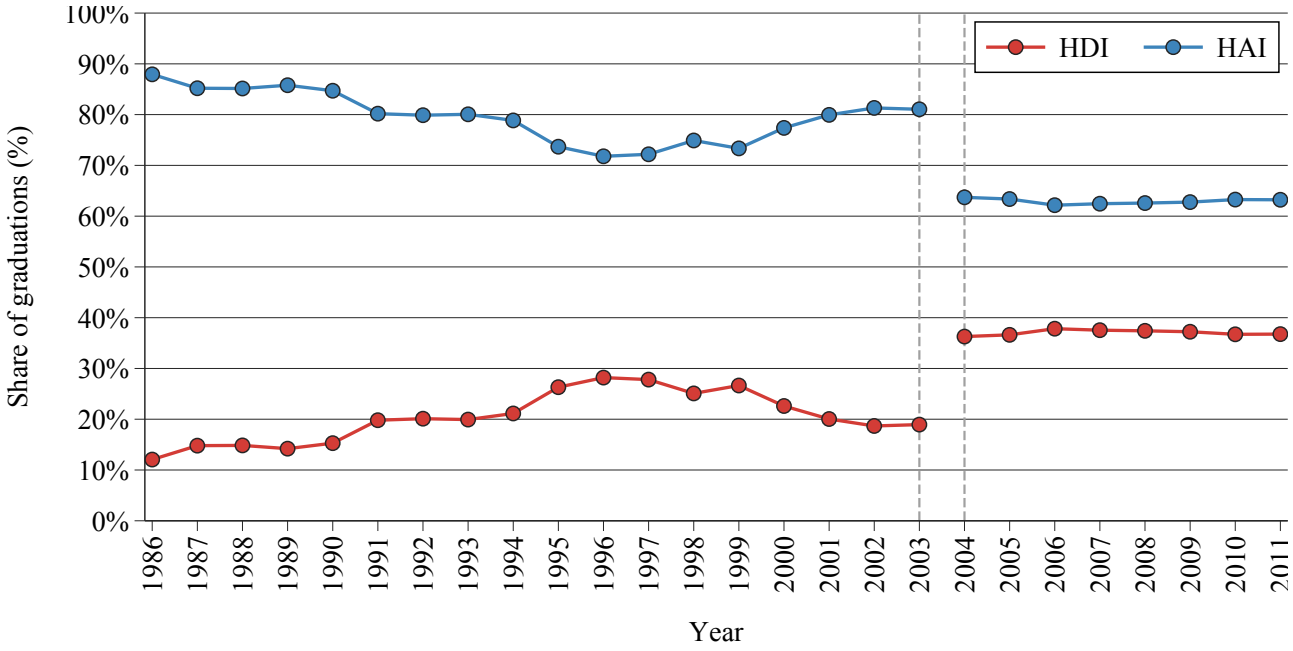
HAIs and HDIs respectively produced around 80% and 20% of South Africa's graduate-level graduations by 2003. However, if one applies the classification commonly used in the literature on South Africa's HE system, whereby institutions that were either already classified as historically disadvantaged before 2004 or were merged with HDIs as part of the amalgamation are now also be described as HDIs, there is a large, discontinuous change in the relative contributions of HDIs and HAIs.[10] Specifically, this classification makes it seem as though HDIs have been producing just short of 40% of all new graduates since 2004.

Due to the potential pitfalls inherent in using a classification which is based solely on historical status to evaluate post-amalgamation HEIs , CHET (2010) proposes a three-cluster classification of South Africa's universities which expresses institutional differentiation in terms of observable criteria and performance measures (Fisher and Scott, 2011:33).[11] As shown in Table A.3, the first cluster comprises South Africa's leading research institutions, all of which are HAIs. Cluster 2 is composed of both traditional and comprehensive universities while the third cluster includes all the universities of technology, most of which could be classified as HDIs, and two comprehensive universities (Fisher and Scott, 2011:33). Though the original aim of the 3-cluster clas-

[10] According to this classification, the new HDIs include 12 institutions: University of Fort Hare (UFH), University of KwaZulu-Natal (UKZN), University of Limpopo (UL), North West University (NWU), University of Venda (UNIVEN), University of Western Cape (UWC), University of Zululand (UZ), Walter Sisulu University (WSU), Cape Peninsula University of Technology (CPUT), Durban Institute of Technology (DUT), Tshwane University of Technology (TUT), and Mangosuthu University of Technology (MUT).

[11] The observable input criteria used in the construction of the three CHET (2010) HE institutional clusters include: the percentage headcount enrolment in science, engineering and technology; the percentage master and doctoral headcount enrolments; the student to academic and/or research staff FTE ratio; the percentage of permanent academic and/or research staff with doctoral degrees; the percentage private income; and the government and/or student fee income per FTE student. The performance measures used in the construction of the clusters include student success rates, graduation rates, and the weighted research outputs units per permanent academic and research staff member.

Figure 2.13: Graduate-level graduation shares, by HDIs vs HAIs (1986 - 2011)



NOTES: Own calculations using aggregate HEMIS data accessed via DHET (2014*b*). Lines denote the respective shares of all graduate-level graduations per year in the public HE system for HAIs.

sification was to differentiate HEIs based on function and focus, it nevertheless provides a useful hierarchical classification of institutional quality in different parts of the HE system.

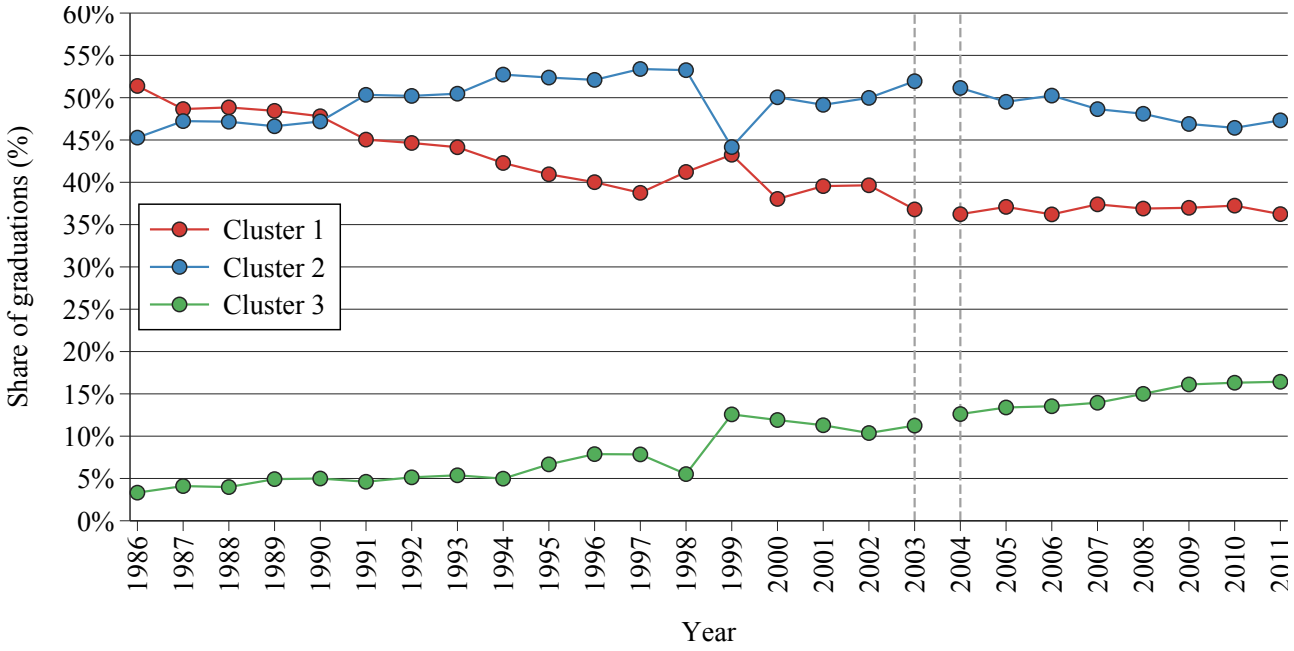
Figure 2.14 shows the shares of total graduates produced each year by universities in the three different HEI clusters.[12] In the long run, cluster 3 institutions have been increasing their graduate outputs relative to cluster 1 universities. In the last 10 years, however, cluster 3 institutions have been increasing their graduate outputs relative to both cluster 1 and cluster 2 institutions. By 2011, 47% of new graduates were being produced by cluster 2 universities, followed by 36% by cluster 1 universities and 17% by cluster 3 universities.

The racial dimensions of historical status in South Africa's HE system coupled with the significant expansion of the number of Black graduates produced by the country's HEIs over the past 25 years imply that the aforementioned changes in the HE landscape are unlikely to have been equally pertinent to all race groups. This is confirmed by Figure 2.15 which shows marked differences in the proportions, and changes in the proportions, of Black, Coloured, Indian, and White graduates produced by HDIs.

In 1986, more than 50% of Indian, Coloured, and Black graduates graduated from HDIs. By 2003, the percentage of Black graduates from HDIs had fallen to 35%, the percentage of Coloured graduates from HDIs to 29%, and the proportion of Indians from HDIs to 18%. Crucially, this change was not driven by a decline in the numbers of Black, Coloured, and Indian graduates being produced by HDIs. Rather, it was the result of the fact that the number of Black, Coloured, and Indian students who graduated from HAIs increased comparatively more rapidly between 1986 and 2003. Ignoring what is most likely a definition-driven discrete jump in the proportion of graduates from HDIs across all race groups between 2003 and 2004, it appears as though the historical downward trend in the proportion of Black and Indian graduates from HDIs has continued in the years following the amalgamation.

[12] The CHET (2010) cluster classification was retrospectively applied to the 36 pre-amalgamation technikons and universities based on the HEIs into which they were merged in 2004.

Figure 2.14: Share of annual graduate-level graduations, by HEI cluster (1986 - 2011)

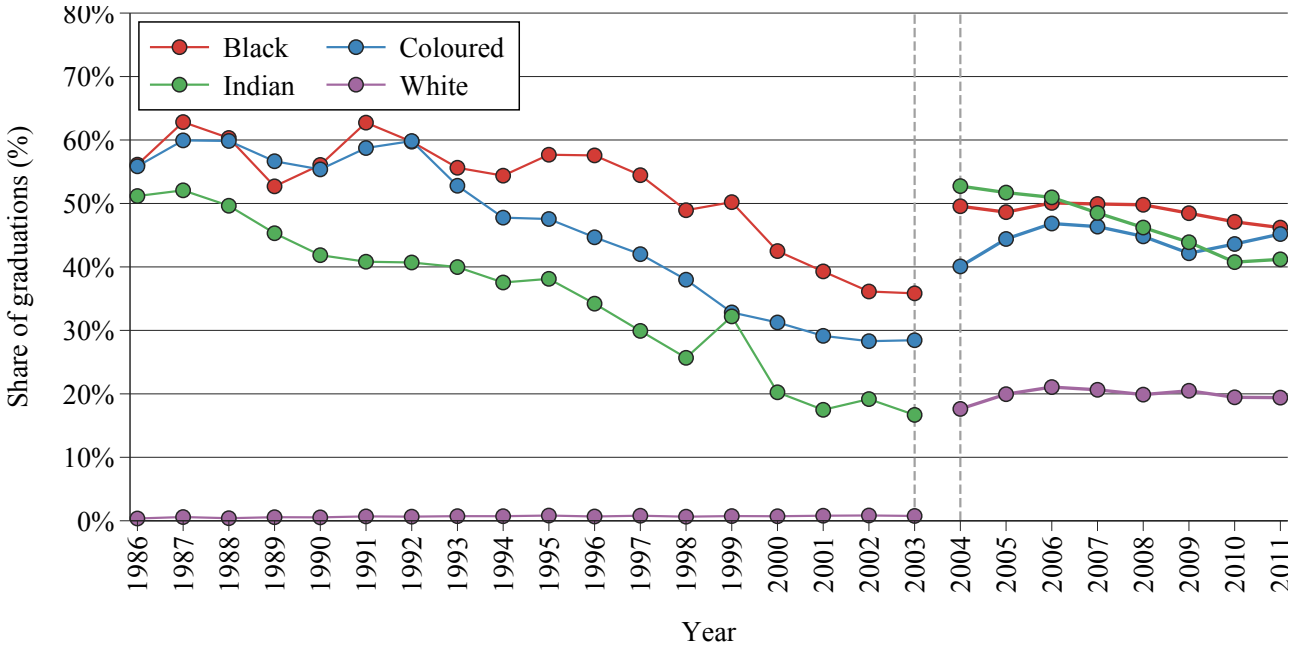


NOTES: Own calculations using aggregate HEMIS data accessed via DHET (2014*b*). Lines denote the respective shares of all graduate-level graduations per year in the public HE system for cluster 1, cluster 2, and cluster 3 HEIs (CHET, 2010).

Despite the general decline in the HDI-share of graduations, Figure 2.15 suggests that a far greater proportion of Black, Coloured, and Indian graduates still graduate from historically disadvantaged HEIs than is the case for Whites. This supposition is supported by Figure 2.16 which shows that, while 57% and 39% of White graduates respectively graduated from cluster 1 and cluster 2 HEIs in 2011, a mere 5% graduated from cluster 3 HEIs. By contrast, in the same year over 50% of Black graduates graduated from cluster 2 institutions and the percentage of Black graduations from cluster 1 or cluster 2 HEIs was roughly equal at about 25% each.

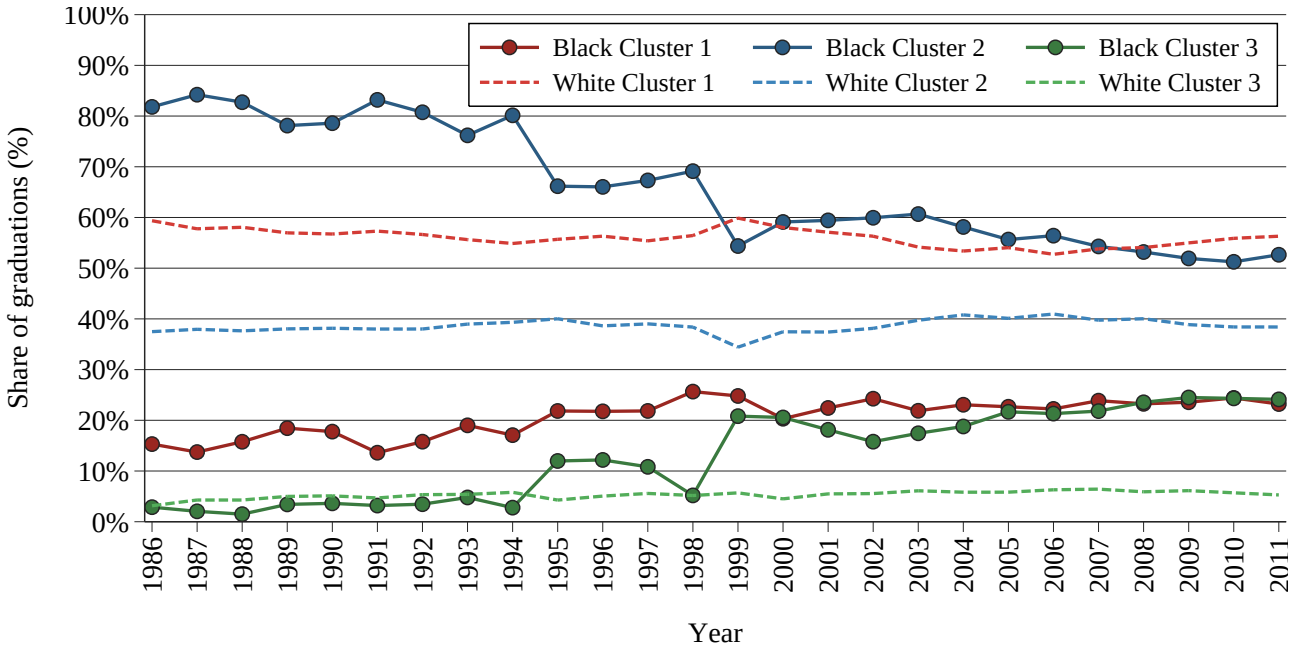
It is reasonable to expect that the various features of South Africa's HE system and the changes in the HE landscape outlined above would have important implications for the labour market prospects faced by the country's graduates. In the absence of a commensurate increase in the demand for graduate labour and expansion of the labour market's capacity to absorb graduates into graduate-level jobs over the past 25 years, the rapid rise in the number of graduates produced by the HE system each year should mean that new graduates find it increasingly difficult to procure employment. Second, and perhaps more importantly, the significant expansion of South Africa's stock of Black graduates, in particular, must be viewed in the context of historically limited access to quality HE. That is, because of historical inequalities in access to quality education, the fact that the Black share of graduate-level graduations is rising over time also means that South Africa's stock of graduates are increasingly being supplemented by individuals who are likely to have bee educated in the weaker-performing parts of the HE system. Thus, it is plausible that part of the difference in the unemployment rates that are observed for Black and White graduates could be attributed to the fact that a far greater proportion of Black graduates (more than 75%) graduate from cluster 2 or 3 HEIs, for example, than White graduates, the majority of which graduate from cluster 1 institutions.

Figure 2.15: HDI-share of Black, Coloured, Indian, and White graduate-level graduations (1986 - 2011)



NOTES: Own calculations using aggregate HEMIS data accessed via DHET (2014*b*). Lines denote the respective HDI shares of all Black, Coloured, Indian, and White graduate-level graduations per year in the public HE system.

Figure 2.16: Share of Black and White graduate-level graduations by HEI cluster (1986 - 2011)



NOTES: Own calculations using aggregate HEMIS data accessed via DHET (2014*b*). Lines denote the respective shares of all Black and White graduate-level graduations per year in the public HE system for cluster 1, cluster 2, and cluster 3 HEIs (CHET, 2010).

2.5 Relating HEIs to graduate unemployment and employment probabilities

As discussed above, historical patterns of access to HEIs, persistent heterogeneity in the type and quality of university education, and the changing demographic composition of the country's stock of graduates are

likely to be important for explaining racial differentials in graduate labour market outcomes in South Africa. However, no study has thus far been able to examine on a nationally representative basis the extent to which the nature of the specific HEIs attended by graduates is associated with the probabilities that they will be employed or unemployed. This is largely attributable to the fact that there is no existing dataset for South Africa that allows information on the HEIs attended by graduates to be linked directly to the labour market outcomes they face.[13] By implication, the success of any attempt to empirically investigate the relationship between HE institutional features and graduate labour market outcomes in South Africa hinges on the extent to which it is possible to link" information regarding graduate labour market outcomes in one dataset, to information regarding graduate HE institutional aspects in another dataset.

2.5.1 Data

The analysis below exploits two distinct sources of data on South African graduates. The first is a pooled sample of cross-sectional labour force data for working-age graduates from Statistics South Africa's (StatsSA) March and September 2000- 2007 Labour Force Surveys (LFS) and its 2008Q1 - 2015Q2 Quarterly Labour Force Surveys (QLFS). The second source of data comes from the Department of Higher Education and Training's (DHET) Higher Education Management Information System (HEMIS).

HEMIS is the national repository for information on students who have enrolled in and subsequently graduated from the public HE system in South Africa and, in its original form, contains detailed unit-record information on all enrolments and graduations since 2000. The HEMIS data used in this chapter, however, while based on the aforementioned unit-record information, has been aggregated in such a way that it is no longer possible to identify individual student records.[14] Nevertheless, the data contains sufficiently detailed information on student demographics and the specific HEIs where different graduates obtained their qualifications to be used for the purposes of the empirical methodology outlined below.

While the pooled labour force survey data (hereafter collectively referred to as *LFS data*) covers the period 2000 - 2015, audited aggregate HEMIS data is currently only available for the period 2000 - 2013.

2.5.2 Methodology

In order to examine the association between HEIs and graduate employment and unemployment probabilities, it is first necessary to find a way of linking the information on graduates in the HEMIS data to information on graduates in the LFS data.

The approach proposed here combines forms of multiple imputation and probabilistic cell-matching and entails using the availability of common time-invariant group-specific variables found in both the LFS and HEMIS data to estimate the probability that specific LFS graduates come from specific groups of HEMIS graduates.[15] Specifically, by using information that is unique across different combinations of time-invariant

[13] On the one hand, none of the nationally representative labour force survey datasets available for South Africa contain information on the tertiary institutions where graduates obtained their qualifications and, on the other hand, HE administrative records containing detailed information on the individuals who have graduated from public HEIs in South Africa do not contain any information on the labour market outcomes subsequently faced by those graduates.

[14] This aggregate HEMIS data was extracted from the IDSC's Higher Education Data Analyser (HEDA, 2015).

[15] The methodology proposed here is based on the approaches discussed in Ridder and Moffitt (2007), Kim and Chambers (2012), Hof and Zwinderman (2012), and Goldstein *et al.* (2012).

group-specific variables in both the HEMIS and LFS data, the approach exploits the fact that it is theoretically possible to assign to each graduate in the LFS data an estimated probability of having graduated from a specific South African HEI, based on the known distribution of graduations in the HEMIS data.

The time-invariant group-specific variables that are common across the HEMIS and LFS data can be represented by a series of vectors, $\mathbf{X}^H, \mathbf{Y}^H \ldots \mathbf{Z}^H$ and $\mathbf{X}^L, \mathbf{Y}^L \ldots \mathbf{Z}^L$, where the superscripts H and L respectively denote the HEMIS and LFS datasets. Consequently, $\mathbf{x}_i^j$ would denote the i^{th} observation of variable $\mathbf{X}$ in dataset j.

There is a finite number of unique combinations of observed values that the set of group-specific variables takes on in each dataset. It is therefore possible to construct a criterion index variable, $\mathbf{c}$, that uniquely identifies each of the unique combinations that occurs in either dataset. That is, $\mathbf{c}_i^j \in \mathcal{C}$ where $\mathcal{C}$ is the set of indices of unique patterns in $\left\{\mathbf{X}^H, \mathbf{Y}^H, \ldots, \mathbf{Z}^H\right\} \bigcup \left\{\mathbf{X}^L, \mathbf{Y}^L, \ldots, \mathbf{Z}^L\right\}$. In other words:

$$\mathbf{c}_i^j = \mathbf{c}_m^k \text{ if and only if } \left(\mathbf{x}_i^j = \mathbf{x}_m^k \text{ and } \mathbf{y}_i^j = \mathbf{y}_m^k \text{ and } \ldots \text{ and } \mathbf{z}_i^j = \mathbf{z}_m^k\right)$$

$$1^m \left(X^L = x_m^L, y^L = y_m^L, \ldots, Z^L = z_m^L\right) = c_m^L \quad \forall \quad m \in M$$

Let HEI be an index that takes on values in a set U that identifies the HEI from which individual i in the HEMIS data graduated. Calculate for each unique value of the index $\mathbf{c}$ in the HEMIS data, the proportion of graduates who graduated from a specific HEI, u. Call this variable $\mathbf{p_u}^j$ in dataset j.

$$\mathbf{p_u}_i^H = \Pr\left(HEI_i = u | \mathbf{c}_i^H = c\right) = \frac{\sum_{j=1}^N \mathbf{1}\left(\mathbf{c}_j^H = c\right) \mathbf{1}\left(HEI_j = u\right)}{\sum_{k=1}^N 1\left(\mathbf{c}_k^H = c\right)} \tag{2.1}$$
$$\forall \ (u, c) \in U \times \mathcal{C}^H$$

where $\mathbf{1}\left(.\right)$ denotes an indicator function.[16]

Wherever the index of unique patterns matches between datasets, assign to that observation in the LFS data the $\mathbf{p_u}$ value in the HEMIS dataset constructed as per equation (2.1). If a particular pattern in the LFS data does not have a counterpart in the HEMIS data, a missing value is recorded.

$$\mathbf{p_u}_j^L = \begin{cases} \mathbf{p_u}_i^H & \text{if } \mathbf{c}_j^L = \mathbf{c}_i^H \\ \oslash & \text{otherwise} \end{cases}$$

For the sake of brevity, this approach is hereafter referred to as *probabilistic linking* while the imputed HEI probability variables, $\mathbf{p_u}_j^L$ are referred to as HEI proxies.

It should be clear that the accuracy of the probabilistic linking approach depends on the extent to which the values taken by the criterion, $\mathbf{c}$, uniquely identify the different observations in the LFS and the HEMIS data and sufficiently discriminate between graduates who graduated from different HEIs (Goldstein *et al.*, 2012:3481). This, in turn, is a function of the number of unique possible combinations of the identifier variables in relation to the total number of observations in each sample under consideration as well as the amount of variation in the number of distinct HEIs within each combination of the identifier variables.

[16] Note that there is one variable for each HEI represented in the HEMIS dataset. This effectively entails averaging the variables of interest (i.e. the specific university attended) over each unique value of the criterion.

Due to the fact that the questions regarding the highest education qualifications held by respondents in the LFS and QLFS changed between 2000 - 2015, three nested criteria had to be used sequentially to probabilistically link LFS graduates to HEMIS HEIs.[17] *Criterion 1* - the strictest criteria - consisted of unique combinations of respondents'/students' year of birth, race, gender, the type of graduate qualification held or awarded (e.g. a bachelors degree, post-graduate diploma, or master's degree or higher qualification), and the broad field of study in which the highest qualification was attained.[18] As no *field of study* questions were asked in the 2008Q1 - 2012Q2 QLFSs, *criterion 2* consisted of unique combinations of respondents'/students' year of birth, race, gender, and the type of graduate qualification held or awarded (e.g. a bachelors degree, post-graduate diploma, or master's degree or higher qualification). Finally, *criterion 3* consisted only of unique combinations of respondents'/students' year of birth, race and gender. In al cases, an attempt was made to first link on *criterion 1*, then on *criterion 2* and, in the event that a link still had not been established, on *criterion 3*.

Given that the HEMIS data used in this chapter was only available for the period 2000 - 2013 and that it is not known when graduates observed in the LFS data graduated from the HEIs they attended, the probabilistic linking approach implicitly assumes that all LFS graduates for the period 2000 to 2015 were drawn from the 2000 to 2013 HEMIS graduation probability distribution. Put differently, the approach assumes that the conditional probability of having graduated from a specific HEI before 2000 or after 2013 can be inferred directly from the conditional probability of having graduated from that HEI between 2000 and 2013. In addition, for obvious reasons, graduates in the LFS data can only have been drawn from the HEMIS graduation distributions for previous years. It is not possible, for example, for a graduate observed in the 2001 March LFS data to only have graduated in 2002. This implies that graduates from the 2000 LFS data could only be probabilistically linked using 2000 HEMIS data, graduates from the 2001 LFS data could only be probabilistically linked using 2000 - 2001 HEMIS data, and so forth.

Under these assumptions, each graduate in the LFS data was probabilistically linked to the HEMIS data. Table B.1 shows the number of unique combinations for each of the three linking criteria in the LFS and HEMIS data in relation to the sample sizes for each of the datasets under consideration. Based on this information, Table B.2 in Appendix B shows the percentages of LFS graduates in each year that could be linked successfully using the available criteria. Once the LFS graduates were linked, the inferred probabilities regarding the specific HEIs from which they are likely to have graduated was used to calculate the respective probabilities that they graduated from a technikon, a comprehensive university, a traditional university, a university of technology, an HDI, an HAI, a Cluster 1 HEI, a Cluster 2 HEI, or a Cluster 3 HEI.

As a further potential diagnostic on the probabilistic linking approach used, Tables B.6, B.7, and B.8 respectively show the actual proportions of HEMIS graduates who graduated from the various types of HEIs listed above, the proportion of graduates in the LFS data sample who, via probabilistic linking, are estimated to have graduated from different types of HEIs, and the proportion of graduates in South Africa's working-age population who are estimated to have graduated from various HEIs.

[17] It should be noted that there are reasons to be weary of reporting error on the *"highest level of education completed"* variables in the LFS and QLFS data. This could happen if respondents indicate that they have completed a certain level of education when they have only attended that level without actually completing it. While this is likely to introduce measurement error and may even bias results, it is largely unavoidable given that misreporting errors in the LFS and QLFS data are virtually impossible to detect.

[18] The 2000 to 2007 March and September LFSs use the 12-category South African Qualifications Authority (SAQA) classification of field of study whereas the HEMIS data uses the 22-category Department of Education (DoE) second order classification of educational subject matter (CESM) classification of field of study. In order to use these variables as identifiers in the *p-linking* procedure, it was therefore necessary to convert the 22 CESM fields in the HEMIS data into the 12 SAQA fields as per Mabizela (2005:94).

Lastly, it is important to note that the probabilistic linking approach introduces non-classical measurement error in the estimations that follow. Crucially, the nature of this measurement error differs from that which typically arises in instances where indicator variables are subject to misclassification. Under indicator variable misclassification, measurement error is necessarily correlated with the misclassified indicator variable (Aigner, 1973). That is not the case here. Instead, the measurement error here is akin to measurement error as a result of using group averages to proxy for individual-level variables (Angrist and Krueger, 1999:1342). This is clear when one considers that, as indicated by equation (2.1), the probabilistic linking approach is effectively tantamount to using group averages (i.e. proportion of graduates who graduated from a specific HEI) from the HEMIS data as proxy variables for missing individual-level HEI indicator variables in the LFS data. By construction, the measurement error will therefore be uncorrelated with the HEI proxy variables. It follows that the parameter estimates on the HEI proxies will be consistent under OLS estimation (Pischke, 2007:9). However, since the HEI proxy variables are imprecisely measured relative to the missing individual-level HEI indicator variables in the LFS data, it is also the case that the standard errors associated with the parameter estimates will be inflated. This is illustrated in greater detail in B.1.

2.5.3 The association between HEI type and graduate unemployment/employment

Having assigned to each graduate in the LFS data a set of variables capturing the estimated probability of having graduated from a HEI of specific type, the analysis now proceeds to the estimation of the association between that HEI type and graduate labour market outcomes.

A series of probit regressions were estimated to find the partial association between the probability that a graduate attended a specific type of HEI and the probability that that graduate is (a) narrowly unemployed and (b) employed.[19] Each set of regressions has three permutations. The first uses the same specification in all the regression tables and includes only the main demographic variables that are assumed to have bearing on graduates' probabilities of unemployment/employment in the South Africa.[20] The second permutation includes a specific HEI type probability variable or set of probability variables while the third permutation interacts that HEI type probability variable or set of probability variables with race.

Each set of results from these estimations is expected to shed light on the following three questions: First, is there a statistically significant association between the probability of having attended a specific type of HEI and the probability of being unemployed or employed? Second, does controlling for the probability of having attended a specific type of HEI change the extent of any unexplained differences in the probability of unemployment or employment between race groups? Finally, does the association between the probability of having attended a specific type of HEI and the probability of unemployment or employment differ across race groups?

2.5.3.1 HEI type and the expect probability of narrow unemployment for graduates

The results of the various estimations of narrow unemployment probability are presented in Tables C.1 - C.3 in Appendix C.

[19] As explained in Section 2.3, the narrow definition of unemployment is not only the most consistently defined across Stats SA's various labour force surveys, but the difference in broad and narrow unemployment rates for graduates is largely negligible.

[20] All regressions include variables for *age*, *age-squared*, *race*, *gender*, *level of qualification held*, *province*, *enrolment in education*, and controls for *survey period*.

Column (1) in Table C.1 confirms most priors regarding the expected relationships between age, race, qualification level and the probability that a graduate will be narrowly unemployed in the South African labour market. It is found that Coloured, Asian, and White graduates are all significantly less likely to be unemployed than their Black counterparts, even once other factors have been taken into account. Similarly, there is a statistically significant negative association between the level of one's graduate qualification and the probability of being unemployed. It is interesting to note, however, that female graduates are statistically no more likely to be unemployed than male graduates.

The estimates in column (2) of Table C.1 show that there is a statistically significant association between the probability of having graduated from a specific type of HEI and the probability of being unemployed. Specifically, graduates who attended traditional universities are found to be statistically significantly less likely to be unemployed than graduates who attended comprehensive universities, but statistically significantly more likely to be unemployed than graduates who attended either technikons or universities of technology. However, the estimates in column (3) show that the extent to which this is true varies by race. For example, Indian graduates from traditional universities are estimated to have lower likelihoods of narrow unemployment than those from technikons or universities of technology. Similarly, the estimated likelihood of narrow unemployment is higher for White graduates from universities of technology that it is for those who attended traditional universities.

While the fact that the coefficients on the HEI type probability variables in Table C.1 are statistically significant indicates that the type of HEI attended is predictive of the probability of unemployment, the coefficients on the race indicator variables remain statistically significant even after these measures have been taken into account. It follows that the observed racial differentials in graduate unemployment rates cannot be explained away completely by the fact that graduates from different race groups are likely to have graduated from different types of HEI.

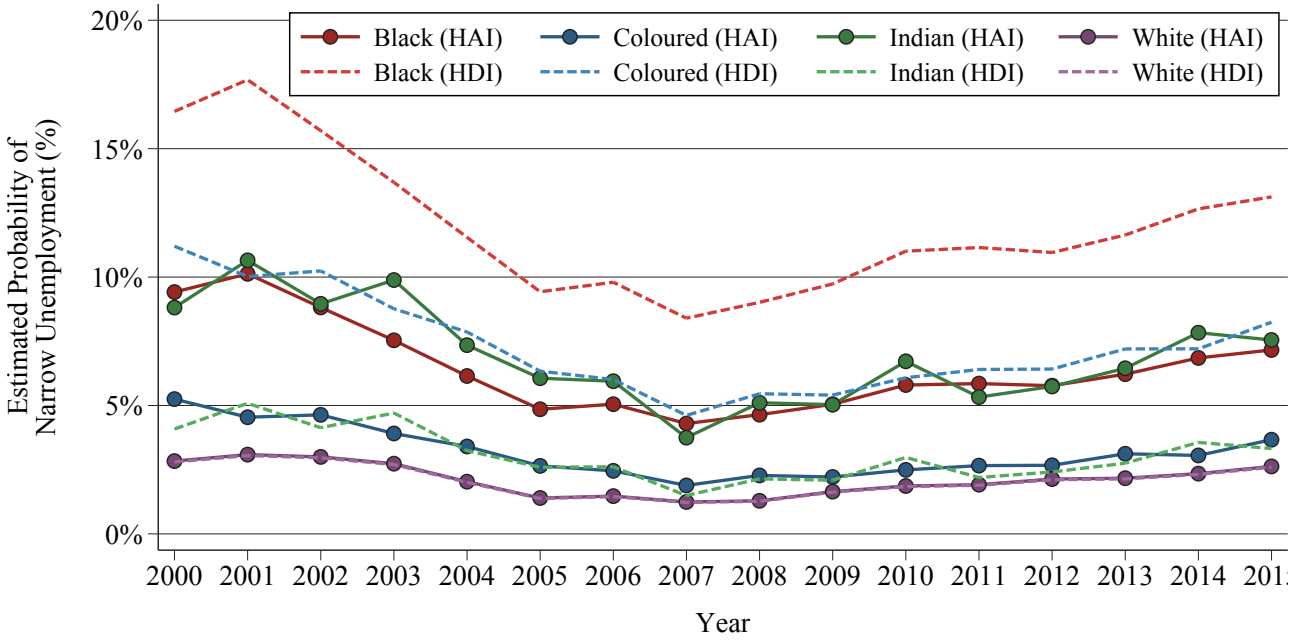
Columns (2) and (3) in Table C.2 show not only that graduates who are likely to have graduated from HDIs have statistically significant higher probabilities of being unemployed than their counterparts from HAIs, but that the association between attending an HDI or an HAI and the probability of unemployment also differs between race groups. The coefficients on the interaction terms suggest that the positive association between the likelihood of unemployment and the probability of having graduated from an HDI is effectively negated for Indian and White graduates.[21] In fact, it would appear as though the probability of unemployment for Indian graduates from HDIs is lower, on average, than it is for those from HAIs. The implication is that the detrimental association between attending an HDI and graduate unemployment appears to apply only to Black and, to a lesser extent, Coloured graduates.

These findings are illustrated in Figure 2.17 which uses the predictions from regression (3) in Table C.2 to calculate the yearly expected probabilities of narrow unemployment for different race groups, conditional on having graduated either from an HDI or an HAI. Taken in conjunction with the estimates in Table C.2, the graph suggests that part of the unexplained difference in unemployment rates for Black, Coloured, and White graduates can be explained by the fact that Black and Coloured graduates have historically been far more likely to graduate from HDIs than Whites. In fact, the figure shows that, while unexplained differences remain even after controlling for the historical status of the HEI likely to have been attended, the narrow

[21] The statistical insignificance of the interaction term between the *HDI* and *White* variables is likely to be a consequence of the fact that, as discussed above, very few White graduates would have studied at HDIs. It follows that the coefficient in question is imprecisely estimated.

unemployment rates for Black and Coloured graduates from HAIs may be as much as 5 percentage points lower than the narrow unemployment rates for Black and Coloured graduates from HDIs. Nevertheless, it remains clear that the expected level of unemployment among White graduates is still far lower, on average, than it is among Black and Coloured graduates, regardless of the historical status of the HEI attended.

Figure 2.17: Predicted probability of narrow unemployment for graduates, by HAI/HDI and race (2000 - 2015)



NOTES: Figures reflect the mean predicted graduate narrow unemployment probability for the respective race groups in each year. Predictions based on regression (3) in Table C.2. Estimates of the expected unemployment probability associated with attending a HDI were generated using HDI = 1 and HAI = 0. Estimates of expected unemployment probability associated with attending a HAI were generated using HAI = 1 and HDI = 0. All other variables kept at their observed values in the data when calculating the respective expected graduate unemployment probabilities.

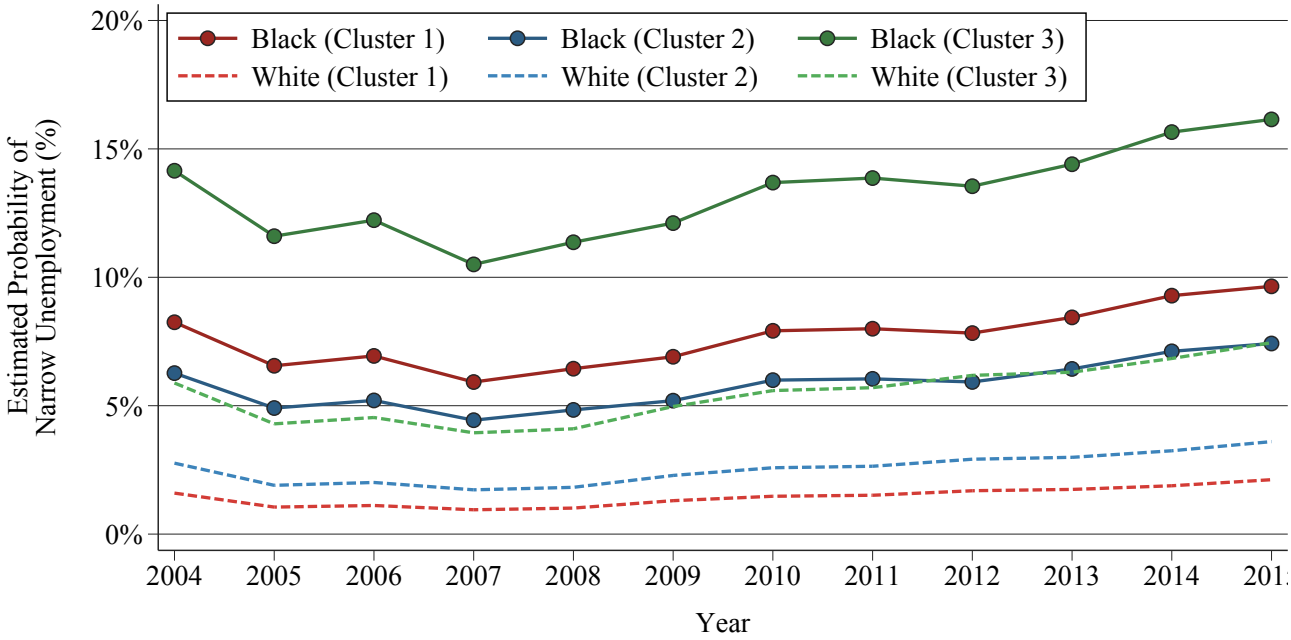
Lastly, the results from regression (2) in Table C.3 suggest that graduates who are likely to have graduated from cluster 2 or cluster 1 HEIs are statistically significantly less likely to be unemployed than graduates from cluster 3 HEIs. As the coefficients on the interactions between the cluster probabilities and the race variables in column (3) of Table C.3 are difficult to interpret, the results for the regression are again graphically illustrated in Figure 2.18 which plots the expected predicted probabilities of narrow unemployment for Black and White graduates - the two race groups for whom the estimated narrow unemployment rate differentials are largest - conditional on the cluster of the HEI attended.

It is clear that the predicted probability of unemployment within each race group is far higher for graduates from cluster 3 institutions than those from cluster 1 and cluster 2 HEIs. However, it is telling that the expected narrow unemployment rate for Black graduates from cluster 1 and 2 HEIs is at least as high as the expected narrow unemployment rate for White graduates from cluster 3 HEIs. When viewed purely in terms of the probability of unemployment, these results thus suggest that the best-performing group of Black graduates only performs the same as, if not worse than, the worst-performing group of White graduates.

2.5.3.2 HEI type and the expect probability of employment for graduates

Tables C.4 - C.6 contain the results from probit regressions estimating the probability of graduate employment. The specifications used are the same as in Tables C.1 - C.3 with the exception that, in this instance, the

Figure 2.18: Predicted probability of narrow unemployment for Black and White graduates, by HEI Cluster (2004 - 2015)



NOTES: Figures reflect the mean predicted graduate narrow unemployment probability for the respective race groups in each year. Predictions based on regression (3) in Table C.3. Estimates correspond to the mean predicted narrow unemployment probability for the respective race groups in each year. Estimates of expected graduate unemployment probability associated with attending a cluster 1 HEI generated using cluster1 = 1, cluster2 = 0, cluster3 = 0; estimates associated with attending a cluster 2 HEI generated using cluster1 = 0, cluster2 = 1, cluster3 = 0; estimates associated with attending a cluster 0 HEI generated using cluster1 = 0, cluster2 = 0, cluster3 = 1. All other variables kept at their observed values in the data when calculating the respective expected graduate unemployment probabilities.

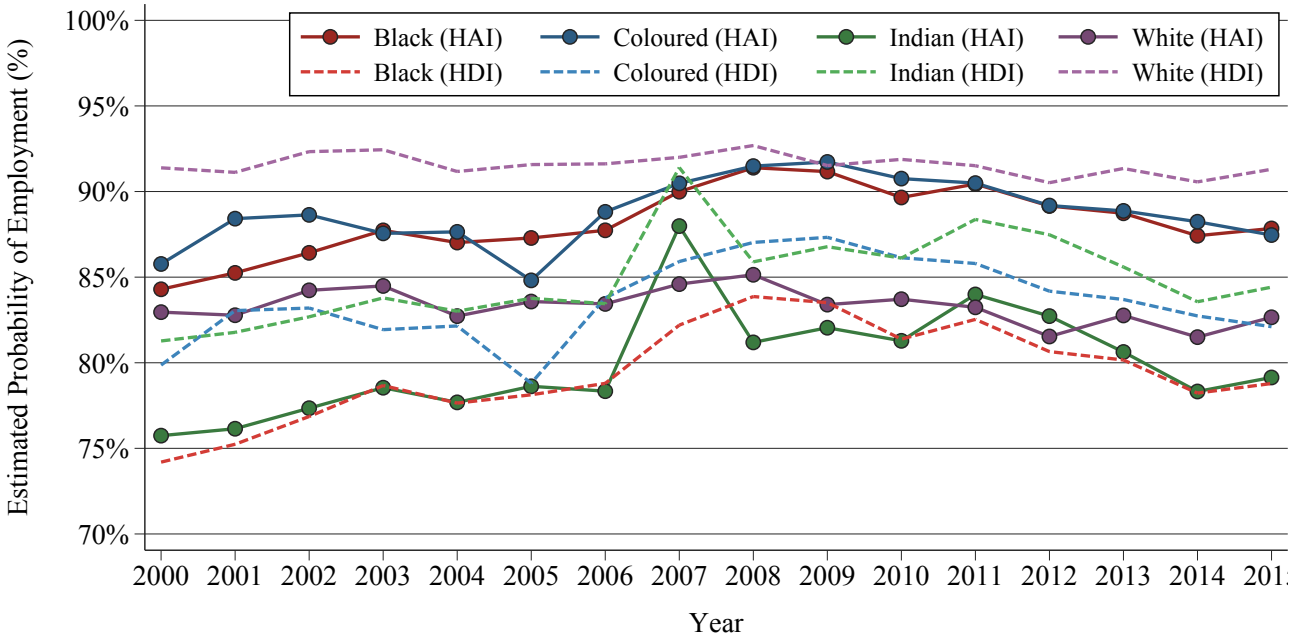
dependent variable is employment status rather than narrow unemployment status.

The results in Table C.4 are broadly consistent with those presented in Tables C.1 - C.3 in terms of the nature of the conditional associations that are found to exist between specific demographic variables and graduate labour market status. However, there are some noteworthy differences. Chief among these is the fact that female graduates are found to have statistically significant lower probabilities of employment than male graduates. Given that the narrow unemployment rate is simply the difference between the narrow LFP rate and the employment rate, this finding implies that the fact the the narrow unemployment rates for female graduates are not statistically significantly different from those for male graduates can largely be attributed to the fact that female graduates have lower narrow LFP rates, on average, than male graduates do. A similar argument is likely to explain why Indian graduates are found to be statistically significantly less likely to be employed than Black or Coloured graduates, while simultaneously having been found to be statistically significantly less likely to be unemployed than these two groups.[22]

Unsurprisingly, the estimates in column (2) and (3) of Table C.4 suggest that the expected employment rates are highest for graduates from technikons and universities of technology, and lowest for graduates from comprehensive universities, on average and with all else being constant. However, none of the interaction effects between race and the HEI type probability variables in column (3) are statistically significant. Thus, there do not appear to be any significant differences in the associations between HEI type and employment probabilities for graduates from different race groups. Moreover, much like the case for the narrow unemployment

[22] The LFS and QLFS data support this notion. Over the period 2000 - 2015, the average LFP rate for male graduates was 92.8% whereas, for females, it was only 85.1%. Similarly, the the average LFP rate for Indian graduates (86.4%) was lower than the average LFP rates for Black (93.1%) and Coloured (91.1%) graduates.

Figure 2.19: Predicted probability of employment for graduates, by HAI/HDI and race (2000 - 2015)



NOTES: Figures reflect the mean predicted graduate employment probability for the respective race groups in each year. Predictions based on regression (3) in Table C.5. Estimates of the expected employment probability associated with attending a HDI were generated using HDI = 1 and HAI = 0. Estimates of expected employment probability associated with attending a HAI were generated using HAI = 1 and HDI = 0. All other variables kept at their observed values in the data when calculating the respective expected graduate employment probabilities.

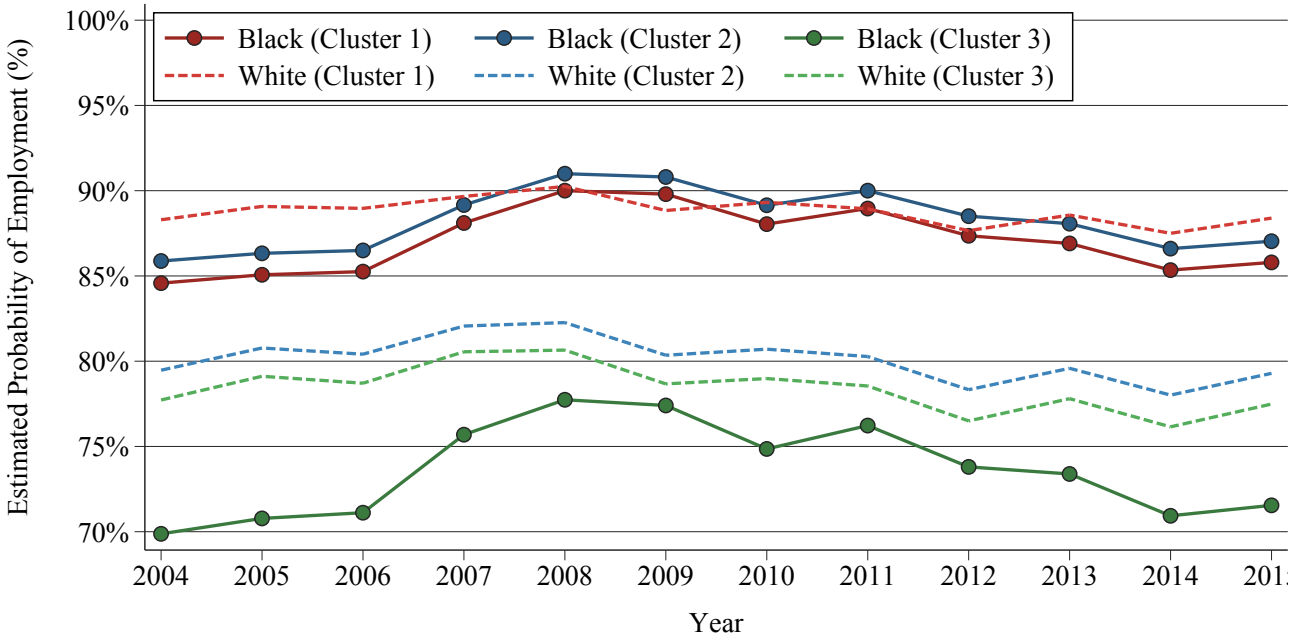
estimations, controlling for the likelihood of having graduated from a specific type of HEI does not greatly alter the statistical significance or apparent magnitude of the unexplained racial employment rate differentials for graduates.

The results from column (2) in Table C.5 show that the coefficient on the *White* race indicator variable becomes statistically insignificant once a measure of the historical status of the HEI from which graduates are likely to have graduated is included in the estimation. However, the HDI probability variable is not statistically significant in column (2). Though this may appear perplexing given the findings discussed in Section 2.5.3.1 above, the reason or the statistical insignificance of the *HDI* term in column (2) becomes clear when it is interacted with the respective race variables in column (3) of Table C.5. These estimates show that the nature and extent of the association between the probability of having graduated from an HDI and the likelihood of employment differs substantially across race groups. Specifically, the results suggest that there is a large and statically significant negative association between graduating from an HDI and the probability of employment for Black and Coloured graduates. By contrast, once other factors have been taken into account, the association between graduating from an HDI and the probability of employment for White and Indian graduates might actually be positive.

As before, these findings are illustrated graphically in Figure 2.19. The graph shows that, while the expected probability of employment for Black graduates from HDIs are the lowest for all groups, the expected probability of employment for Black or Coloured graduates from HAIs is higher than that for White graduates from HAIs. However, it is important to note that the difference between the expected employment probabilities for Black and White graduates from HAIs is smaller than the difference between the expected employment probabilities for Black and White graduates from HDIs. This finding resonates with those found by others on the primary and secondary schooling system in South Africa which suggest that, while Black individuals

may benefit from attending HAIs, this benefit is generally overshadowed by the significant disadvantages associated with attending HDIs (van der Berg, 2007; Van der Berg, 2008).

Figure 2.20: Predicted probability of employment for Black and White graduates, by HEI Cluster (2004 - 2015)



NOTES: Figures reflect the mean predicted graduate narrow employment probability for the respective race groups in each year. Predictions based on regression (3) in Table C.3. Estimates correspond to the mean predicted employment probability for the respective race groups in each year. Estimates of expected graduate employment probability associated with attending a cluster 1 HEI generated using cluster1 = 1, cluster2 = 0, cluster3 = 0; estimates associated with attending a cluster 2 HEI generated using cluster1 = 0, cluster2 = 1, cluster3 = 0; estimates associated with attending a cluster 0 HEI generated using cluster1 = 0, cluster2 = 0, cluster3 = 1. All other variables kept at their observed values in the data when calculating the respective expected graduate employment probabilities.

The results from Table C.6 suggest that the cluster of the HEI likely to have been attended has important bearing on the probability of employment. As before, the predictions from regression (3) are used to calculate the expected employment probabilities from Black and White graduates from different cluster HEIs in Figure 2.20. The graph shows that, while Black graduates from cluster 3 HEIs are predicted to have the lowest expected probabilities of employment, the probability of employment for Black graduates from cluster 2 or cluster 1 HEIs has been more-or-less the same as the probability of employment for White graduates from cluster 1 HEIs since 2007. Similar to what was the case when looking at narrow unemployment probabilities in Table C.3, White graduates from cluster 2 or cluster 3 institutions have significantly lower employment probabilities than White graduates from cluster 1 HEIs.

Lastly, Table 2.1 summarizes the predicted average narrow unemployment rates and employment rates for graduates by race and HEI type over the period 2000 - 2015, using the estimation results from regression (3) in Tables C.1 - C.6. The significant variation in the estimates across race groups and HEI types in the Table provide a clear illustration of the degree to which graduate unemployment and employment rates differ between different groups of graduates in South Africa.

Table 2.1: Predicted average narrow unemployment and employment rates (%) for graduates by race and HEI type (2000 - 2015)

	Narrow Unemployment Rate (%)[a]				*Employment Rate (%)*[b]			
HEI Type	**Black**	**Coloured**	**Indian**	**White**	**Black**	**Coloured**	**Indian**	**White**
Traditional	8.1***	3.1***	2.6***	1.7***	85.0***	88.9***	84.4***	86.8***
Technikon	5.7***	1.0*	4.4**	1.3***	89.9***	91.4***	87.4***	88.4***
Technology	2.4***	3.1	7.4*	2.6	91.6***	93.9***	87.4***	93.1***
Comprehensive	16.2***	10.3*	22.7***	5.7***	68.6***	78.0***	61.5***	72.3***
HDI	11.4***	5.4***	2.6***	2.0**	78.7***	85.9***	84.9***	92.3***
HAI	6.0***	2.2***	6.0***	2.0***	87.6***	90.5***	79.9***	84.4***
Cluster 1	7.7***	3.5***	2.5***	1.5***	86.0***	89.9***	84.5***	89.8***
Cluster 2	5.9***	3.3***	8.6***	2.6***	87.2***	88.2***	76.8***	81.5***
Cluster 3	13.4***	0.0	0.0	5.5	72.1***	72.5	100.0***	79.9***

NOTES: [a] Figures reflect the average predicted graduate narrow unemployment rates for the respective race groups and HEI types over the period 2000 - 2015 and are based on the marginal predictions from the regressions in columns (3) of Tables C.1 - C.3. [b] Figures reflect the average predicted graduate employment rates for the respective race groups and HEI types over the period 2000 - 2015 and are based on the marginal predictions from the regressions in columns (3) of Tables C.4 - C.6. Predictions generated by setting the relevant HEI type proxy variables equal to 1 or 0. E.g. the predicted rates for graduates from traditional HEIs was generated using Technikon = 0, Technology = 0, and Comprehensive = 0, whereas the predicted rates for graduates from Cluster 2 HEIs was generated using Cluster 1 = 0 and Cluster 2 = 1.All other variables were kept at their observed values in the data when calculating the respective expected graduate unemployment/employment rates. *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on linearised robust standard errors which have been adjusted for complex survey design. Estimates are weighted.

2.6 Conclusion

The apparent paradox of high levels of graduate unemployment combined with persistent skills shortages in the South African labour market has often been attributed to structural changes which are held to have resulted in a misalignment between the skills that graduates traditionally have to offer and the skills that employers demand. It is claimed that the effects of this supposed skills-mismatch are further exacerbated by the severe heterogeneity in the quality of education received, even at the tertiary level, by different groups and cohorts in South Africa. When coupled with the signal eroding effect of substantial qualification inflation in the labour force over time and the significant changes in the demographic composition of South Africa's stock of graduates, it seems likely that this heterogeneity will have served to undermine the fidelity of graduate education credentials as signals of potential labour market productivity and, in general, reduced graduate employability.

The results from this chapter suggest that graduate unemployment in South Africa is not nearly as problematic as is often asserted. In part, this is simply because individuals with degrees or higher qualifications are often misguidedly lumped together with individuals with post-secondary diplomas and certificates under the collective "graduates". Yet, the descriptive analysis in Section 2 shows precisely why such practice is dubious and leads to an inflated perception of graduate unemployment in South Africa.

Despite significant changes in the demographic composition of South Africa's stock of graduates and policy changes which have altered South Africa's HE landscape, graduates remain the group with the best labour market prospects relative to other education cohorts. This is true for all race groups, even though there remain differences in the employment and unemployment probabilities for Black, Coloured, Indian and White graduates. However, as the multivariate analysis shows, part of the racial differentials in graduate unemployment and employment outcomes in the country can potentially be attributed to heterogeneity in the types of HEIs

commonly attended by individuals from different race groups. For example, it is clear that having attended an HDI rather than an HAI is negatively associated with employment prospects and positively linked to the probability of unemployment. Similarly, graduates from Cluster 1 HEIs appear to have higher employment rates and lower unemployment rates than graduates from Cluster 2 or Cluster 3 HEIs.

It is important to note that these findings cannot make any causal claims regarding the relationships between HEI-type and graduate labour market outcomes. It is not, for example, argued that the fact that graduates from HDIs appear to have higher unemployment rates than graduates from HAIs is a consequence of the fact that the quality of education at HDIs is lower than the quality of education at HAIs. While such an argument may be plausible, it is only one of many plausible reasons that may explain the observed associations between HEI type and graduate unemployment/employment rates. As is discussed in the next chapter, selection into HE and HEIs is an endogenous process and individuals who graduate from HDIs may be fundamentally different from those who graduate from HAIs in ways that are not accounted for in the estimations presented here.

In addition to the fact that the estimates presented in this chapter cannot be interpreted causally, it should also be remembered that the probabilistic linking approach underlying those estimates is based on a number of potentially contestable assumptions. The consistency of the parameter estimates discussed above is ultimately premised on the validity of these assumptions. Thus, while the probabilistic linking methodology offers a novel way of linking HEI aspects to graduate labour market outcomes, it is not without potential flaws.

Notwithstanding the aforementioned caveats, the findings from the analysis suggest that understanding the heterogeneity between HEIs may be crucial for understanding the observed variation in graduate labour market outcomes as well as the racial differentials in graduate unemployment rates. Consequently, more should be done to ensure that HEI-related factors are incorporated when analysing graduate labour market prospects and it is essential for researchers to have access to the type of data that would enable them to do so. Ultimately, policy interventions aimed at improving graduate labour market outcomes can only be effective if the nature of the racial and institutional dimensions underlying those outcomes are understood.

Chapter 3

Higher education access and success in the Western Cape

3.1 Introduction

It is widely acknowledged that private and social investments in Higher Education (HE) yield significant socio-economic returns at both an individual and societal level (Greenaway and Haynes, 2004:310 - 313). Successful participation in HE is associated with a host of economic and non-pecuniary benefits including better labour market outcomes in terms of employment probability, remuneration, and overall job security (Fisher and Scott, 2011:1). This is particularly true in South Africa, where pervasive skills shortages mean that the demand for highly educated and highly skilled labour is disproportionately high (Bhorat, 2004; DRPU, 2006).

However, access to HE in South Africa not only remains low, but also inequitable, with large segments of the population effectively being excluded from HE opportunities (Akoojee and Nkomo, 2007). This is exacerbated by the fact that the public HE system is characterised by persistently low levels of throughput and high levels of dropout (CHE, 2014*a*). In addition, much like HE access, differences in HE throughput and dropout rates remain strongly delineated along the lines of race and socio-economic background. As a result, the HE system is not only failing to produce sufficient numbers of graduates to meet the scarce skills demands of the economy, but also perpetuates many of the existing socio-economic inequalities in the country.

In light of these issues, there is a clear need to improve both the inclusivity and the efficiency of South Africa's HE system. Doing so, firstly necessitates a comprehensive understanding of the various underlying factors that have contributed to the current *status quo*. Yet, despite a proliferation in the number of studies on HE access and success in recent years, much remains unknown about the ways in which HE participation, throughput and dropout are predicated on various factors pertaining to demographics, socio-economic status, academic performance, school quality, and HE institutional considerations. In particular, there is a near-complete lack of representative quantitative research on the extent of transition into and through HE from the secondary schooling system in South Africa and of the various underlying dimensions of these transitions. This critical knowledge gap constitutes a major barrier to the improvement of the HE system.

The present chapter seeks to address this knowledge gap by using learner-level matric and secondary schooling data in conjunction with unit-record student data from the Higher Education Management Information

System (HEMIS) to follow learners who wrote the 2005 Senior Certificate Examinations (SCE) in Western Cape Education Department (WCED) schools into and through undergraduate study in the South African public higher education system between 2006 and 2009.[1] This is the first study to explicitly link secondary schooling and HE outcomes in South Africa at a provincially representative level using unit-record administrative data.

The combined richness of the data sources used means that it is possible to investigate the associations between HE access and success and a far larger set of learner-level and school-level attributes than has previously been possible. By jointly focussing on HE access, throughput, and dropout, the analysis presented provides new insights into the relative roles that demographics, matric performance, school quality, and higher education factors play in explaining the extent of, and the racial differentials in, HE access and success in the Western Cape and, to some extent, also more broadly in South Africa as a whole.

The chapter endeavours to answer four main research questions. First, what is the extent and pattern of HE access, throughput, and dropout among matric learners in the Western Cape? Second, what are the primary correlates underlying observed patterns of HE access and success in the province? Third, what is the relative importance of demographics, matric performance, school type and school performance, and HEI and programme-specific factors for explaining observed HE outcome differentials in the Western Cape? And fourth, to what extent is the inequitable production of HE graduates in the province a consequence of differentials in HE access rather than differentials in HE throughput?

The empirical results reveal that learners take varied pathways into and through HE in South Africa and that HE access, completion, and dropout rates vary considerably across race groups in the Western Cape. It is found that matric performance is highly predictive of HE access, throughput, and retention across all race groups and that the observed racial differentials in HE participation levels among matric learners are mainly the result of underlying differences in matric performance levels. Nonetheless, statistically significant racial differentials in HE throughput remain even after differences in matric performance and other factors have been taken into account. It is argued that these differentials are at least partly a consequence of differential selection into HE, where HE entry for learners with low likelihoods of HE success is more prevalent among some race groups than others.

The findings imply that the continued expansion of equitable HE access in South Africa is unlikely to result in commensurate improvements in equitable HE graduate outputs unless the articulation gap between the secondary schooling and HE systems is addressed. In this context, both the pre-tertiary and HE sectors have critical, but varied roles to play. It remains imperative that the quality of schooling in the pre-tertiary sector improves in order to ensure that learners who leave secondary school are adequately prepared to cope with the demands of HE study. At the same time, the HE sector has a responsibility to ensure that learners who are able to access HE opportunities receive sufficient support to ensure that they can convert those opportunities into HE success.

The remainder of the chapter is structured as follows: Section 3.2 provides a review of the existing literature on HE access and success in South Africa and sets out the rationale for the methodology underlying the analysis presented in this study. Section 4.2 describes the data sources used in the analysis and outlines the methodology used to measure HE access, throughput, and dropout among the 2005 WCED matric cohort.

[1] In South Africa, *Matric* is the name commonly given to the final grade of secondary school (Grade 12). The National Senior Certificate (NSC) examination, which is the national secondary school-leaving examination, is also commonly referred to as the *Matric examination*.

Section 3.4 describes the HE enrolment flows among the 2005 WCED matric cohort and the HE-level factors along which throughput and dropout rates are found to vary. Section 3.5 turns to the pre-entry correlates of HE access and success in the Western Cape, providing a descriptive analysis of the associations between HE throughput, completion, and dropout and various demographic, matric performance, and school-level factors.

Section 3.6 extends the descriptive analyses in Sections 3.4 and 3.5 by analysing the marginal contributions of the respective pre-entry correlates to HE access, completion, and dropout rates in a multivariate context and investigating the relative contributions of different sets of correlates to observed HE outcomes. The section also examines the relative contributions of HE access and HE throughput to observed racial graduation differentials. Lastly, Section 3.7 summarises the main findings from the analysis and concludes on the policy implications of those findings.

3.2 Background and literature overview

South Africa's HE system is often described as one which is characterised by low participation, low throughput, and high dropout (Fisher and Scott, 2011:1). Only a small proportion of South Africans have access to HE opportunities and even among those who do, few complete their studies and ultimately reap the benefits of HE success.

In order to understand the observed graduate output patterns produced by the the HE system and the extent to which secondary school completers are likely to become HE completers, it is necessary to first understand the underlying correlates of HE access and success. Moreover, it is important to consider the extent to which levels of, and differentials in, HE success in South Africa are predicated on levels of, and differentials in, HE access. In order to contextualise the discussion and findings in this chapter and provide the rationale for the empirical analysis presented, this section therefore gives an overview of the HE access and HE throughput literature in South Africa and identifies the most critical shortcomings in the extant research.

3.2.1 HE participation and access

Access to HE in South Africa has historically been both limited and strongly delineated along the lines of socio-economic class and race (Nyalashe, 2007:82). Institutionalised discrimination and exclusionary practices during Apartheid meant that the vast majority of Coloured and Black individuals, in particular, had very limited access to HE. Moreover, the fortunate few who were able to enrol in HE were largely prohibited from attending the elite HEIs that were exclusively available to White students at the time (Akoojee and Nkomo, 2007:389). In 1986, for example, Black and Coloured students respectively accounted for only 23.3% and 5.5% of all undergraduate headcount enrolments across South Africa's public universities and technikons. The vast majority of the Black students in this group (65%) were enrolled at just two HEIs, namely Vista University and the University of South Africa. Similarly, the majority of Coloured students (74%) were enrolled either at the University of the Western Cape or the University of South Africa.[2]

In an attempt to redress the inherited inequalities of the past, HE policy in South Africa since 1994 has largely focussed on effecting transformation and expanding equitable access to HE opportunities (Coughlan,

[2] These figures are the author's own estimates based on HE headcount enrolment statistics accessed via DHET (2014*a*).

2006:209). Under these policies, enrolments in HE have grown significantly, particularly among historically disadvantaged groups. As a result, the demographic composition of the South African student body is increasingly becoming more representative of the South African population, with Black students accounting for an estimated 73% of all national headcount enrolments in undergraduate studies in 2013.[3]

Despite the significant growth in HE enrolment numbers, HE participation in South Africa, as measured by the Gross Enrolment Ratio (GER), remains low overall.[4] Though figures vary, most research since 2008 has reported national GER estimates of between 16% and 18%.[5] More recent estimates suggest that participation rates may now be closer to 19.2% (DHET, 2014*c*:15). Nonetheless, this estimate is still below the already modest national target of 20% set out in DoE (2001:20 - 21) and well below the average of 27.9% for other middle income countries (World Bank, 2015).[6] In addition, South Africa's GER differs considerably between race groups. Badsha and Cloete (2011:9), for example, show that the GERs for Whites (56% - 64%) and Asians (45% - 50%) were consistently between four and five times higher than the GERs for Blacks (12% - 13%) and Coloureds (12% - 13%) between 2004 and 2008.[7]

3.2.1.1 Measuring HE access in South Africa

The GER may be the most widely reported measure of HE participation in the literature, but its appropriateness as a measure of HE access in South Africa may be questioned on a number of grounds. Because it is heavily influenced by changes in enrolments for individuals who fall outside the 20 - 24 year-old age band, the GER is likely to exaggerate the true extent of HE access, particularly among younger individuals. This has significant implications in South Africa, where the share of students who are either below the age of 20 or above the age of 24 is not only large, but has increased substantially since 2000, rising from 32% to nearly 38% in 2013.[8]

In contrast to the GER, the Net Enrolment Ratio (NER) expresses total headcount enrolments in HE among 20 - 24 year-old students as a percentage of the population between the ages of 20 and 24 (Steyn, 2009:3 - 4). It follows that the NER is, in general, significantly lower than the GER. The NER estimates presented in Table E.1 in Appendix E, for example, suggest that only 7.3% of all South African 20 - 24 year-olds were enrolled in HE in 2013. Moreover, though the NERs for both Black and Coloured individuals nearly doubled between 2001 and 2013, the estimated NER for Whites in 2013 remained more than four times as high. In fact, the estimated NERs suggest even greater inequality in HE participation between race groups than the estimated GER does, even if the extent of this inequality appears to be declining over time.

While the NER overcomes one problem with the GER, it fails to address a more fundamental concern. Both the GER and NER will not only rise if greater numbers of individuals enter HE, but also if greater numbers of students remain in the HE system for longer periods of time. Consequently, they are not pure measures of

[3] The drive towards equitable expansion of HE access is not unique to South Africa, but appears to be part of a global trend of HE "massification" (Cross and Carpentier, 2009:6).

[4] In general, the GER expresses total headcount enrolments in HE as a percentage of the estimated number of 20 - 24 year-olds in the population (CHE, 2014*b*:iv).

[5] See, for example, Beckmann (2008:783) - 17% in 2000, Sheppard (2009:9) - 16% in 2007, CHE (2010*a*:3) - 16.3% in 2003, Badsha and Cloete (2011:9) - 17% in 2009, DHET (2012:x) - 16% in 2011, CHE (2013:41) - 18% in 2010, and DHET (2014*c*:15) - 19.2% in 2012.

[6] This target has subsequently been revised to a GER of 23% by 2030 (DHET, 2012:5).

[7] In this chapter, *Asians* refer to all individuals of Asiatic descent. Indians are likely to account for the majority of this group.

[8] Author's own estimates using aggregate HEMIS data accessed via HEDA (2015).

HE access, but also of HE retention. For this reason, Steyn (2009:7) argues that the analysis of HE access in South Africa should instead focus on the extent of first-time entry into HE.

Estimating accurate HE entry rates requires the ability to track cohorts of individuals over time as they move into the HE system. In South Africa, the type of data required to do this is generally either restricted or not available at a sufficiently detailed or representative level. Consequently, few studies have attempted to provide any estimates of HE entry rates in South Africa.

In the context of this chapter, the extent of HE entry among learners who exit the South African secondary schooling system is of particular interest.[9] Using data from a tracer study conducted by Cosser *et al.* (2004), Cosser (2006:253) finds that only 13.7% of the learners who wrote the Senior Certificate Examination (SCE) in 2001 entered public HE in 2002. In a later study, Sheppard (2009:32) used data from the Higher Education Management Information System (HEMIS) to estimate that roughly 20% of first-time entering undergraduate students between 2001 and 2007 were secondary school learners in the year prior to entering the HE system.[10]

These estimates are also imperfect measures of HE access, since they only take into account individuals who enter public HEIs immediately after matriculation. Nonetheless, they suggest that the extent of transition between secondary school and HE in South Africa is low in general. This is all the more worrisome in light of the fact that many learners in South Africa never even reach matric (Gustafsson, 2011:9 - 11). For example, Scott *et al.* (2007:33) estimate that only a third of learners who started Grade 1 in 1995 ever reached Grade 12.

3.2.1.2 Correlates of HE access

As in many other countries, the statutory minimum requirements for HE entry in South Africa are formulated primarily in terms of scholastic achievement in Grade 12. Until 2007, learners could only qualify for entry into undergraduate degree programmes at public HEIs if they passed the Senior Certificate (SC), which served as the national school-leaving certificate at the time, with matriculation endorsement (Sheppard, 2009:23).[11]

A number of studies have noted that the formal academic requirements for HE entry has served as a major bottleneck in terms of the equitable expansion of HE access in South Africa, particularly given the vast differences in matriculation pass and endorsement rates between race groups (Letseka and Pitsoe, 2013:1943). For example, while an estimated 53.7% and 51.3% of all Asian and White learners who wrote the SCE between 2002 and 2007 in South Africa passed with endorsement, only 11.6% of Black and 17.1% of Coloured learners followed suit (See Table E.4).

In light of the significant racial differentials in secondary schooling outcomes, stringent minimum HE entry requirements are often viewed as exclusionary, with some arguing that they counteract the transformation imperative and not only perpetuate existing inequalities in HE but, more broadly, in South Africa as a whole (Herman, 1995:270).

[9] In this chapter, *learners* refer to individuals who are enrolled in primary or secondary school whereas *students* refer to individuals who are enrolled in HE.

[10] Because of the underlying methodology used, the estimates presented in Sheppard (2009:32) are likely to be upward-biased estimates of the percentage of matriculants who proceed with HE immediately after finishing secondary school. This is discussed in greater detail in Section D.1.

[11] As explained in Section 3.5.2 below, there were a number of formal exceptions to this rule. In addition, Makhafola (2005:19) notes that, in practice, strict adherence to the minimum statutory requirements for HE programme entry as set out in DoE (1997) was often left to the discretion of the respective HEIs.

In 2008, the Senior Certificate (SC) was replaced by the National Senior Certificate (NSC). In contrast to the SC, the NSC differentiates between four types of matric pass and part of its purpose is to improve channelling into the HE system and expand the pool of potential HE participants (Wedekind, 2013:12 - 13). However, HE participation is low even among learners who satisfy the new formal minimum requirements for entry into undergraduate studies in South Africa. Of the estimated 334 000 matric candidates who were eligible for HE entry by virtue of achieving either a higher certificate, national diploma, or bachelor's degree pass in the 2008 NSC, only 21.8% enrolled in public HEIs in 2009 (Blom, 2014:18). Though it is reasonable to expect that the percentage of learners from the cohort who enrolled in HE will have continued to rise in subsequent years, this figure nevertheless illustrates that the extent of immediate access to HE opportunities in South Africa is disconcertingly low.

The fact that few of the learners who satisfy the minimum entry requirements for HE study in South Africa ultimately enrol in HE is an indication that academic factors are not the only constraints to HE access. Given the significant costs associated with attending HEIs, financial constraints often constitute insurmountable barriers to HE entry (Fisher and Scott, 2011:49). This is particularly true among historically disadvantaged groups. Branson *et al.* (2009*a*:53), for example, find that socio-economic status and access to financial resources are the most important determinants of HE participation among Black learners in the Western Cape.

Even when financial constraints do not preclude HE access, they can often still shape the nature of HE enrolments. The substantial variation in tuition fees and availability of financial support across HEIs in South Africa means that learners with limited financial means also have limited options when it comes to choosing HEIs and specific academic programmes (DHET, 2013:37). Using data from the *Student Retention and Graduate Destination Study*, Cosser (2010:17) finds that financial constraints are one of the main reasons why students sometimes enrol at completely different HEIs and for completely different programmes than they originally intended to.

In addition to financial and academic barriers to HE access, the lack of adequate information regarding HE application procedures and admission requirements in large parts of the secondary schooling system serves as a further hindrance to HE access (Lewis, 2008:87). Branson *et al.* (2009*a*:55) note that there is significant informational asymmetry about the availability of, and the preparatory steps needed for, tertiary study opportunities in South Africa, with some schools being far better equipped to provide career counselling and application guidance to their learners than others.

3.2.2 HE throughput and retention

South Africa's HE system has not only expanded rapidly in terms of headcount enrolments over the past two decades, but also in terms of its graduate output (DHET, 2012:38). In fact, the number of graduations in the system has grown significantly faster than the number of new enrolments since 2000. While first-time entering undergraduate enrolments at public HEIs increased by an estimated 40.4% between 2000 and 2013, rising from roughly 112 800 to 158 400, undergraduate graduations nearly doubled from around 68 400 to 128 800 over the same period.[12]

Despite the substantial growth in graduations, CHE (2013:9) notes that the current level of graduate output in the HE system is still not sufficient to meet South Africa's skills demands. One of the quantifiable targets

[12] Author's own estimations using aggregate HEMIS data accessed via HEDA (2015).

set out in NPC (2011:278) is to increase the number of graduates produced by the HE system to 425 000 by 2030 - more than double the system's current estimated graduate output. This target is not only premised on increasing the GER to more than 30% (currently 19.2%), but also on increasing the national graduation rate to 25%, despite the fact that the graduation rate only rose from 15.3% to 18.3% between 2001 and 2013.[13]

In light of the aforementioned targets, the pervasiveness of low levels of throughput and retention across much of the HE system is a significant cause for concern. Far too few students ever complete their undergraduate studies and those who do often take considerably longer than the minimum time required to do so. For example, in what could be considered to be the first nationally representative HE cohort tracking study to be conducted in South Africa, Scott *et al.* (2007:12) estimates that only 38% of the national 2000 first-time entering undergraduate cohort successfully completed their studies within five years, while 45% of the cohort had already left the system without completing any qualification.

More recent HE cohort tracking and tracer studies in South Africa have tended to confirm the findings of Scott *et al.* (2007). The Council on Higher Education's (CHE) undergraduate curriculum proposal, which is arguably the most widely referenced major study on HE throughput and retention in South Africa, for example reported that only 35% of the students from the national 2006 first-time entering undergraduate cohort completed their studies within five years and that 55% were unlikely to ever graduate (CHE, 2013:45).[14] CHE (2014*a*:1) furthermore notes that, on average, only 27% of undergraduate students complete their qualifications within regulation time. Similarly, the figures presented in Blom (2014:38 - 46) show that, of the learners from the 2008 national matric cohort who entered the HE system as first-time entering undergraduate students in 2009, only 36.3% completed their studies within four years, while 25.8% dropped out of HE within three years.[15]

Clearly, a situation where more than half of all students who commence with undergraduate studies never complete those programmes is untenable. Not only does it undermine the much needed expansion of South Africa's scarce skills base, but it is also tremendously costly, both for society and for those students who are effectively excluded from reaping the benefits of HE success. This is particularly true given that, much like HE access, the extent of HE throughput and retention in South Africa varies substantially along dimensions of race and socio-economic status (DHET, 2012:8).

Tracking the national 2006 first-time entering undergraduate cohort, CHE (2013:43) estimates that 44% of all White students who enrolled in 3- or 4-year undergraduate programmes at contact HEIs completed their studies in regulation time. By contrast, only 20% of Black students, 24% of Coloured students, and 28% of Indian students from the cohort are estimated to have done the same. Racial differentials were also evident in terms of HE attrition.[16] Where it was found that 42% of Black and 47% of Coloured students receptively dropped out by the end of regulation time, the estimates for their Indian and White counterparts were 39% and 33%, respectively.

[13] Author's own estimations using aggregate HEMIS data accessed via HEDA (2015). The graduation rate expresses the number of graduates produced by HEIs as a percentage of the number of headcount enrolments in the system.

[14] The throughput and dropout estimates in CHE (2013) exclude students who enrolled in 1- or 2-year certificate or diploma programmes. According to aggregate HEMIS data accessed via HEDA (2015), students enrolled in such programmes accounted for roughly 10.3% of the national 2006 first-time entering undergraduate cohort.

[15] The attrition and completion rate estimates presented in Blom (2014) are highly misleading and do not appear to be supported by the data in the report. Consequently, the figures reported here are the author's own calculations based on the raw figures in the report and were estimated using the methodology described in Section 3.3.3 below.

[16] The notion of HE *attrition* in CHE (2013) is never formally defined and it is not immediately clear how the various attrition rates presented in the study were estimated. However, the terms *attrition* and *dropout* appear to be used virtually interchangeably throughout the study and, as such, one might assume that the CHE (2013) *attrition rate* is analogous to the HE dropout rates more commonly reported in other studies on HE throughput.

While it may have been expected that students from historically disadvantaged backgrounds would take longer to complete their studies and be more likely to drop out of HE, the racial differentials implied by CHE (2013:43) and other studies (see Scott *et al.* (2007)) are alarming. Moreover, these differentials appear to be persistent over the enrolment horizon. Using data on the national 2007 first-time entering undergraduate cohort, CHE (2014*b*:62,63,65) shows that even after six years, the completion rate for White students enrolled at contact HEIs is roughly 25% higher and the dropout rate 25% lower than the equivalent metrics for Black and Coloured students across all 3- and 4-year undergraduate programmes.

South Africa's low and unequal HE throughput and retention rates are likely to be underpinned by many of the same factors that explain the low and unequal levels of HE access in the country. In an institutional case study conducted at the University of the Western Cape (UWC), for example, Breier (2010:57) found that students were most likely to drop out or stop out of HE because of financial reasons.[17] However, most studies have argued that low levels of HE throughput and retention in South Africa are largely the result of a significant articulation gap between the secondary schooling system and HE, noting that students are generally inadequately prepared to cope with the academic demands of HE study.[18]

The prevalence of supposed under-preparedness among first-time entering HE students is neither a new phenomenon, nor one which is unique to South Africa.[19] A large number of studies, dating back as early as 1936, have noted that first-time entering HE students in South Africa are inadequately prepared to deal with the academic challenges inherent in undergraduate study (Case *et al.*, 2013:2). However, the extremely low levels of throughput and high levels of dropout, particularly among historically disadvantaged students, suggests that under-preparedness in South African HE is as acute as ever, if not substantially more so. Moreover, the persistence and pervasiveness of this phenomenon partly exposes the fact that it remains poorly understood. From a policy perspective, there is thus clearly a need to better understand how under-preparedness manifests in the HE system and why the HE outcomes that are observed for different students obtain.

3.2.3 Shortcomings and gaps in the existing literature

The extent and underlying correlates of HE access and success remain relatively under-researched topics in South Africa. Though this is partly a consequence of the fact that the HE sector has historically served only a small and unrepresentative segment of the population, it is primarily the result of a general lack of access to sufficiently detailed HE data and a near-complete absence of integration between secondary schooling and post-secondary schooling data sources.

Analogous to the rapid expansion of the public HE system since the early 1990s, studies on HE access, throughput, and/or retention in South Africa have proliferated over the past two decades. In addition, the type of research being conducted in these areas is becoming increasingly comprehensive and, at the same time, also more nuanced as better and more data become available. This trend is expected to continue as ever-increasing numbers of individuals seek out opportunities to access HE and concern over the country's weak and inequitable HE outcomes continues to grow.

[17] The term *"stop out"* in HE is used to refer to individuals who exit HE temporarily with the intention of returning at a later stage to complete their studies.

[18] See, for example, Scott *et al.* (2007:42 - 43), Fisher and Scott (2011:10 - 11), and CHE (2013:57 - 61).

[19] See, for example, Mulvey (2008) for a discussion on under-preparedness among students in the US.

However, despite the growing body of research on HE outcomes in South Africa, many critical questions remain unanswered. For example, it remains unclear why the public HE system performs so poorly in terms of student throughput and retention. Similarly, surprisingly little is known about the extent to which HE success across the system is predicated on pre-entry factors rather than HE-level factors, or about the relative importance of specific pre-entry correlates for both HE access and success. There is also an incomplete understanding of the degree to which observed differentials in HE outcomes between certain groups of students are driven by underlying differences in HE access rather than differences in HE completion and dropout rates.

These and other pertinent questions remain unanswered because of various shortcomings and gaps that are found in most of the existing South Africa HE research. Some of these shortcomings are methodological in nature, while others have been unavoidable to an extent, given the lack of adequate data in the public domain. In the context of this chapter, four specific shortcomings bear noting.

First, interrelated HE outcomes in South Africa are generally analysed in a highly fragmented manner. Studies mainly tend to focus either on HE access or on HE success, and those that focus on both rarely attempt to establish an explicit link between the two. The majority of HE cohort tracking studies, for example, focus exclusively on individuals who have already gained access to HEIs and only tangentially link the observed outcomes for such individuals to the extent and nature of HE participation in South Africa.[20] This is problematic, since the outcomes produced by the HE system are largely predicated on the outcomes produced by the secondary schooling system. In order to understand HE performance and HE outputs in South Africa, it is therefore crucial to firstly understand the extent to which the factors that determine HE access, or at least the factors on which selection into HE is based, also influence HE success.

Second, the majority of research on school to university transitions and the pre-entry correlates of HE success in South Africa are either qualitative in nature or based on case studies.[21] While the findings from these studies may be informative, they are generally also unrepresentative and seldom extend beyond a particular HEI. Of course, there are exceptions to this rule, and some studies have been conducted on larger, more representative samples.[22] However, there is a general shortage of quantitative analyses on the extent to which secondary school learners accede to, and move through, the public HE system, owing largely to a lack of integration between data on secondary schooling outcomes and HE outcomes in South Africa. McLoughlin and Dwolatzky (2014:584) refer to this lack of integration as the *"information gap"* in South African HE, and argues that it represents the single greatest barrier to understanding the observed HE outcomes in the country.

Third, research on HE outcomes in South Africa generally suffers from a lack of methodological transparency. Few studies ever formally define or adequately explain the methodologies and formulas underlying their estimates of specific metrics of HE access, throughput, and retention. This is exacerbated by the fact that the underlying data used in empirical analyses vary considerably between studies, both in terms of composition and representativeness, and are rarely available in the public domain. The ability to draw comparisons between studies or scrutinise specific findings in the literature is consequently compromised. Moreover, the lack of adequate transparency can easily lead to incorrect inferences, conclusions, and policy recommendations. This is particular cause for concern given the relative paucity of studies that report HE participation, throughput, and retention rates which often leads to a situation where the findings from the few prominent studies that do exist are interpreted at face value or accepted *bona fides*.

[20] See, for example, Scott *et al.* (2007), CHE (2010*a*), Letseka *et al.* (2010), Bhorat *et al.* (2012), CHE (2013), and CHE (2014*b*).
[21] See, for example, Bitzer and Troskie-De Bruin (2004), Lemmens *et al.* (2011), Dlomo *et al.* (2011), and van Zyl *et al.* (2012).
[22] See Blom (2014), for example.

Fourth, there is a shortage of sufficiently nuanced multivariate analysis in research on HE access and success in South Africa. Though there are some notable exceptions[23], the analyses in most extant studies of HE access or success in the country never extend beyond basic bivariate or trivariate descriptions. In addition, there is a tendency to draw overly strong causal inferences from the results of such descriptive analyses. This is not only a problem in South Africa, but also internationally. Tumen *et al.* (2008:235) note that the majority of studies that link secondary schooling factors to HE outcomes rely only on basic descriptive analysis. The inherent complexity and inter-related nature of the factors underlying observed patterns of HE access and success clearly mean that it is dubious to base policy conclusions on relatively superficial information. This is particularly true given that the associations identified through basic descriptive analyses often conceal underlying causal linkages.

Collectively, these issues not only undermine the credibility of much of the existing research on HE access and success in South Africa, but also imply that there is substantial scope for more nuanced and comprehensive analysis of HE outcomes and the underlying factors on which they are predicated.

The analysis presented in this chapter speaks directly to each of the aforementioned shortcomings. First, HE access and success (as measured by throughput and retention) are analysed in a cohesive manner throughout the chapter. Second, all of the metrics that are used to measure HE access and success are explicitly defined in order to ensure that the analysis is as transparent and replicable as possible. Third, the data sample used is representative of the learners in an entire province and not just a single HEI. Fourth, the empirical analysis presented not only consists of univariate, bivariate, and trivariate descriptions of HE outcomes, but also includes a far more comprehensive multivariate analysis of HE outcomes.

Where applicable, further evidence from the literature on the associations between specific pre-entry correlates and HE outcomes is integrated into the analysis presented in Sections 3.4 to 3.6 below.

3.3 Data and Methodology

In order to track individuals into and through the HE system, this chapter integrates data on matric performance and data on HE enrolments and graduations across two separate databases. The data on matric performance, learner characteristics, and school-level factors comes from the 2005 WCED SC database, which contains learner-level unit-record information on all learners who wrote the 2005 SCE in WCED schools within the Western Cape. The data on HE outcomes, on the other hand, was drawn from the Higher Education Management Information System (HEMIS) for the period 2006 to 2009. This database contains student-level unit-record data on all enrolments and graduations in South Africa's public HE system.[24]

The WCED matric and HEMIS data share a number of common variable fields. Crucially, both contain common identification variables that uniquely identify learners/students. By exploiting this information, learner records from the 2005 WCED SC database could be explicitly linked to student records in the HEMIS database. This makes it possible to follow learners who wrote the 2005 SCE in WCED schools (hereafter referred to as the *2005 WCED matric cohort*) over time as they moved into and through undergraduate studies in the South African public HE system over the period 2006 - 2009.[25]

[23] See, for example, Lam *et al.* (2010), Lemmens *et al.* (2011), and Dlomo *et al.* (2011).

[24] The version of the HEMIS data used in this chapter contains only a small subset of variables from the original database.

[25] This chapter focusses exclusively on HE access and success in South Africa's public HE system for two reasons. First, unlike the

3.3.1 The 2005 WCED matric cohort

The reasons for focussing specifically on the 2005 WCED matric cohort are largely practical. 2005 was the first year in which SCE candidates in WCED schools were required to provide ID numbers when registering for their examinations (WCED, 2005). At the national level, SCE candidates have only been required to provide ID numbers since 2008. This means that the 2005 WCED matric cohort is likely to be the first provincially representative matric cohort in South Africa that can be tracked using ID information.

Second, the version of the HEMIS data used in this chapter does not extend beyond 2009. This places an absolute limit on the duration over which any pre-2009 matric cohort can be followed through the HE system. As explained below, the duration over which cohorts can be tracked through the South African HE system has major implications for the analysis of HE throughput and dropout. Given the available data, the 2005 WCED matric cohort was therefore selected on the basis that it could be followed through HE for a longer period (four years) than any subsequent matric cohort in the WCED matric database.

Choosing to focus exclusively on HE access and success among learners from the 2005 WCED matric cohort has important implications for the external validity of the findings in this chapter. The population in the Western Cape differs from that of other provinces in a number of important respects, not least in terms of socio-economic and demographic composition.[26] In addition, the HE landscape in the province also differs from that in the rest of the country. It is therefore reasonable to expect that the observed extent and patterns of HE access and success among the 2005 WCED matric cohort may not necessarily be fully reflective of the national experience. Crucially, however, the substantive findings pertaining to the underlying correlates of HE access and success, as identified in the analysis that follows, are expected to extend to the rest of South Africa as well.

In addition to potential comparability issues between HE outcomes in the Western Cape and those in the rest of South Africa, the replacement of the SC with the NSC in 2008 means that many of the pre-entry correlates considered in the analysis below, including overall and subject-specific matric performance measures, may not be not be directly comparable to current indicators of matric performance. Unfortunately, this limitation cannot be overcome unless unit-record HEMIS data for the post-2009 period is made available for analysis. Nevertheless, insofar as the matric performance measures used below are reflective of specific academic competencies, the findings presented are still expected to be informative regarding the associations between scholastic achievement in secondary school and HE outcomes in the Western Cape.

3.3.2 Inverse probability weighting the 2005 WCED matric cohort data

While 41 258 learners wrote the 2005 SCE in WCED schools, only 29 997 of these learners had valid, non-missing ID numbers in the WCED matric database.[27] Given that matching with HEMIS data is premised on

data on public HE, information on private HE is highly fragmented and non-standardized across institutions (DHET, 2012:49). Moreover, the number of registered or provisionally registered private HEIs in South Africa varies considerably over time (see, for example, Blom (2011:18), Taylor (2011:33), and SAIRR (2012:520)) and there is no centralised private HE student database. Second, private HE in South Africa has historically accounted for only a small proportion of HE enrolments. Though a number of studies have suggested that this proportion has risen considerably over the past decade, the estimates in DHET (2015:21) show that private HE currently accounts for no more than 10% of all HE enrolments in the country.

[26] Some of the most significant differences between the 2005 WCED and national matric cohorts are discussed in greater detail below.

[27] That is, 11 261 learners in the data either did not have their ID numbers captured, or did not have valid ID numbers to report.

unique identification information, it follows that the 11 261 learners (27.3%) for whom IDs were not available could not be linked to HE data, irrespective of whether or not they accessed HE between 2006 and 2009.[28]

Critically, the extent to which the sample of 29 997 learners with IDs is representative of the 2005 WCED matric cohort population hinges on the ways in which learners with and without IDs differ from each other. Specifically, if there are unobserved differences between the sample with and without IDs which also influence the likelihood of HE access and success, the sample will not be representative of the population and estimates based on sample information alone will be biased.

By definition, it is not possible to use the data to determine whether there are unobserved differences between the learners from the 2005 WCED matric cohort who have identification information and those who do not. However, missingness of ID numbers was found to be correlated with a number of observable variables, including race, gender, the type of SC pass achieved, and the specific schools that learners attended. It is therefore clear that the ID numbers in the data are not missing completely at random (MCAR) and that the 29 997 learners with ID information are not a random sample of the 41 258 learners in the cohort population (Cameron and Trivedi, 2005:927). However, in the analysis that follows, it is assumed that the missingness of IDs in the WCED matric data is orthogonal to unobservable factors and can be fully accounted for by conditioning on observable variables. In other words, it is assumed that ID numbers are missing at random (MAR) (Cameron and Trivedi, 2005:926). While this is a potentially contentious assumption, it is effectively unavoidable.

The assumption that ID numbers in the 2005 WCED matric cohort data are MAR is tantamount to assuming that the sample of learners with IDs will be representative of the entire cohort population once differences in observables between learners with and without IDs have been taken into account (Heitjan and Basu, 1996:207). However, in order to ensure that the unconditional estimates of HE access and success presented below are also representative of the 2005 WCED matric cohort population, inverse probability weights were constructed using probit regressions. These regressions included controls for age, gender, race, SC pass type, and the specific schools that learners attended and were subsequently used to predict the probability of being included in the sample of learners with IDs. The predicted probabilities of inclusion for all learners with IDs were then inverted and rescaled to sum to the cohort population size.

Importantly, none of the 764 learners in the 2005 WCED matric cohort data for whom race information were missing had ID numbers. These learners therefore had to be excluded from the inverse probability weighting estimations. This reduces the effective 2005 WCED matric cohort population to 40 494 learners. The scaled inverse probability weights were thus estimated in such a way that the sample of individuals for whom identification information is available (29 997) should be representative of an effective population of 40 494 learners under probability-weighted estimation. All of the estimates for the 2005 WCED matric cohort below are based on these probability weights.

3.3.3 Measuring HE access and success: access, completion, and dropout rates

The primary objective of the empirical analysis in this chapter is to examine the extent of HE access and success among the 2005 WCED matric cohort and evaluate the underlying correlates on which observed HE

[28] The data indicates that 415 of the learners who wrote the 2005 SCE and who had identification numbers also wrote the 2006 SCE. As it is not possible to track individuals for whom no identification information is available in the WCED matric data, this is likely to be a lower-bound estimate of the number of learners who re-wrote the SCE in 2006.

outcomes for the group are predicated. To this end, the analysis focusses on three main metrics: the HE access rate, the HE completion rate, and the HE dropout rate.[29]

While *access rates*, *completion rates*, and *dropout rates* are commonly used terms in the HE literature, their intended meanings can differ substantially from one study to the next and they are rarely estimated using a single, consistent methodology. In the interest of methodological transparency and to avoid potential confusion, each of these metrics is therefore explicitly defined below.[30]

3.3.3.1 *Participants* and the *access rate*

In the analysis below, HE *participants* refer to all individuals who have enrolled in HE as first-time entering undergraduate students at some stage. The HE *access rate* expresses the cumulative number of individuals from a given cohort who have participated in HE within a given number of years, as a percentage of the total number of individuals in that cohort.

Access rates are both cohort- and time-specific. For example, the 1-year access rate for learners from the 2005 WCED matric cohort reflects the percentage of the learners from the cohort who entered the HE system as first-time entering undergraduate students in 2006 (i.e. one year after writing the 2005 SCE). Similarly, the 4-year access rate for females from the cohort reflects the percentage of female learners who participated in HE at any stage between 2006 and 2009 (i.e. within four years of writing the 2005 SCE).

It is also possible to introduce additional specificity when estimating access rates. For example, the 3-year undergraduate Bachelor's degree access rate for the 2005 WCED matric cohort would reflect the percentage of learners from the cohort who enrolled in 3-year undergraduate Bachelor's degree programmes as first-time entering undergraduate students between 2006 and 2008.

3.3.3.2 *Completers* and the *completion rate*

In the context of this chapter, a *completer* is any individual who has successfully completed a formal undergraduate or otherwise-specified HE academic programme/qualification. The HE *completion rate*, in turn, expresses the cumulative number of completers from a given first-time entering undergraduate cohort who completed their studies within a specific number of years, as a percentage of the total number of students in that cohort.

Like access rates, completion rates are both cohort- and time-specific. However, completion rates are necessarily also qualification or programme-specific. The 4-year completion rate for the WCED 2006 first-time entering undergraduate cohort, for example, reflects the percentage of the students from the WCED 2006 first-time entering undergraduate cohort who successfully completed undergraduate qualifications within the first four years of study (i.e. between 2006 and 2009).

[29] HE access and success are not only difficult to define, but, as already noted in Section 3.2, also difficult to measure. This is perhaps one of the reasons why few studies in South Africa appear to adhere to the same definitions of HE access, throughput, or dropout.

[30] These definitions are based on the author's reading of the international literature on the quantitative analysis of HE outcomes based on unit-record learner and/or student data. They are also a response to the lack of a coherent, unified framework for the quantitative analysis of HE outcomes in South Africa. The definitions given do not necessarily correspond to those in other studies.

Crucially, the overall undergraduate completion rate is completely agnostic about whether or not the undergraduate qualifications/programmes that students complete are the same as the undergraduate qualifications/programmes for which they were initially enrolled as first-time entering undergraduate students. In other words, completers who switch between academic programmes, qualification types, fields of study, and/or HEIs prior to completing their studies would still contribute to the overall undergraduate completion rate as long as the programmes that they complete are classified as undergraduate programmes.

In contrast to the overall undergraduate completion rate, the 3-year completion rate for 3-year undergraduate Bachelor's degree programmes among the WCED 2006 first-time entering undergraduate cohort would reflect the percentage of the students from the WCED 2006 first-time entering undergraduate cohort who were enrolled in 3-year undergraduate Bachelor's degree programmes in 2006 and had successfully completed 3-year undergraduate Bachelor's degree programmes by the end of 2008 (i.e. with three years of study).

3.3.3.3 *Non-completers, dropouts, retention* and *dropout rates*

This chapter draws an important distinction between *non-completers* and HE *dropouts*.

In the context of the analysis that follows, a *non-completer* is any student who is enrolled for a formal undergraduate qualification, but who has not yet successfully completed that qualification. The non-completer *retention rate* denotes the number of non-completers from a given first-time entering undergraduate cohort who are still enrolled after a given number of years, as a percentage of the total number of students in that cohort.

In contrast to non-completers, a *dropout* is any student who, having been enrolled for an undergraduate programme, exits the HE system without having completed any formal academic qualification and without subsequently returning to the HE system.[31] This implies that students can only be classified as dropouts if they (a) exit the public HE system for good and (b) do not complete any undergraduate qualification. The HE *dropout rate* consequently expresses the cumulative number of dropouts from a given first-time entering undergraduate cohort who dropped out within a specified number of years, as a percentage of the total number of students in that cohort. The primary reason for defining *dropout* and the *dropout rate* in this manner is to prevent students who switch between programmes, qualification types, fields of study, and/or HEIs, yet ultimately complete their studies, from being incorrectly classified as dropouts.[32]

Like access and completion rates, dropout rates are also cohort- and time-specific. As already mentioned, however, they are not programme- or qualification-specific. The 3-year dropout rate for the WCED 2006 first-time entering undergraduate cohort, for example, reflects the percentage of the students from the WCED 2006 first-time entering undergraduate cohort who left the HE system before 2009 (i.e. within three years of study) without having completed any undergraduate qualification between 2006 and 2008. Similarly, the 2-year dropout rate for 3-year diploma programme students from the WCED 2006 first-time entering undergraduate

[31] As explained below, the fact that it is generally not possible to observe whether individuals who exit the HE system return to continue their studies at a later stage has important implications for the estimation of dropout and dropout rates in practice.

[32] Say, for example, that a student commences with a 3-year undergraduate BComm degree. After two years, the student switches to a 4-year BSc degree which she successfully completes after a further three years of study. While the student did not complete the specific programme with which she originally started, she did ultimately successfully complete an undergraduate qualification. Thus, it would clearly be incorrect to classify her as a *HE dropout*. However, this is often implicitly what is done in some studies on HE throughput and dropout in South Africa.

cohort reflects the percentage of those students who left the HE system before 2008 (i.e. within two years of study) without having completed any undergraduate qualification between 2006 and 2007.

Lastly, given the definitions above it should be clear that all students who have not (yet) completed their studies fall into one of two groups: retained non-completers or dropouts. The retention rate and the dropout rate therefore effectively represent two sides of the same coin. As the dropout rate increases, the non-completer retention rate must necessarily decrease. Similarly, a persistently high retention rate must be indicative of a low dropout rate. For this reason, the concepts of dropout and retention are used interchangeably in some instances in the remainder of this chapter.

3.3.4 Short-term vs long-term HE access, completion, and dropout rates

Measuring HE access and success in South Africa is difficult for number of reasons, not least due to the fact that many students take a long time to progress through and ultimately exit the HE system. This implies that short-term measures of access, completion, and dropout are likely to understate the full extent of HE access, completion, and dropout for any cohort under consideration.

In theory, the solution to this problem would be to track cohorts over extended periods of time as they progress through the HE system. However, this is virtually never feasible given the data constraints. The HEMIS data used in this chapter, for example, only allows learners from the 2005 WCED matric cohort to be tracked through the HE system for a maximum of four years.

Blom (2014:12) notes that tracking cohorts through undergraduate study in South Africa for the purposes of estimating completion and/or dropout rates requires a minimum time frame of four years. However, Parker and Sheppard (2015:15) argue that the estimation of completion and dropout rates in HE requires longitudinal data that extends at least two years beyond the formal minimum time requirements for programme study. It is therefore worth considering the extent to which estimates based on only four years of data are likely to understate the ultimate extent of throughput and dropout for the learners from the 2005 WCED matric cohort.

Based on the extent and timing of completion among the various national first-time entering undergraduate cohorts in the 2000 - 2009 HEMIS data, it is possible to gauge the degree to which the 4-year completion rates for the 2005 WCED matric cohort are likely to differ from the ultimate completion rate for the cohort.

The estimates in Table E.7 suggest that only about 60% - 62% of all students who complete undergraduate programmes in South Africa do so within the first four years of study. Obviously, the timing and extent of completion also differs between different undergraduate qualification types. Using the same crude methodology as above, the figures in Tables E.8 - E.11 suggest that around 80% of 1 to 2-year undergraduate diploma or certificate graduates, 65% of 3-year undergraduate diploma graduate, 69% of 3-year undergraduate degree graduates, and 53% of 4-year undergraduate degree graduates are respectively expected to complete their programmes within four years of study. Again, it should be reiterated that these are only crude estimates. Nonetheless, they suggest that a significant part of throughput for any cohort only occurs after the initial four year time frame.

The implications of working with a short time frame are more severe for dropout rate estimates than they are for completion rate estimates. Table E.12 shows that just over 37% of the 2000 - 2002 national first-time

entering undergraduate cohorts exited public HE within the first four years of study without having completed any qualification. However, nearly 23% of these individuals (8.5% of the cohort) returned to the HE system to continue their studies after the fourth year, with 5.4% (2% of the cohort) completing qualifications subsequent to their return.

These estimates make it clear that, technically, it is only possible to definitively categorise students as dropouts if it is known that they never return to HE to continue their studies. However, this is obviously not possible given the data constraints. This has two implications for accuracy of the 3-year dropout rates estimated throughout this chapter. First, they are virtually guaranteed to be upward-biased estimates of the true 3-year dropout rates since at least some students who are not observed to be enrolled in the in the HEMIS data in 2009 may have returned to complete their studies in 2010 or thereafter. Second, the 3-year dropout rates will understate the ultimate extent of dropout for the cohort since some non-completers who were still enrolled by the end of 2009 are likely to have dropped out in 2010 or thereafter.

Without access to more data, there is very little that can be done about the aforementioned issues and they serve as important caveats to the findings from the analysis presented below.

3.4 Into and through HE: The 2005 WCED matric cohort

To contextualising the analysis of the underlying correlates of HE access and success, it is useful to first describe the patterns of access to HE among the 2005 WCED matric cohort and the various pathways taken by those learners who enrolled in HE between 2006 and 2009.

3.4.1 Enrolment flows for the 2005 WCED Matric Cohort

Table 3.1 summarises the HE enrolment flows for the 2005 WCED matric cohort along with dropout and completion estimates for the years 2006 to 2009.

Roughly 27.4% of the cohort accessed HE at some stage during the first four years following the 2005 SCE. However, only 68.9% of this group (18.9% of the cohort) commenced with their undergraduate studies in the year immediately following matriculation. A significant share of the HE participants (20.7%) from the cohort only entered the HE system after two years and a non-negligible portion entered HE after a delay of 3 or more years. The rate of decline in the marginal access rates over the first four years suggest that fewer than 30% of the 2005 WCED matric cohort are likely to have ultimately enrolled in HE. Access to HE among secondary school leavers is thus not only low in general, but delays in the transition between high school and university are also prevalent.

Just under 18% of the learners from the cohort were still enrolled in undergraduate programmes in 2009. The bulk of this group (86.4%) were non-first-time entering students who had not yet completed any undergraduate qualification prior to 2009. Only 5.6% were first-time entering students and the remaining 8% were students who had already completed some sort of undergraduate qualification and were enrolled for a further undergraduate programme.

By the start of 2009, 36.1% of the learners who entered HE between 2006 and 2008 were no longer enrolled in undergraduate studies. Roughly 61% of this group were students who dropped out of HE without completing

Table 3.1: HE enrolment, exit, and completion for the 2005 WCED matric cohort (2006 - 2009)

	% of the 2005 WCED matric cohort			
	2006	**2007**	**2008**	**2009**
Enrolled	18.90	22.30	22.06	17.95
- First-time entering	18.90	5.70	1.81	1.01
- Non-entering	—	16.60	20.25	16.94
Not enrolled	81.10	77.70	77.94	82.05
- Non-participants	81.10	75.40	73.59	72.56
- Exit HE - Completers[a]	—	0.02	0.08	3.71
- Exit HE - Non-completers[a]	—	1.69	3.72	5.83
- Exit HE - Stop out[b]	—	0.60	0.57	—
Completers[a]	0.07	0.47	5.06	10.64
- Completers (non-cumulative)	0.07	0.40	4.59	5.58
Dropouts[a]	1.69	3.72	5.83	—
- Dropouts (non-cumulative)	1.69	2.03	2.12	—

NOTES: Estimates are weighted and are expressed as a percentage of the number of learners in the 2005 WCED matric cohort. The percentages are based on the numbers in Table E.5. *Completers* refer to students who successfully completed undergraduate qualifications between 2006 and 2009 whereas *dropouts* refer to students who left HE prior to 2009 without having completed any undergraduate qualification. [a]Numbers are cumulative. [b]Non-completing students who temporarily exited the system for one or two years (i.e. were not observed to be enrolled), but returned to HE in either 2008 or 2009.

any formal qualification, while the remaining 39% were no longer enrolled on account of the fact that they had already completed their undergraduate studies prior to 2009. In fact, the estimates in Table 3.1 suggest that the extent of dropout over the first three years among the cohort exceeded the extent of completion over the same period. To some degree, this is not surprising given that the group under consideration included students who were enrolled in 4-year programmes as well as students who only entered HE in 2007 or 2008.

The only students who were theoretically eligible to graduate before 2009 are those who commenced with 3-year or shorter period programmes in 2006, those who commenced with 2-year or 1-year programmes in 2007, and those who commenced with 1-year programmes in 2008. Collectively, these groups accounted for less than 56% of all individuals from the cohort who entered undergraduate studies between 2006 and 2008. If one were to consider only this group, it is found that the estimated 3-year completion rate of 33.3% actually exceeded the 3-year dropout rate of 23.5%.

Notwithstanding the issues noted above, it is clear that undergraduate programme completion among learners who enter HE within the first four years after writing the SCE is very low. By the end of 2009, only 10.6% of the 2005 WCED matric cohort had successfully completed some type of undergraduate qualification. Moreover, only 64.3% of these qualifications were three or four-year undergraduate Bachelor's degrees. In other words, less than 6.9% of the 2005 WCED matric cohort had completed a university degree by the end of 2009.

The estimates suggest that the low extent of graduate production over the short term is not simply the result either of low access to HE or of low programme throughput, but rather a combination of both. This is all the more worrisome in light of the fact that, as noted in Section 3.2 above, learners who reach grade 12 in South African schools and write the SCE are already a small and select group, in that they have successfully passed many of the hurdles that large proportions of their peers have not. Section 3.6.4 provides a more detailed discussion of the relative contributions of HE access and HE throughput to observed differentials in graduate outputs among the 2005 WCED matric cohort.

3.4.2 The timing of HE entry and its implications for throughput analysis

To avoid the problems that arise when analysing HE throughput and dropout among multiple first-time entering undergraduate cohorts as though they constituted a single homogeneous group, the primary analytic focus in terms of HE success in this chapter falls on the 7 654 learners from the 2005 WCED matric cohort who commenced with undergraduate studies in 2006 (hereafter referred to as the *WCED 2006 first-time entering undergraduate cohort*). Crucially, there are reasons to expect that this group will be different from those who only entered HE with some delay after writing the 2005 SCE .

In the United States, a number of studies have found that learners who continue with HE immediately after completing secondary school tend to perform better, on average, in terms of programme completion and retention than those who postpone HE entry (Bozick and DeLuca, 2005:527). Tracking the national 2008 first-time entering college cohort, Shapiro *et al.* (2014:58 - 59), for example, find that the six-year completion rates for students with delayed entry into HE were significantly lower than the completion rates for those who proceeded with HE directly after high school. In their review of the existing literature on delayed post-secondary enrolment, Roksa and Velez (2012:772) moreover argue that the negative association between delayed HE entry and subsequent HE outcomes is generally found to persist even after inter-group differences in pre-entry socio-demographic factors have been taken into account.

While the existing international evidence on the link between delayed HE entry and HE performance may be compelling, the near-complete lack of representative quantitative research on school-to-university transitions in South Africa means that little is known about the extent of postponed HE entry or about the performance differentials between students who continue with HE immediately after finishing matric, and those who only enter HE at some later stage.

The extant South African research on the transition from high school to university is largely qualitative in nature and the focus on delayed entry has mostly been in terms of describing the prevalence and potential advantages or disadvantages of taking a *"gap year"* between leaving secondary school and entering HE.[33] Yet, for many, delayed HE entry may not be the result of choosing to take a *"gap year"*. Instead, it is likely that some prospective students may postpone entry because they lack the financial means to attend HE. Others may delay entry if their initial applications for admission into specific programmes or at specific HEIs are unsuccessful.

In the absence of richer qualitative measures, the data used in this chapter can only offer limited insights regarding the precise reasons why some learners postpone enrolment in HE. Nonetheless, the data can be used to gain some understanding of the prevalence and extent of immediate versus delayed HE entry as well as the extent and nature of any observable performance differentials between immediate and delayed-entry students - arguably an important component of understanding the nature of transition between high school and university in South Africa.

As discussed above, at least 8.5% of the learners from the 2005 WCED matric cohort accessed HE after a delay of at least one year following the 2005 SCE (Table 3.1). More generally, the HEMIS data indicates that students who were in secondary school in the year immediately preceding enrolment in HE accounted for no more than 66% of any first-time entering undergraduate cohort in the South African HE system between 2000 and

[33] See, for example, Cosser (2009) and Coetzee and Bester (2010).

Table 3.2: Matric pass type, undergraduate qualification type, completion, and dropout by year of HE entry for the 2005 WCED matric cohort

	% of first-time entering undergraduate cohorts		
	2006	**2007**	**2008**
Passed with endorsement	83.9	64.4	49.4
Passed without endorsement	14.5	30.8	42.0
1 to 2-year certificates/diplomas	5.8	9.3	8.9
3-year diplomas	23.1	42.3	45.3
3 to 4-year degrees	71.1	48.3	45.9
Completed in regulation time[a]	34.1	26.2	—
Dropped out in regulation time[a]	16.0	24.7	—

NOTES: Estimates are weighted and are expressed as a percentage of the learners from the 2005 WCED matric cohort who respectively entered undergraduate studies for the fist time in 2006, 2007, and 2008. [a]None of the students who commenced with 4-year undergraduate Bachelor's degrees after 2006 would have been able to graduate before 2010. To ensure comparability across first-time entering undergraduate entry cohorts, the completion and dropout rates by regulation time that are reported in the table are therefore only estimated for individuals enrolled in 1 to 2-year certificate, 3-year diploma, or 3-year bachelor's degree programmes in the 2006 or 2007 first-time entering undergraduate cohorts. Completion and dropout rates for the 2008 HE entry-cohort have been omitted.

2009. Similarly, students aged 23 or older consistently accounted for more than a quarter of all first-time entering undergraduate cohorts between 2000 and 2008.[34]

Postponed enrolment in HE in South Africa thus seems to be a fairly common and persistent phenomenon. In addition, the data shows that there are indeed differences, on average, in secondary school performance and HE enrolment and throughput patterns between immediate and delayed entrants from the 2005 WCED matric cohort (Table 3.2).

A far greater percentage of the WCED 2006 first-time entering undergraduate cohort passed with matriculation endorsement (83.9%) than was the case for those learners who only entered HE in 2007 (64.4%) or 2008 (49.4%). The learners who were part of the 2007 or 2008 first-time entering undergraduate cohorts were also not only less likely to enrol in undergraduate Bachelor's degrees (as opposed to 3-year diploma or 1 to 2-year certificate programmes) than the learners in the WCED 2006 first-time entering undergraduate cohort, but were also less likely to complete their programmes and more likely to drop out of HE by the end of regulation time.[35]

3.4.3 Enrolment flows for the WCED 2006 first-time entering undergraduate cohort

Table 3.3 summarises the enrolment patterns and the retention, completion, and dropout rates for the WCED 2006 first-time entering undergraduate cohort. In contrast to the conclusions drawn from Table 3.1, the estimates indicate that a greater percentage of the cohort completed undergraduate qualifications (25.4%) than dropped out (20.4%) within the first three years. Notably, the timing of completion and dropout differed considerably. While the bulk of the completers over the first three years only completed their programmes in the third year of study, most of the students who had dropped out before 2009 did so in the first two years

[34] Author's own estimates using 2000 - 2009 HEMIS data. Individuals who are 23 years of age or older in South Africa may qualify for admission to HE on the grounds of "mature age exemption", which means that they can in some instances gain access to HE without necessarily having passed with matriculation endorsement (CHE, 2007:128 - 129).

[35] Horn *et al.* (2005) find similar results when investigating delayed post-secondary enrolment in the United States.

of study. A further 23.6% of the cohort completed their first undergraduate qualifications in the 4th year of study.

By the end of 2009, nearly half (49.0%) of the WCED 2006 first-time entering undergraduate cohort had successfully completed some undergraduate qualification.[36] Furthermore, 30.5% of the cohort were still enrolled in undergraduate studies by the end of 2009, despite not yet having completed their studies. Though it is likely that some of these students would not have returned to continue their studies in 2010 (i.e. dropped out), it is also likely that some of those who were retained would have either completed their programmes in 2010 or at some stage thereafter. As explained in Appendix D, it is also expected that the 3-year dropout rate reported in Table 3.3 will be an upward-biased estimate of the true 3-year dropout rate for the cohort and that at least some of the students who were identified as dropouts may have returned to complete their studies after 2009.

These estimates paint a far more encouraging picture of HE throughput and retention than the estimates presented in CHE (2013). The estimated 4-year completion rate presented here, for example, is substantially higher than the estimated 5-year undergraduate completion rates (35%) for the national 2006 first-time entering undergraduate cohort reported in CHE (2013:45). Similarly, the 3-year dropout rate in Table 3.3, which is argued to already exaggerate the true extent of 3-year dropout for the cohort, is substantially lower than the first-year undergraduate attrition rate (33%) presented in CHE (2013:44).

Table 3.3: HE enrolment, exit, and completion for the WCED 2006 first-time entering undergraduate cohort (2006 - 2009)

	% of the WCED 2006 first-time entering undergraduate cohort			
	2006	**2007**	**2008**	**2009**
Enrolled	100.0	87.8	82.3	60.8
- Non-completers[a]	99.6	85.7	57.2	30.5
Not enrolled	—	12.2	17.7	39.2
- Exit HE - Completers[b]	—	0.1	0.4	19.1
- Exit HE - Non-completers[b]	—	8.9	15.1	20.4
- Exit HE - Stop out[c]	—	3.2	2.3	—
Completers[b]	0.4	2.2	25.4	49.0
- Completers (non-cumulative)	0.4	1.8	23.2	23.6
Dropouts[b]	8.9	15.1	20.4	—
- Dropouts (non-cumulative)	8.9	6.2	5.3	—

NOTES: Estimates are weighted and are expressed as a percentage of the 7 654 learners that constitute the WCED 2006 first-time entering undergraduate cohort. The percentages are based on the numbers in Table E.6. *Completers* refer to students who successfully completed undergraduate qualifications between 2006 and 2009 whereas *dropouts* refer to students who left HE prior to 2009 without having completed any undergraduate qualification. [a] Percentage of the cohort who were enrolled in undergraduate studies but had not completed any undergraduate qualification by the end of the year in question. [b] Figures are cumulative. [c] Non-completing students who temporarily exited the system for one or two years (i.e. were not observed to be enrolled), but returned to HE in either 2008 or 2009.

Though the extent of the differences between the throughput estimates presented here and those presented in CHE (2013) may appear worrying, it is important to understand that they obtain because of compositional differences in the underlying populations being studied and also because of the methodological differences in

[36] 371 students in the WCED 2006 first-time entering undergraduate cohort completed more than one undergraduate qualification between 2006 and 2009. Of the students who completed undergraduate degrees by the end of 2008, 762 enrolled in postgraduate programmes in 2009. Of these, 601 (78.9%) successfully completed those programmes by the end of 2009.

the definition and subsequent estimation of student completion and throughput. There are thus essentially two main reasons for the differences in the estimates.

First, as explained above, it is reasonable to expect that individuals who transition from secondary school to higher education without delay will perform better, on average, than those who only enter HE after a number of years subsequent to completing secondary education. Whereas the WCED 2006 first-time entering undergraduate cohort includes only individuals who entered HE directly after high school, the national 2006 first-time entering undergraduate cohort used in the CHE (2013) study also includes individuals who were not secondary school students in 2005.[37] Furthermore, as shown below, there are additional compositional differences in terms of the types of qualifications for which students are enrolled and the specific HEIs attended between the WCED and the national 2006 first-time entering undergraduate cohorts, which may explain why throughput and overall performance for the former group is likely to be better than that for the latter group.

Even in the absence of any methodological differences, the aforementioned compositional differences imply that throughput estimates for the WCED and national first-time entering undergraduate cohorts should be expected to differ. Table 3.4 compares the respective completion and dropout rates for these two cohorts over the period 2006 - 2009 using exactly the same methodology. The estimates show that there are indeed stark differences in throughput and retention between the two cohorts, with completion within the first four years of study being significantly higher for the WCED cohort than the national cohort and the opposite holding true for dropout within the first three years.

Table 3.4: Completion and dropout rates (%) for the WCED vs the national 2006 first-time entering undergraduate cohorts (2006 - 2009)

	WCED cohort[a] *(Matric in 2005)*		*National cohort*[b] *(All)*		*National cohort*[c] *(Secondary school in 2005)*	
	Completion rate	**Dropout rate**	**Completion rate**	**Dropout rate**	**Completion rate**	**Dropout rate**
2006	0.4	8.9	0.8	19.4	0.4	9.5
2007	2.2	15.1	3.0	28.2	1.7	15.6
2008	25.4	20.4	17.2	36.3	22.1	22.6
2009	49.0	—	32.7	—	44.1	—

NOTES: Estimates for the 2005 WCED matric cohort have been weighted. All figures are cumulative and are expressed as a percentages of the number of students in the original cohort intake in 2006. [a]Learners from the 2005 WCED matric cohort who were part of the WCED 2006 first-time entering undergraduate cohort. [b]National cohort of students who were first-time entering undergraduate students in 2006. [c]National cohort of students who were first-time entering undergraduate students in 2006 and who indicated that their primary activity in the year preceding entry (i.e. 2005) was being in secondary school.

When the national 2006 first-time entering undergraduate cohort is limited only to the sample of individuals who indicated that they were in secondary school in 2005, the estimated completion and dropout rates are far more similar to those estimated for the WCED 2006 first-time entering undergraduate cohort. These results not only offer further support for the notion that students who enter HE immediately after secondary school perform better, on average, than those with delayed entry, but also illustrate the extent to which throughput and retention estimates are influenced by the underlying samples on which they are based.

Second, while the completion rates in CHE (2013) are estimated using a programme-specific methodology, the completion rates in this chapter are estimated using only a qualification type-specific approach. Consequently,

[37] The HEMIS data indicates that only 65.5% of the national 2006 first-time entering undergraduate cohort were secondary school learners in 2005.

many of the students who switched between undergraduate programmes or even between HEIs between 2006 and 2009 would have been counted as dropouts or non-completers in the CHE (2013) study, even if they did end up completing an undergraduate qualification by the end of 2009. It follows that the completion rates presented in CHE (2013) should be lower than the completion rates presented in this chapter, even if they were based on precisely the same underlying samples. In fact, CHE (2014*b*:102) acknowledges that completion rate estimates are higher when they are based on uniform qualification classifications rather than uniform programme classifications.

A similar argument can be made in terms of the differences in estimated dropout rates. Where students who discontinue with a particular undergraduate programme before re-enrolling in another would be classified as dropouts in CHE (2013), students are only classified as dropouts in this chapter if they left the HE system before 2009 without having completed any undergraduate qualification whatsoever. It is therefore to be expected that the dropout rates presented in this chapter will be lower than the dropout rates in CHE (2013).

Lastly, for the purposes of reference, Table 3.5 summarises the HE access rates for the learners from the 2005 WCED matric cohort along with the respective completion, dropout, and non-completer retention rates for students from the WCED 2006 first-time entering undergraduate cohort.

Table 3.5: HE access, completion, dropout, and non-completer retention rates (%) for the 2005 WCED matric and WCED 2006 first-time entering undergraduate cohorts (2006 - 2009)

	1 year *(2006)*	**2 years** *(2007)*	**3 years** *(2008)*	**4 years** *(2009)*
Access rate	18.9	24.6	26.4	27.4
Completion rate	0.4	2.2	25.4	49.0
Dropout rate	8.9	15.1	20.4	—
Non-completer retention rate[a]	87.6	80.5	54.2	—

NOTES: Estimates are weighted. Access rates are estimated for learners from the 2005 WCED matric cohort while completion, dropout, and retention rates are only estimated for students from the WCED 2006 first-time entering undergraduate cohort. Access, completion, and dropout rates are cumulative. [a]The non-completer retention rate presented in the table is estimated as the number of non-completers in the cohort who were still enrolled in undergraduate studies in the following year, expressed as a percentage of number of students in the WCED 2006 first-time entering undergraduate cohort. The estimated completion, dropout, and non-completer retention rates for each year would sum to 100% if it were not for the fact that some completers enrolled for further undergraduate programmes subsequent to completion.

3.4.4 Pathways through HE

Much of the discourse on access to and progression through HE in South Africa remains implicitly premised on the notion that most individuals follow a traditional route into and through HE whereby they enter a HEI immediately after finishing secondary school, remain enrolled for a single undergraduate programme at that HEI until the end of the regulation study period, graduate, and subsequently either continue with postgraduate studies or exit the HE system. However, this notion is at odds with reality. In fact, the CHE's proposal for an extended undergraduate curriculum structure in South Africa is largely based on the fact that only a select minority of students follow a *"traditional"* route through undergraduate studies (CHE, 2013:15 - 16).

It has already been shown that delayed entry into HE is commonplace in South Africa. Yet, even among those secondary school learners who enrol in HE immediately after completing matric, few take a direct path

through undergraduate studies (CHE, 2010*a*:6). Every year, a host of factors influence whether or not students are able to continue with their specific academic programmes at the HEIs that they attend and, critically, whether they elect to do so. Some students may, for financial or other reasons, have to interrupt their studies temporarily, only to continue at a later stage (i.e. stop out). Others may choose or be forced by circumstances to switch between courses, programmes, qualifications, and even HEIs in order to continue studying.

While research on the prevalence of programme and institution switching in South African HE appears to be non-existent, the HEMIS data indicates that these are not uncommon phenomena. For example, 10.4% of the students in the WCED 2006 first-time entering undergraduate cohort who were enrolled in HE for at least two years between 2006 and 2009 switched between HEIs at some stage during undergraduate study. Similarly, approximately 12% of the students from the cohort switched from one undergraduate programme or qualification to another without first having completed the former.[38]

Though the complexities of the various pathways through HE are important for understanding HE progression in South Africa, it also complicates the measurement of throughput (CHE, 2010*a*:6). However, when framed purely in terms of HE access and completion, much of this complexity can be simplified by considering the fact that, in any given year, an individual can essentially occupy one of two states: *enrolled in HE* or *not enrolled in HE*. For individuals who are enrolled in HE, it is possible to further distinguish between those who are first-time entering undergraduate students, those who are completing a qualification, and those who are neither first-time entering students, nor completers in the year in question. This reduces the potential HE status state space to just four categories: not enrolled (N), first-time entering enrolled (F), completing enrolled (C), and non-entering and non-completing enrolled (E). For each year of data available, every student can thus be classified under one of these states such that the sequence of states effectively describes the path they took through HE.[39]

The parametrisation of the pathways approach described above means that it would have theoretically been possible for students from the WCED 2006 first-time entering undergraduate cohort to progress through HE along 54 unique pathways between 2006 and 2009.[40] In reality, the students from the cohort took only 28 different pathways through HE.[41] Moreover, over 96% of the cohort followed one of only 10 pathways over the period.[42] These are shown in Table 3.6 alongside the percentages of the 2005 WCED matric cohort and the WCED 2006 first-time entering cohort that respectively progressed along each pathway.

Persistent enrolment ending in non-completion represented the most common pathway among the WCED 2006 first-time entering undergraduate cohort, with more than a quarter of all the students in the cohort remaining enrolled for the duration of the 2006 - 2009 period without completing an undergraduate qualifica-

[38] Due to the non-uniform nature of the nomenclature used to describe study programmes, both between HEIs and within HEIs over time, it is difficult to determine whether students switch between programmes. The figure reported here is a conservative estimate in that it only reflects switches in qualification type (e.g. from a 3-year Bachlelor's degree to a 3-year diploma) and/or broad field of study (e.g. from SET to HSS).

[39] This approach is a simplified application of the pathways methodology proposed by Robinson (2004) and developed in Robinson (2005) and Robinson and Bornholt (2007).

[40] In theory, four years of data and four potential states means that there should be $4^4 = 256$ possible pathway combinations. However, because of the path dependence between some of the states (e.g. one cannot be a first-time entering undergraduate student after having been a completing enrolled student), the number of possible pathways is reduced to 81. Moreover, since the students from the WCED 2006 first-time entering undergraduate cohort must have been either first-time entering students in 2006 or first-time entering and completing students in 2006, this further reduces the potential number of pathways for the group to 54.

[41] 21 pathways were associated with completion, 4 pathways with dropout, and 4 pathways with non-completer retention.

[42] These 10 pathways also accounted for more than 95% of all non-completers, completers, and dropouts among the WCED 2006 first-time entering undergraduate cohort over the period.

Table 3.6: Pathways through HE among the WCED 2006 first-time entering undergraduate cohort (2006 - 2009)

		Individuals taking pathway as percentage of...				
Pathway	**Type**	**2005 WCED matric cohort**	**WCED 2006 HE-entry cohort**	**Retained non-completers**	**Completers**	**Dropouts**
F-E-E-E	Non-completers	5.0	26.6	87.2	—	—
F-E-E-C	Completers	4.4	23.5	—	47.9	—
F-E-C-N	Completers	3.4	17.8	—	36.3	—
F-N-N-N	Dropouts	1.7	8.9	—	—	43.7
F-E-N-N	Dropouts	1.2	6.2	—	—	30.3
F-E-E-N	Dropouts	0.9	4.8	—	—	23.4
F-E-C-C	Completers	0.6	3.3	—	6.7	—
F-E-C-E	Completers	0.4	2.1	—	4.3	—
F-N-E-E	Non-completers	0.3	1.7	5.5	—	—
F-E-N-E	Non-completers	0.3	1.4	4.5	—	—
TOTAL	—	18.2	96.3	97.3	95.3	97.4

NOTES: Estimates are weighted and are calculated for the WCED 2006 first-time entering undergraduate cohort. The figures in each column express the number of students from the WCED 2006 first-time entering undergraduate cohort who took a specific path through HE as a percentage of the group indicated in the column header. Only the ten most common paths followed by the students from the cohort are shown and are ordered from most to least prevalent. The respective HE status states are: first-time entering enrolled (F), non-entering, non-completing enrolled (E), completing enrolled (C), and not enrolled (N).

tion. This group also accounted for 87.2% of all retained non-completers, with the remaining 12.8% comprising students who interrupted their studies at some stage between 2006 and 2009.

The second and third most common pathways were for students who respectively completed their undergraduate programmes in the fourth and third year of study. Just over 82% of all completers identified in the cohort (41.3% of the cohort) took one of these pathways. As explained below, this is not surprising given that the vast majority of the students in the cohort were enrolled in 3-year or 4-year diploma or degree programmes.

The fourth, fifth, and sixth most common pathways among the cohort were for students who respectively dropped out of HE after 1 year, 2 years, and 3 years of enrolment.[43] It is clear from the estimates in the table that the marginal dropout rate decreases over the enrolment horizon with first-year dropout accounting for 43.7% of the students from the cohort who are estimated to have dropped out of HE before 2009.

The remaining four most common pathways were for students who completed programmes in the 3rd year of enrolment before enrolling for further undergraduate programmes in 2009 and non-completers who "stopped out" over the period. The majority of the students in the former group were enrolled for, and completed, 3-year undergraduate diplomas at CPUT before continuing with Bachelor of Technology degree programmes in 2009.

The HE pathways considered here are fairly crude and conceal significant additional complexity regarding the ways in which students progress through the South African HE system. Nonetheless, they are sufficient to

[43] The remaining students who dropped out prior to 2009 followed the path "F-N-E-N". This was the 12th most common path taken (0.6% of the cohort).

illustrate that metrics such as completion and dropout rates, while highly informative about throughput and retention, cannot be expected to capture all of the heterogeneity underlying observed HE outcomes. While the remainder of this chapter focusses exclusively on such metrics of HE access and success, it is therefore important to keep these limitations in mind.

3.4.5 HE access and success by HEI, broad field of study, and qualification type

Physical proximity to HE opportunities is a crucial determinant of whether and where individuals choose to study (Gibbons and Vignoles, 2012:98). Subject to financial and other constraints, individuals generally choose to study at institutions that are located near to where they live, rather than ones that are further away. Therefore, one would expect that the institutional enrolment patterns for the WCED 2006 first-time entering undergraduate cohort would differ from the enrolment patterns for students from other provinces.

Table 3.7 shows that the institutional composition among students from the WCED and those from the national 2006 first-time entering undergraduate cohorts differed substantially. More than 85% of the students from the WCED cohort enrolled at one of the four contact HEIs in the Western Cape. Nationally, these four HEIs collectively accounted for only 12.5% of all first-time entering undergraduate enrolments in 2006. CPUT accounted for the majority of enrolments (28.4%) among the WCED 2006 first-time entering undergraduate cohort, followed by US (25.1%), UWC (17%), and UCT (14.7%). A further 8.7% of the students from the cohort enrolled at UNISA while the remaining 6.1% were spread across the remaining 18 contact HEIs located in other provinces.

Table 3.7: HEI shares of enrolments (%) among the WCED and National 2006 first-time entering undergraduate cohorts

	WCED	National	HEI	WCED	National
CPUT	28.4	4.9	UKZN	0.2	4.2
US	25.1	2.9	UFH	0.1	1.3
UWC	17.0	2.3	CUT	0.1	1.8
UCT	14.7	2.4	TUT	0.1	8.6
UNISA	8.7	29.5	VUT	0.0	3.0
NMMU	1.8	2.5	UL	0.0	2.4
NWU	1.3	3.9	DUT	0.0	4.8
RHODES	1.1	0.8	UZ	0.0	1.3
UP	0.6	5.1	MUT	0.0	2.2
WSU	0.5	4.6	UFS	0.0	0.7
WITS	0.2	2.9	UNIVEN	0.0	1.9
UJ	0.2	6.0	—	—	—

NOTES: Figures in the *WCED* column are weighted and express the estimated number of students from the 2006 WCED first-time entering undergraduate cohort who were enrolled at specific HEIs in 2006 as a percentage of the students in the cohort. Figures in the *National* column express all first-time entering undergraduate enrolments at specific HEIs in 2006 as a percentage of the number of students in the national 2006 first-time entering undergraduate cohort.

Given that throughput and retention rates vary across HEIs, it should be clear that the differences in the institutional composition among the WCED and the national 2006 first-time entering undergraduate cohorts imply that the extent of HE success for the former is unlikely to be reflective of the extent of HE success for the latter. It is well-known, for example, that throughput rates at UNISA are not only far lower, on average, than

throughput rates at contact HEIs, but that students at UNISA also generally take much longer to complete their undergraduate studies (CHE, 2013:42). The mere fact that UNISA accounted for nearly 30% of all national first-time entering undergraduate enrolments in 2006 while it accounted for less than 9% of enrolments among the WCED cohort already suggests that, with all else being equal, throughput rates for the WCED cohort would most likely have been higher than the national average.

Table 3.8 provides a breakdown of enrolments among the WCED 2006 first-time entering undergraduate cohort by the HEI attended, as well as the types of undergraduate qualifications and the broad fields of study associated with the programmes for which students were enrolled.

Table 3.8: Breakdown of enrolments among the WCED 2006 first-time entering undergraduate cohort (% of cohort) by broad field of study, qualification type, and HEI attended in 2006

		HEI attended					
Field	**Qualification**	**CPUT**	**US**	**UWC**	**UCT**	**UNISA**	**All HEIs**[a]
BCM	1 to 2-year UG Dip	3.6	—	—	—	0.5	4.2
	3-year UG Diploma	4.9	—	—	—	1.0	6.6
	3-year UG Degree	—	8.0	4.3	1.6	3.5	18.1
	4-year UG Degree	0.7	—	0.1	2.4	—	3.1
	All UG programmes	9.2	8.0	4.3	4.0	5.0	32.0
HSS	1 to 2-year UG Dip	0.1	—	0.3	0.1	0.3	0.7
	3-year UG Diploma	4.2	—	—	—	0.1	4.6
	3-year UG Degree	—	5.3	5.0	4.0	1.6	17.2
	4-year UG Degree	3.1	2.4	2.6	1.0	1.2	11.1
	All UG programmes	7.4	7.7	7.9	5.1	3.2	33.7
SET	1 to 2-year UG Dip	0.5	—	0.2	—	0.0	0.8
	3-year UG Diploma	10.6	—	—	—	0.3	11.6
	3-year UG Degree	—	4.1	1.6	2.3	0.1	8.8
	4-year UG Degree	0.5	5.3	1.9	2.9	—	11.0
	All UG programmes	11.7	9.4	3.7	5.3	0.4	32.2
All	1 to 2-year UG Dip	4.2	—	0.4	0.1	0.7	5.8
	3-year UG Diploma	20.0	—	—	—	1.4	23.1
	3-year UG Degree	—	17.5	11.9	8.4	5.3	45.7
	4-year UG Degree	4.3	7.7	4.7	6.3	1.2	25.4
	All UG programmes	28.5	25.2	17.1	14.7	8.6	100.0

NOTES: Estimates are weighted and are calculated for the WCED 2006 first-time entering undergraduate cohort. Figures express the number of students enrolled in a specific qualification type, field of study, and HEI in 2006 as a percentage of the total number of students (7 654) in the cohort. The estimated percentages may not necessarily sum to 100% within the respective dimensions (qualification type, broad field of study, and HEI) due to some missing information in the data. The specific enrolment estimates for other HEIs have been omitted from the table. [a]Includes enrolments across all public HEIs.

Overall, there appears to have been a fairly equal split in terms of the broad fields of study among the students from the WCED 2006 first-time entering undergraduate cohort with 32% enrolling in Business, Commerce and Management (BCM) programmes, 33.7% enrolling in Humanities and Social Sciences (HSS) programmes, and 32.2% enrolling in Science, Engineering, and Technology (SET) programmes. Differences in terms of qualification type are more noticeable. The vast majority (71.1%) of students from the cohort enrolled in 3- or 4-year undergraduate Bachelor's degree programmes, with 23.1% enrolling in 3-year undergraduate diplomas and only 5.8% enrolling in 1- or 2-year undergraduate diploma or certificate programmes.

Table 3.8 also reveals a number of important differences between the HEIs where students from the WCED

2006 first-time entering undergraduate cohort enrolled. For example, of the contact HEIs in the Western Cape, CPUT was the only one to offer 3-year undergraduate diploma programmes and also the only HEI not to offer any 3-year undergraduate Bachelor's degree programmes. There are also subtle differences in terms of qualification types and broad fields of study between HEIs. Where very few of the students who enrolled at UNISA registered for SET programmes, SET programmes actually dominated enrolments at US, even if only marginally so. These and other differences make it clear that programme offerings and the nature of enrolments across HEIs in the Western Cape differ substantially. Thus, it would be reasonable to expect that different HEIs would perform differently in terms of student throughput.

Table 3.9: 4-year completion rates (%) for the WCED 2006 first-time entering undergraduate cohort by broad field of study, qualification type, and HEI attended in 2006

		HEI attended					
Field	**Qualification**	**CPUT**	**US**	**UWC**	**UCT**	**UNISA**	**All HEIs**[a]
BCM	1 to 2-year UG Dip	70.3	—	—	—	14.6	62.4
	3-year UG Diploma	55.5	—	—	—	62.7	54.3
	3-year UG Degree	—	66.3	42.7	59.0	19.4	50.4
	4-year UG Degree	32.0	—	—	57.0	—	51.2
	All UG programmes	59.6	66.3	42.2	57.8	27.7	52.9
HSS	1 to 2-year UG Dip	67.4	—	14.3	49.9	66.3	43.6
	3-year UG Diploma	54.4	—	—	—	—	52.4
	3-year UG Degree	—	68.3	28.0	74.1	25.9	53.3
	4-year UG Degree	57.3	59.1	19.1	53.1	31.3	45.1
	All UG programmes	55.8	65.4	24.5	69.7	30.5	50.3
SET	1 to 2-year UG Dip	64.4	—	85.0	—	—	68.2
	3-year UG Diploma	48.9	—	—	—	—	47.6
	3-year UG Degree	—	59.7	40.5	62.1	10.1	56.3
	4-year UG Degree	12.1	40.9	36.8	33.7	—	36.2
	All UG programmes	48.1	49.1	40.9	46.3	3.3	46.6
All	1 to 2-year UG Dip	69.5	—	43.9	49.9	33.3	60.5
	3-year UG Diploma	51.1	—	—	—	45.4	49.9
	3-year UG Degree	—	65.0	32.8	64.7	21.1	51.1
	4-year UG Degree	48.4	46.7	26.2	45.4	31.3	42.0
	All UG programmes	53.4	59.4	31.3	56.4	27.4	49.0

NOTES: Estimates are weighted and are calculated for the WCED 2006 first-time entering undergraduate cohort. Figures express the cumulative percentage of students enrolled in a specific qualification type, field of study, and HEI in 2006 who completed their programmes by the end of 2009. The specific 4-year completion rate estimates for students enrolled at other HEIs have been omitted from the table. [a] 4-year completion rates across all public HEIs.

Tables 3.9 and 3.10 present the estimated 4-year completion rates and 3-year dropout rates for the WCED 2006 first-time entering undergraduate cohort by HEI, qualification type, and broad field of study.

A number of general findings emerge from the completion rate estimates in Table 3.9. First, the average 4-year completion rate for SET programmes (46.6%) is slightly lower than that for BCM programmes (52.9%) and HSS programmes (50.3%), respectively. Second, completion rates are highest for 1- and 2-year undergraduate certificate or diploma programmes (60.5%) and lowest for 4-year undergraduate Bachelor's degree programmes (42.0%), with the 4-year completion rates for 3-year diploma programmes (49.9%) and 3-year Bachelor's degree programmes (51.1%) being broadly similar. Third, 4-year completion rates were highest at US (59.4%),

followed by UCT (56.4%) and CPUT (53.4%).[44] The 4-year completion rate at UWC was far lower, however, at only 31.3% - nearly as low as the 4-year completion rate at UNISA (27.4%).

The estimates in Table 3.9 show that, in general, the associations between the 3-year dropout rate and HEI, qualification type, and field of study among the WCED 2006 first-time entering undergraduate cohort run in the opposite direction of the associations found in terms of programme completion. Dropout appears to have been lowest among students who enrolled in longer duration qualifications (particularly 4-year Bachelor's degrees) and students who enrolled in SET programmes. However, the most significant dropout rate differentials are clearly between HEIs. While the 3-year dropout rates at US (9.9%) and UCT (9.2%) were broadly similar, the 3-year dropout rates at both CPUT (25.3%) and UWC (28.8%) were more than twice as high.

Together, the estimates in Tables 3.8, 3.9, and 3.10 illustrate not only that there were large differences in the nature of enrolments between HEIs among the WCED 2006 first-time entering undergraduate cohort, but also that the throughput and retention rates for the cohort varied significantly across HEIs, qualification types, and fields of study. However, it is important to note that selection into HEIs and formal academic programmes programmes is not random.

Table 3.10: 3-year dropout rates (%) for the WCED 2006 first-time entering undergraduate cohort by broad field of study, qualification type, and HEI attended in 2006

		HEI attended					
Field	**Qualification**	**CPUT**	**US**	**UWC**	**UCT**	**UNISA**	**All HEIs**[a]
BCM	1 to 2-year UG Dip	21.6	—	—	—	62.2	26.5
	3-year UG Diploma	19.0	—	—	—	30.3	24.2
	3-year UG Degree	—	9.5	11.9	6.2	29.6	14.0
	4-year UG Degree	26.5	—	55.1	5.8	—	11.3
	All UG programmes	20.5	9.5	12.4	6.0	32.7	17.5
HSS	1 to 2-year UG Dip	32.6	—	70.1	50.1	26.4	46.3
	3-year UG Diploma	30.1	—	—	—	100.0	32.5
	3-year UG Degree	—	13.9	39.4	10.1	36.2	22.7
	4-year UG Degree	23.3	8.7	29.5	14.3	23.7	21.0
	All UG programmes	27.2	12.3	37.1	11.6	32.8	24.0
SET	1 to 2-year UG Dip	21.7	—	7.6	—	100.0	17.4
	3-year UG Diploma	26.6	—	—	—	58.3	27.6
	3-year UG Degree	—	10.8	29.2	7.6	20.1	13.4
	4-year UG Degree	31.3	5.5	9.1	2.9	—	7.0
	All UG programmes	26.5	7.8	17.8	5.0	47.2	16.4
All	1 to 2-year UG Dip	21.8	—	44.0	50.1	49.7	28.2
	3-year UG Diploma	26.2	—	—	—	41.6	28.4
	3-year UG Degree	—	11.4	30.8	11.4	31.5	19.0
	4-year UG Degree	24.7	6.5	22.4	5.8	23.7	13.9
	All UG programmes	25.3	9.9	28.8	9.2	33.6	20.4

NOTES: Estimates are weighted and are calculated for the WCED 2006 first-time entering undergraduate cohort. Figures express the percentage of students enrolled in a specific qualification type, field of study, and HEI in 2006 who dropped out of HE before 2009. The specific 3-year dropout rate estimates for students enrolled at other HEIs have been omitted from the table. [a] 3-year dropout rates across all public HEIs.

Individuals choose to apply to specific institutions and qualifications based on a range of factors, including

[44] The difference in the estimated completion rates between UCT and US are likely to be due to compositional differences in the types of qualifications for which students at the two institutions were enrolled (Table 3.8).

personal preference, academic achievement, and financial circumstances. In addition, tuition fees and minimum entry requirements in South Africa can often vary significantly depending on the HEI and the academic programme in question. Different HEIs, qualification types, and fields of study therefore tend to attract different types of students, which leads to substantial heterogeneity in terms of the characteristics of students who are enrolled in different parts of the HE system.

In general, students with better scholastic achievement in secondary school and greater financial means are more likely to attend selective, high quality HEIs, than students with poor secondary school academic performance or students from historically disadvantaged backgrounds. In a cohort tracking study of undergraduate students at the four contact HEIs in the Western Cape, for example, CHEC (2013:21 - 22) finds that a far larger share of UCT and US students passed mathematics higher grade in matric than was the case for students at CPUT and UWC. Racial patterns were also evident, with Coloured and Black students accounting for far larger shares of enrolments at CPUT and UWC than they did at SU and UCT (CHEC, 2013:20).

To conclude this section, Table 3.11 shows the average levels of performance in the 2005 SC for students from the WCED 2006 first-time entering undergraduate cohort by HEI, qualification type, and field of study.

Table 3.11: Average SC aggregate (%) for students from the WCED 2006 first-time entering undergraduate cohort by broad field of study, undergraduate qualification type, and HEI attended in 2006.

		HEI attended					
Field	**Qualification**	**CPUT**	**US**	**UWC**	**UCT**	**UNISA**	**All HEIs**[a]
BCM	1 to 2-year UG Dip	56.3	—	—	—	58.3	56.2
	3-year UG Diploma	52.7	—	—	—	50.9	52.1
	3-year UG Degree	—	77.4	61.8	78.5	63.3	70.9
	4-year UG Degree	52.6	—	50.5	85.1	—	77.6
	All UG programmes	54.1	77.4	61.7	82.4	60.4	65.8
HSS	1 to 2-year UG Dip	51.5	—	47.6	54.0	42.9	46.6
	3-year UG Diploma	54.9	—	—	—	31.2	54.3
	3-year UG Degree	—	72.8	52.0	72.7	61.1	65.8
	4-year UG Degree	55.6	77.5	58.3	78.3	56.4	64.2
	All UG programmes	55.1	74.2	53.9	73.4	56.8	63.2
SET	1 to 2-year UG Dip	53.7	—	60.5	—	66.0	56.6
	3-year UG Diploma	56.9	—	—	—	49.4	57.0
	3-year UG Degree	—	75.6	56.4	74.3	62.9	71.6
	4-year UG Degree	50.4	83.5	64.1	82.1	—	78.2
	All UG programmes	56.5	80.0	60.5	78.7	54.4	68.2
All	1 to 2-year UG Dip	55.9	—	53.0	54.0	52.8	55.1
	3-year UG Diploma	55.4	—	—	—	49.0	55.0
	3-year UG Degree	—	75.5	56.3	74.7	62.6	68.8
	4-year UG Degree	54.5	81.6	60.5	82.7	56.4	71.9
	All UG programmes	55.3	77.4	57.4	78.0	58.7	65.6

NOTES: Estimates are weighted and are calculated for the WCED 2006 first-time entering undergraduate cohort. Figures represented the average 2005 SC aggregate percentage achieved by students enrolled in specific qualification types, fields of study, and HEIs in 2006. All rates are cumulative. The retention rate is estimated as the number of non-completers in the cohort who are still enrolled in undergraduate studies in the next year, expressed as a percentage of number of students in the original first-time entering undergraduate cohort. Completion, dropout, and retention rates are only estimated for students who were part of the WCED 2006 first-time entering undergraduate cohort.

The nature of the differences in matric performance across the three dimensions in the table effectively mirror the results in Tables 3.9 and 3.10. For example, it is clear that students who enrolled in 3- or 4-year Bachelor's degree programmes performed considerably better, on average, in the 2005 SC than students who enrolled in 3-year diploma or 1 to-2-year diploma or certificate programmes. Similarly, students who enrolled in SET programmes performed slightly better, on average, than students who enrolled in BCM programmes or HSS programmes. However, yet again, the biggest difference is in terms of the HEIs where students were enrolled. The average SC aggregate achieved by students who attended SU or UCT was roughly 20 percentage points higher than the average SC aggregate for students who attended either UWC or UNISA, and about 23 percentage points above the average for CPUT students.

These estimates should make it clear that students who attend different HEIs and enrol in different programmes in South Africa are not drawn from an homogeneous group. Instead, they often differ in ways that have major implications for the observed differentials in throughput and dropout rates between institutions. This fact is often overlooked in analyses of HE throughput in South Africa and is one of the reasons why simple univariate or bivariate comparisons of throughput and dropout measures between HEIs can easily lead to misleading conclusions about institutional performance.

3.5 Pre-entry correlates of HE access and success

Where the previous section provided a description of the HE flows for the 2005 WCED matric cohort and considered some of the HE-level factors that have a bearing on the HE outcomes faced by the learners from the cohort, the attention now turns to the pre-entry correlates of HE access and success. Specifically, this section considers the associations between various demographic, learner-level matric performance, and school-level factors and HE outcomes among the 2005 WCED matric cohort. The discussion not only sets out the rationale for investigating specific pre-entry attributes, but the findings that emanate from the descriptive analysis also provide the context for the multivariate analysis presented in Section 3.6.

3.5.1 Demographics

3.5.1.1 Age

The majority of first-time entering undergraduate students in South Africa are individuals who transition from secondary school into the HE system with little or no delay. However, as already noted in Section 3.2.1, HE participation among older individuals is not uncommon. Between 2000 and 2013, roughly 22% of all first-time entering undergraduate students in South African public HEIs were 25 years of age or older (HEDA, 2015). That said, South Africa's HE participation rates decrease rapidly over the age profile (See figure E.1 in Appendix E).

The international evidence on the association between age of entry into HE and the likelihood of HE success is mixed, but most studies find that younger students who enter HE shortly after finishing secondary school are more likely to achieve success than older students. This is partly because younger students are often more accustomed to dealing with the academic demands of formal education, but also because older students tend to have significant additional responsibilities outside of their formal studies (Van Zyl, 2010:59).

One of the problems with analysing the association between age and HE outcomes is that individuals who enter HE at older ages also tend to be those who postponed HE entry. Given the discussion of the association between delayed HE entry and HE throughput in Section 3.4.2, it is to be expected that there would be a negative association between age and success in undergraduate studies. Rarely is any distinction made between senior first-time entering undergraduate students who are older because they postponed HE enrolment and those who are older purely because they were already older by the time that they completed secondary school. This means that it is difficult to disentangle the parts of the association between age and HE success that are respectively due to delayed entry and due to differences in age.

The WCED matric data contains information both on when learners were born and when they wrote the SCE. It is therefore possible to account for differences in age at HE entry that are due to delayed enrolment and differences due to other factors. Specifically, since most children from the 1987 birth cohort should have entered Grade 1 in 1994 and, conditional on not dropping out or repeating any grades, progressed to Grade 12 by 2005, the date of birth information in the data can be used to determine if the learners who wrote the 2005 SCE were under-aged, appropriately-aged, or over-aged for Grade 12 (Burger *et al.*, 2012:6 - 7).

Critically, whether or not learners are of the appropriate age in Grade 12 conveys important underlying information about their entry into and pathways through the primary and secondary schooling system. If Grade 12 learners are under-aged, for example, one can conclude with reasonable confidence that it is because they entered the formal schooling system at a younger age than the rest of their peer group. By contrast, over-aged Grade 12 learners may be over-aged because they entered the schooling system later than their peers, because they repeated one or more grades during school, or because of some combination of these factors. This implies that any unconditional association between HE outcomes and age (as it is measured here) that is identified in the data will not only reflect any pure age effects, but also any underlying school entry and school progression effects associated with reaching Grade 12 at a given age. Nevertheless, the primary focus at this stage is not on the causal mechanism underlying the association between age and HE access and success, but rather on establishing whether such an association exists in the first place.

Table 3.12: Matric pass type and HE access, completion, and dropout rates for the 2005 WCED matric cohort by age group

	Appropriate age	**Under-aged**	**Over-aged**
Share of matric cohort	50.7	13.2	36.1
Passed with endorsement	46.1	40.1	13.0
Passed without endorsement	44.8	50.9	49.3
4-year access rate	35.9	33.8	13.2
1-year access rate	25.7	23.7	7.6
- Bachelor's[a]	75.8	64.6	56.3
4-year completion rate	52.7	47.3	33.4
3-year dropout rate	17.6	23.2	30.8

NOTES: Estimates are weighted and are calculated only for the sample of learners from the 2005 WCED matric cohort. Completion and dropout rates are estimated only for those learners who were part of the WCED 2006 first-time entering undergraduate cohort. [a] Figures reflect the estimated percentage of the WCED 2006 first-time entering undergraduate cohort who were enrolled in 3- or 4-year undergraduate Bachelor's degree programmes in 2006. For the 2005 matric cohort, learners born in 1987 are categorised as being appropriately-aged whereas learners born before or after 1987 are respectively categorised as over-aged and under-aged.

Just over half of the 2005 WCED matric cohort fell within the appropriate age band for Grade 12 (Table 3.12).

A substantial proportion (36.1%) were over-aged and a smaller, yet non-negligible, number of learners were under-aged (13.2%). It is evident that appropriate-age learners performed better, on average, in secondary school than over-aged learners in terms of the likelihood of passing matric and the type of pass obtained.[45] Appropriately aged learners were also not just more likely to access HE between 2006 and 2009 than over-aged learners, but far more likely to do so immediately after 2005. In fact, the proportion of appropriately-aged learners who proceeded to HE in 2006 was more than three times as high as the proportion of over-aged learners who did so. Furthermore, for the learners who did enter HE in 2006, those in the appropriate age group were far more likely to have enrolled in three or four-year undergraduate Bachelor's degree programmes than those in the over-aged group and, to a lesser extent, those in the under-aged group.

Since admission to HEIs explicitly takes matric academic performance into account, one would expect the extent of the association between age at HE entry and HE success to be mitigated to a degree by the nature of selection into HE. It is therefore somewhat surprising that large throughput differentials are found to exist between the different age groups from the 2005 WCED matric cohort. The 4-year completion rates for over-aged students (33.4%) from the cohort are far lower than those in the appropriate age group (52.7%). Similarly, those over-aged matric learners who entered HE in 2006 were far more likely to drop out within three years than the HE entrants from the appropriate age group. In slight contrast to the findings for matric performance and HE access, the under-aged cohort of students is also found to have performed worse than the appropriate-age group in terms of HE completion and dropout, albeit to a far lesser extent than the over-aged group.

3.5.1.2 Gender

In South Africa, females account for a larger share of HE enrolments than males and this share appears to be rising steadily over time. HESA (2012), for example, shows that the female share of headcount enrolments in public HEIs rose from 55% to 58% between 2004 and 2011.[46] In line with most of the international literature, Bhorat *et al.* (2010:103) also find that females generally perform better than males in terms of HE throughput and retention.[47] This finding is also supported by CHE (2014*b*:11), which shows that the course success rates for female students between 2007 and 2012 were consistently between 4 and 5 percentage points higher than they were for males.

Table 3.13 provides a summary of matric performance, HE access, and HE throughput by gender for the 2005 WCED matric cohort. The estimates show that there were no major differences between males and females in terms of 4-year or 1-year HE access rates or in terms of the types of qualifications for which students enrolled.[48] Given the similar levels of matric performance (in terms of the types of passes achieved), the fact that females accounted for a larger share of the WCED 2006 first-time entering undergraduate cohort (56.7%) than males (43.3%) is thus a direct reflection of the gender composition of the 2005 WCED matric cohort and not because female matriculants had a higher propensity to access HE than males. In fact, the gender composition of the 2005 WCED matric cohort and the WCED 2006 first-time entering undergraduate cohort was exactly the same because the 1-year participation rates for both genders were exactly the same.

[45] The difference in pass rates and pass types between appropriate-age and under-aged learners in the cohort is less pronounced.

[46] The HEMIS data indicates that the female share of first-time entering undergraduates also rose from 53.4% in 2000 to over 57% in 2013 (HEDA, 2015).

[47] See Van Zyl (2010:58) for a summary of some of the international literature.

[48] Nonetheless, the 4-year HE access rate for females from the cohort was statistically significantly lower than it was for males at the 5% level of significance.

Table 3.13: Matric pass type and HE access, completion, and dropout rates for the 2005 WCED matric cohort by gender

	Male	Female
Share of matric cohort	43.3	56.7
Passed with endorsement	34.7	32.3
Passed without endorsement	47.4	47.1
4-year access rate	28.2	26.9
1-year access rate	18.9	18.9
- *Bachelor's*[a]	69.9	72.1
4-year completion rate	44.1	52.8
3-year dropout rate	22.1	19.2

NOTES: Estimates are weighted and are calculated only for the sample of learners from the 2005 WCED matric cohort. Completion and dropout rates are estimated only for those learners who were part of the WCED 2006 first-time entering undergraduate cohort. [a] Figure reflects the estimated percentage of the WCED 2006 first-time entering undergraduate cohort who were enrolled in 3- or 4-year undergraduate Bachelor's degree programmes in 2006.

The most notable difference between genders in the WCED 2006 first-time entering undergraduate cohort was in terms of 4-year completion rates, which were significantly higher for females than they were for males. More than half (52.8%) of the females in the cohort successfully completed an undergraduate qualification by the end of 2009. Similarly, the extent of dropout within the first three years of study was marginally lower for females than for males. These findings are consistent with the HE throughput literature in South Africa which finds that females generally tend to outperform males in terms of course success, retention, and programme completion rates (Soudien, 2010:15).

3.5.1.3 Race

As discussed in Section 3.2, race remains perhaps the single most prominent demographic correlate of HE access and success in South Africa. To investigate the association between race and HE outcomes in the Western Cape, Table 3.14 disaggregates the matric pass type and HE access, completion, and dropout rates among learners from the 2005 WCED matric cohort by race.

The racial composition of learners in WCED schools differs substantially from that of the rest of South Africa. The estimates in Table 3.14 show that 28.5% of the learners from the 2005 WCED matric cohort were Black, 47.1% were Coloured, only 1.3% were Asian, and 22.2% were White.[49] By contrast, of all the learners who sat the 2005 SCE nationally, 80.6% were Black, 6.2% were Coloured, 2.8% were Asian, and 8.6% were White (Table E.3). On the basis that race is strongly correlated with observed secondary schooling and HE outcomes, these compositional differences provide yet another reason why the extent of HE access and success among learners in the Western Cape is unlikely to be representative of the country as a whole.

In addition to compositional differences, learners from the 2005 WCED and national matric cohorts also performed differently in terms of the extent and types of matriculation passes achieved in the 2005 SC. It is

[49] Due to the small number of Asian learners (524) in the 2005 WCED matric cohort, the confidence intervals surrounding the HE access, completion, and dropout rate point estimates for this group are quite large. For example, the width of the respective 95% confidence intervals around the estimated 1-year access, 4-year access, and 4-year completion rates for Asian learners from the cohort are all in excess of 12 percentage points. This should be taken into consideration when interpreting the various estimates for Asian learners/students presented below as well as when the results for Indians are compared with those for other race groups.

Table 3.14: Matric pass type and HE access, completion, and dropout rates (%) for the 2005 WCED matric cohort, by race

	Black	Coloured	Asian	White
Share of matric cohort	28.5	47.1	1.3	22.2
Passed with endorsement	15.0	26.3	73.3	67.9
Passed without endorsement	44.2	58.8	20.4	29.2
4-year access rate	21.5	20.0	63.0	47.8
1-year access rate	11.7	14.6	52.1	34.4
- *Bachelor's*[a]	48.3	66.7	86.9	83.3
4-year completion rate	31.9	43.0	46.9	62.1
3-year dropout rate	30.1	26.1	9.6	12.2

NOTES: Estimates are weighted and are calculated only for the sample of learners from the 2005 WCED matric cohort. Completion and dropout rates are estimated only for those learners who were part of the WCED 2006 first-time entering undergraduate cohort. [a] Figure reflects the estimated percentage of the WCED 2006 first-time entering undergraduate cohort who were enrolled in 3- or 4-year undergraduate Bachelor's degree programmes in 2006.

evident that far greater proportions of learners from WCED schools passed with endorsement than was the case nationally. Moreover, this hold true for all race groups. Yet, while learners from different race groups in the 2005 WCED matric cohort may have performed well relative to the national average, there remain substantial racial differentials in the extent and types of passes achieved within the cohort.

Only 15% of Black and 26.3% of Coloured learners from the cohort passed the 2005 SC with matriculation endorsement. By contrast 73.3% of Asian and 67.9% of White learners in the cohort followed suit. Given the importance of matriculation endorsement for HE admissions, as discussed in Section 3.5.2 below, it is therefore to be expected that far fewer Black and Coloured learners would have accessed HE between 2006 and 2009 than White or Asian learners. The data confirms that this was indeed the case. The estimated 4-year HE access rates for Black (21.5%) and Coloured (20.0%) matrics were less than half of what they were for White learners (47.8%).

Closer inspection of the various estimated access rates in Table 3.14 reveals two further interesting findings. First, in contrast to the case for the other race groups, a greater percentage of Black learners from the cohort enrolled in HE at some stage between 2006 and 2009 (21.5%) than passed with endorsement in 2005 (15.0%). In fact, only 48% of the Black learners who accessed HE within four years of writing the SCE passed the 2005 SC with endorsement. Second, the differences in the 1-year and 4-year access rates show that the prevalence of delayed HE entry also differs significantly between race groups. Only just over half of the Black learners from the cohort who enrolled in HE between 2006 and 2009 did so in 2006. The proportion of HE participants from the cohort who entered HE immediately after matric was much higher for Coloured (73%), Asian (83%), and White learners (72%).[50]

In addition to the significant HE access differentials, there are clear differences in terms of the types of qualifications for which students from different race groups in the WCED 2006 first-time entering undergraduate cohort enrolled. Where more than 80% of White and Asian students enrolled in 3- or 4-year undergraduate Bachelor's degree programmes in 2006, only 66.7% of Coloured and 48.3% of Black students did the same.[51]

[50] These figures express the estimated 1-year access rates for the respective race groups in Table 3.14 as a percentage of their 4-year access rates.

[51] See Table E.16 in Appendix E for a more detailed breakdown of access rates by race and qualification type.

Table 3.15 shows that further differences are also apparent in terms of the HEIs where learners from different race groups tended to enrol. While 73.6% of Black and 62.5% of Coloured students from the WCED 2006 first-time entering undergraduate cohort enrolled at either CPUT or UWC, only 37.4% of Indian and 18.9% of White students in the cohort enrolled at these institutions.

Table 3.15: Enrolments for different race groups in the WCED 2006 first-time entering undergraduate cohort, by HEI attended in 2006

	% of group enrolled in at ...				
	Black	**Coloured**	**Asian**	**White**	**All**
CPUT	48.8	32.8	10.8	17.4	28.4
US	2.8	14.0	9.2	47.3	25.2
UWC	24.8	29.7	26.6	1.5	17.1
UCT	10.0	12.2	40.8	15.7	14.7
UNISA	6.3	8.2	7.3	10.2	8.6
Other HEIs	7.3	3.1	5.3	8.0	5.9

NOTES: Estimates are weighted and are calculated only for the students in the WCED 2006 first-time entering undergraduate cohort. Figures represent the percentage of students within each race group who were enrolled at specific HEIs in 2006.

Given the racial differentials in matric endorsement rates and in the underlying institutional and qualification-specific composition of enrolments among the WCED 2006 first-time entering undergraduate cohort, it is perhaps not surprising that Table 3.14 reports significant differences in the extent of throughput and dropout between the different race groups. 62.1% of White students and 46.9% of Asian students successfully completed their undergraduate studies within four years. Yet, only 43.0% of Coloured and 31.9% of Black students respectively completed HE qualifications over the same period. Dropout was also far more prevalent among historically disadvantaged groups with nearly three times as many Black students and more than twice as many Coloured students dropping out of HE than Asian or White students before 2009.

The ratios between the estimated 4-year completion rates and 3-year dropout rates for the respective race groups in Table 3.14 are also telling. More than five times as many White students completed their undergraduate programmes within 4 years than dropped out of HE within the first three years of study with the ratio for Asian students being nearly as high. Although the ratio was considerably less favourable for Coloured students (1.6:1), the situation was by far the worst among Black students where the proportion who dropped out of HE within three years was very nearly as high as the proportion who completed their studies within four years.

The implications of the racial differentials in HE access, throughput, and retention among the 2005 WCED matric cohort for HE graduation outputs is simple. While 24.3% of White learners and 28.8% of Asian learners from the cohort had completed at least one HE qualification by the end of 2009, only 6.9% of Coloured and 4.8% of Black learners managed to do the same. This is particularly worrying in light of the fact that Black and Coloured students were far less likely to have enrolled for Bachelor's degree programmes than White or Asian students.

It is clear that the HE outcomes for learners from the 2005 WCED matric cohort are highly inequitable. However, in order to address these inequalities, it is necessary to understand why they obtain. Perhaps the most crucial question to be asked is thus to what extent the observed racial differentials in HE access, throughput,

and retention might be explained by underlying differences in secondary school performance between race groups. Clearly, the degree to which this is the case firstly depends on the extent to which secondary school performance influences HE access and success. This is the primary focus of the analysis in the next section.

3.5.2 Learner matric performance

Historically, academic achievement in matric has served as the primary component of the formal minimum entry requirements for HE study in South Africa (Zaaiman, 1998:7).[52] In part, the SC and the associated SCE therefore largely served as an HE access examination (Naidoo, 2006:13). Until 2008, formal guidelines stipulated that secondary school learners could only qualify for admission to undergraduate programmes at HEIs if they passed matric with endorsement. There were exceptions to this rule, however. Certain categories of students including, but not limited to, foreigners, immigrants, and applicants deemed to be of "mature age" could qualify for matriculation exemption and subsequent admission on the discretion of the HEIs to which they applied (South Africa, 2000: 23 - 30).[53]

Passing matric with endorsement required satisfying three minimum conditions: (1) offering no fewer than six subjects during the SCE, of which two must be languages from the list of South Africa's 11 official languages, including at least one first language and one university language of instruction; (2) achieving a minimum aggregate mark of 950; and (3) passing at least five subjects and obtaining a sub-minimum of 20 percent in a sixth subject (HESA, 2015).[54]

Given the requirements for achieving matriculation endorsement and the primacy of passing with endorsement for the purposes of HE admission, qualifying for entry into HE can be expected to be a function of overall matric performance as well as subject choice and performance in certain key subjects. However, whether or not learners actually apply to HEIs and enrol in HE is not just dependent on whether or not they satisfy the formal requirements for HE entry. A host of other factors including financial means, socio-economic background, personal preferences, social networks, and HE institutional capacity also play key roles in determining which learners ultimately proceed with HE. For this reason, it remains important to evaluate the extent to which the nature of the matric pass achieved and, more generally, overall matric performance is predictive of HE access. Furthermore, what is central to this study is not only the extent to which matric performance predicts HE access, but, more importantly, the extent to which it predicts throughput and retention for those learners who do enrol in HE.

Table 3.16 shows that only 33.4% of the 2005 WCED matric cohort passed with endorsement. A further 47.2% of the cohort passed without achieving matriculation endorsement, while 14.8% failed the SC and 4.7% achieved an "incomplete" pass. It is clear that the extent of HE access among the cohort varied considerably, depending on the type of pass achieved. While nearly 63% of learners matriculating with endorsement enrolled in HE at some stage between 2006 and 2009, only 12.2% of the learners who passed without endorsement followed suit. Moreover, there are significant differences in the extent of delayed entry and types of qualifications entered between the two groups. Just 5.8% of the learners who achieved regular passes entered HE in 2006, compared

[52] Currently, National Benchmark Tests (NBTs) are used in conjunction with NSC results to determine whether prospective students qualify for entry to HEIs (Du Plessis and Gerber, 2012:82).

[53] The HEMIS data indicates that such students constitute a non-negligible proportion of first-time entering undergraduate students, accounting for between 5% and 9% of each year's intake between 2000 and 2009.

[54] The list of requirements and exceptions for matriculation endorsement that remained in effect until the transition to the NSC curriculum in 2009 is actually substantially more complex than implied here and is presented in full in South Africa (2000).

to 47.5% of those who passed with endorsement. The latter group was also far more likely to enrol in 3- or 4-year undergraduate Bachelor's degree programmes than the former group.[55]

Table 3.16: HE access, completion, and dropout rates (%) for the 2005 WCED matric cohort by type of matric pass achieved (2006 - 2009)

	Type of Senior Certificate (SC) pass achieved[a]			**All**
	Endorsement	**Regular pass**	**Fail**	**learners**[b]
Share of matric cohort (%)	33.4	47.2	14.8	100.0
4-year access rate	62.6	12.2	1.4	27.4
1-year access rate	47.5	5.8	0.0	18.9
- *% Bachelor's*[c]	79.2	28.3	—	71.1
4-year completion rate	51.6	36.1	—	49.0
3-year dropout rate	17.1	39.4	—	20.4

NOTES: Estimates are weighted and are calculated only for the sample of learners from the 2005 WCED matric cohort. Completion and dropout rates are estimated only for those learners who were part of the WCED 2006 first-time entering undergraduate cohort.[a] Excludes information on the 4.7% of learners in the 2005 WCED matric cohort who achieved an "incomplete" pass on the 2005 SCE. [b] Includes all learners in the 2005 WCED matric cohort, regardless of performance on the 2005 SCE. [c] Figure reflects the estimated percentage of the WCED 2006 first-time entering undergraduate cohort who were enrolled in 3- or 4-year undergraduate Bachelor's degree programmes in 2006.

Differences between learners who matriculated with and without endorsement are also evident in terms of HE throughput. A significantly larger share of the WCED 2006 first-time entering undergraduate cohort who passed with endorsement (51.6%) completed their undergraduate studies within four years than was the case for those who entered HE with regular matriculation passes (36.1%).[56] Similarly, more than twice as many learners who entered HE without matriculation endorsement than those who passed with endorsement dropped out of HE within the first three years of study.

A number of preliminary conclusions can be drawn from these results. First, the predictive power of the matric pass type in terms of the likelihood of HE access appears to be skewed. While one can conclude with reasonable confidence that a learner who passed matric without endorsement will have had a very low likelihood of enrolling in HE, the converse does not necessarily hold true for learners who passed with endorsement. It may be true that the extent of HE access was much higher among learners who passed with endorsement than it was among learners who achieved regular passes, but it is difficult to argue that access among the former group was particularly high in absolute terms. A 4-year access rate of 62.6% means that more than a third of learners who satisfied the statutory minimum requirements for HE entry did not, or could not, access HE within four years of matriculating.

Second, the type of matric pass achieved does appear to convey some information about the probability of completing a qualification or dropping out of HE. It is true that, for those learners who transition into HE immediately after matriculation, the ones who passed with endorsement are expected to have higher levels of throughput and retention, on average, than the ones who passed without endorsement.

Third, as in the case of access rates, HE throughput and retention over the short term is surprisingly low, even for learners who matriculated with endorsement. The data indicates that 31.3% of the endorsement learners

[55] 1.4% of the learners who failed the 2005 SC managed to access HE between 2006 and 2009. However, the data indicates that the majority of these individuals either re-wrote and passed the SCE in 2006, or were granted discretionary admission to the HEIs where they applied. Almost all of these learners enrolled in 1 to 2-year certificate or 3-year national diploma programmes.

[56] These results are similar to those found by Breier (2010:60 - 61) in a case study of student throughput and dropout at the University of the Western Cape.

from the WCED 2006 first-time entering undergraduate cohort were still enrolled by the end of 2009, so it is likely that the completion rate for the group will have increased in subsequent years. However, it is still alarming that only 36.3% of this group is estimated to have completed their qualifications in regulation time. Similarly, while a 3-year dropout rate of 17.1% may seem low in comparison to the 3-year dropout rate of 39.4% for non-endorsement students, it still means that more than a sixth of the learners who matriculated with endorsement and commenced their undergraduate studies in the year thereafter, dropped out of HE within 3 years without obtaining a qualification.

3.5.2.1 Overall matric performance

The matric pass type achieved is, to some extent, a relatively coarse indicator of academic achievement in secondary school in that it only measures whether or not a learner performed above or below a certain performance threshold. In addition, the implication of the above is that, while the matric pass type may convey some information about the expected differences in HE throughput and retention between groups, it is, at best, only a crude predictor of HE access and success, and is by no means a guarantee of either.

Even among learners who achieve endorsement passes, there may still be substantial variation in their overall and subject-specific performance. HEIs therefore take overall matric performance as well as performance in specific subjects into account when deciding whether or not to admit applicants into undergraduate studies. Thus, it is reasonable to expect that overall matric achievement, as measured by a learner's aggregate matric mark, will be a better predictor of HE access than the type of pass achieved. Similarly, to the extent that overall matric performance captures academic potential, it would also be expected to be predictive of HE success.

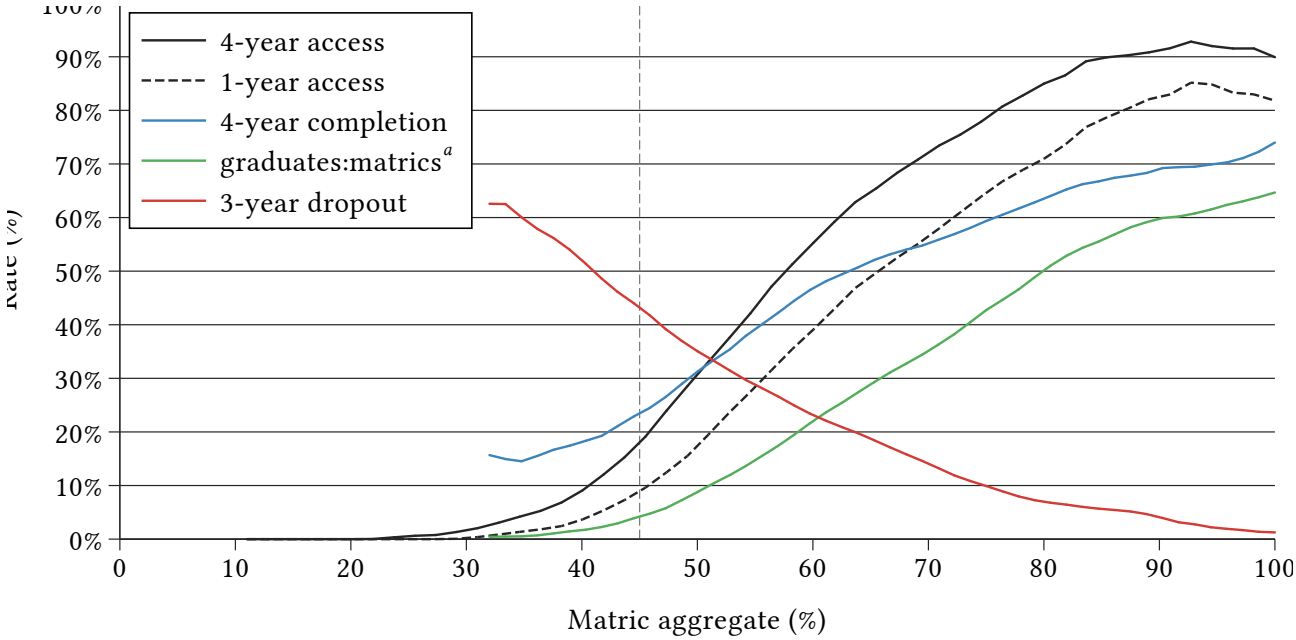
Under the SC curriculum, the matric aggregate mark was calculated as the sum of the marks obtained for each of the six subjects offered by the candidate during the SCE, with each higher grade (HG) and standard grade (SG) subject respectively contributing a maximum of 400 and 300 marks to the overall aggregate.[57] In turn, the final mark for each subject was itself calculated as a weighted average of the school-based continuous assessment (CASS) mark (25% weight) and the mark achieved in the SCE (75% weight). A candidate's overall SC achievement could then be expressed as a percentage by dividing their aggregate mark by 2 100. This meant that it was possible for candidates to pass the SC with an overall matric aggregate that exceeded 100%.[58] In this chapter, the matric aggregate variable used is equal to the Umalusi-adjusted matric aggregate mark, expressed as a percentage out of 2100 (Fatti, 2006).

Figure 3.1 graphically illustrates the estimated association between overall matric performance and HE access and success for the 2005 WCED matric cohort between 2006 and 2009. In line with expectations, both access and completion rates are found to be positive functions of the matric aggregate, while the relationship is reversed for the dropout rate. Though the estimated 4-year completion rate is strongly increasing in the matric aggregate, the slope of the 1-year and 4-year access rate lines are steeper still. Thus, while the difference in the expected 1-year access rates between learners who achieved 50% and 80% in matric is around 55 percentage points, the difference in the 4-year completion rate is only around 32 percentage points. This suggests that variation in the matric aggregate may explain more of the variation in observed HE access rates than it

[57] For candidates who offered more than six subjects during the SCE, the matric aggregate was equal to the sum of the marks from the best two subjects from the list of 11 official languages and the marks in the candidates' remaining best four subjects (South Africa, 2000:13).

[58] For example, 74 (0.18%) of the learners in the 2005 WCED matric cohort obtained an aggregate mark of above 100%. Of these, 64 are estimated to have enrolled in HE in 2006.

Figure 3.1: Expected access, completion, and dropout rates for the 2005 WCED Matric cohort by Matric aggregate (%) (2006 - 2009)



NOTES: Lines represent the expected 4-year access, 1-year access, 4-year completion, and 3-year dropout rates conditional on matric aggregate for the 2005 WCED cohort and were estimated using weighted local polynomial regression. Learners who achieved an "incomplete" pass on the 2005 SCE as well as learners who achieved an aggregate above 100% were excluded from the estimation sample. The dashed vertical line represents the minimum matric aggregate (45%) required for matriculation with endorsement.(UMALUSI, 2012:11). [a]The "graduates:matrics" series expresses the total number of learners from the 2005 WCED matric cohort who completed some undergraduate qualification between 2006 and 2009 as a percentage of the number of learners in the cohort for each level of matric aggregate performance.

explains in observed HE completion rates. In other words, the matric aggregate appears to be a somewhat weaker predictor of HE success than it is of HE access.

The estimates depicted in the graph adds support for many of the findings in the preceding section. For example, it would indeed appear as though the extent of delayed entry into HE among matriculants decreases, on average, with overall matric performance.[59] Similarly, 4-year programme completion is found to be surprisingly low and 3-dropout surprisingly high, even among learners who perform comparatively well overall in matric. For example, for learners who achieved a matric aggregate of 60%, the expected 4-year completion rate was only about 50% and, at that level of matric performance, roughly a quarter of students would have been expected to drop out within the first three years of study.

Lastly, figure 3.1 also includes a series which expresses the percentage of learners from the 2005 WCED matric cohort that completed undergraduate qualifications between 2006 and 2009 as a function of matric achievement. This metric is thus a joint measure of the HE access and programme completion rates for the cohort and, in a sense, provides an indication of the extent to which HE access is expected to translate into HE success, conditional on matric performance.[60] Again, it is evident that this metric shares a positive expected association with matric performance.[61] However, the curve also makes it clear that HE success in the short run is extremely low, even for those matrics who perform extremely well. For example, the estimates suggest

[59] The ratio of the estimated 4-year to the 1-year access rate declines as one moves towards the upper end of the matric performance distribution.

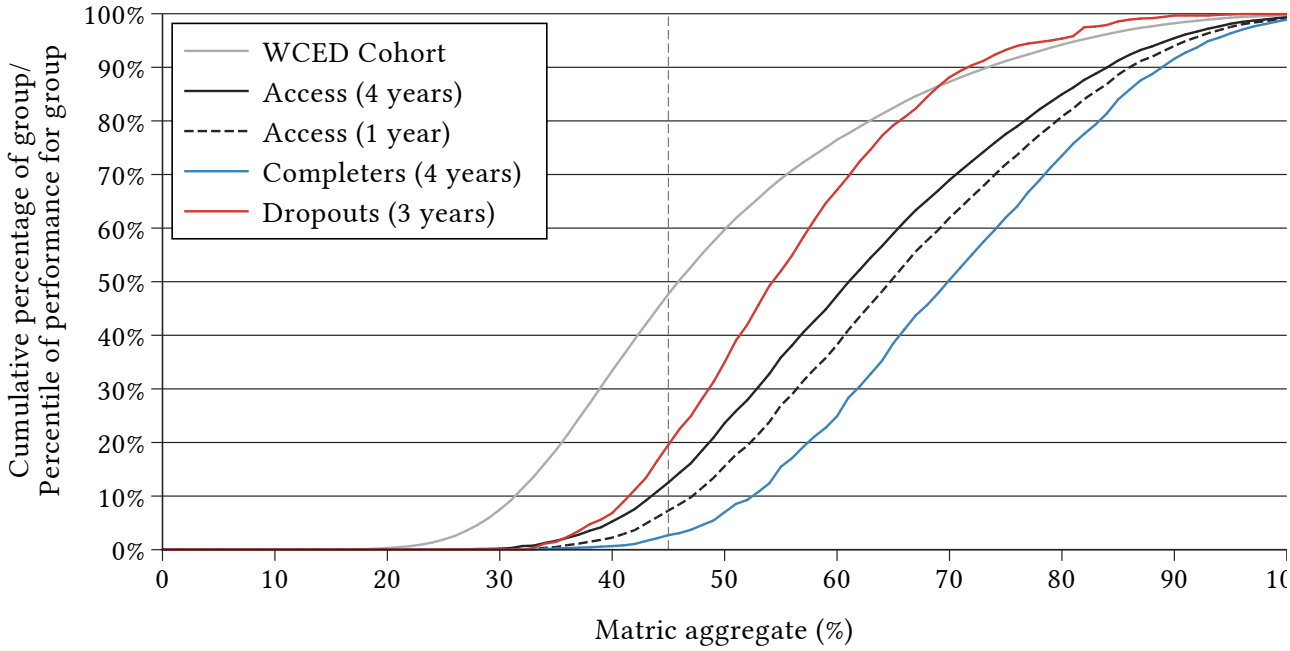
[60] This metric is referred to as the conversion rate in Section 3.6.4 below.

[61] This make intuitive sense since the curve is effectively only the weighted product of the respective access and completion rates for the 2005 WCED matric cohort. Since both the access rate and completion rate for the cohort are upward sloping in the matric aggregate, it follows that the same must be true of the *graduates:matrics* ratio.

that only about half of the learners who achieved an 80% aggregate in matric could be expected to complete an undergraduate qualification within four years of matriculating.

To contextualise the estimates in Figure 3.1, Figure 3.2 shows the cumulative distribution of various groups from the 2005 WCED matric cohort, including the 1-year and 4-year HE entrants as well as the 4-year completers and 3-year dropouts from the WCED 2006 first-time entering undergraduate cohort by level of overall matric performance (matric aggregate). The graph reiterates the fact that overall matric performance among the cohort was low in general. Less than 24% of the learners in the cohort achieved a matric aggregate of 60% or higher. By contrast, nearly 63% of the students in the WCED 2006 first-time entering undergraduate cohort performed above this level. In fact, the extent of the differences in the overall matric performance distributions between the respective groups in the graph is striking.

Figure 3.2: Cumulative distribution of the 2005 WCED matric cohort, HE entrants, completers, and dropouts by overall matric performance (matric aggregate %) (2006 - 2009)



NOTES: Estimates are weighted and calculated only for the 2005 WCED matric cohort. Each lines represent the cumulative percentage of a group that performed below a given level of the matric aggregate percentage. The 4-year completers and 3-year dropouts include only those learners from the cohort who were part of WCED 2006 first-time entering undergraduate cohort. Learner's who achieved an "incomplete" pass on the 2005 SCE were excluded from the estimation sample. The dashed vertical line represents the minimum matric aggregate (45%) required for matriculation with endorsement (UMALUSI, 2012:11).

The entire matric performance distribution for the completers from the WCED 2006 first-time entering cohort lies to the right of the performance distribution for learners who entered HE in 2006, which in turn lies considerably to the right of the distribution for the total 2005 WCED matric cohort. Put differently, the HE completers from the cohort in general performed considerably better than the HE participants from the cohort, who already performed much better in general than the vast majority of learners in the matric cohort.

The implication of these estimates is that the learners who perform well in matric account for a far larger share of HE entrants and, in particular, undergraduate programme completers than they do of matric learners. For example, half of the students from the WCED 2006 first-time entering undergraduate cohort who completed their qualifications within four years achieved matric aggregates of 70% or higher. Yet, less than 13% of learners in the 2005 WCED matric cohort performed at this level. Similarly, it is also evident that learners

who perform towards the upper end of the matric performance distribution account for a far smaller share of 3-year dropouts than they do of HE entrants. Thus, while learners who scored 65% or higher in the 2005 SC accounted for about half of the WCED 2006 first-time entering undergraduate cohort, they accounted for less than 21% of the estimated 3-year dropouts from the cohort.

These findings offer a seemingly ambiguous account of the relationship between matric performance and HE success in South Africa. On the one hand, they provide a further indication of the positive association between matric performance, HE access, throughput and retention in the short term. On the other hand, they also offer support for the notion that there is a significant articulation gap between secondary school and HE in South Africa. Many of the learners who perform sufficiently well in matric to qualify for entrance into HE and who are able to access the means to actually attend HEIs, nevertheless drop out of HE within a relatively short period of time. Even when well-performing matric learners who transition to HE do not drop out, few successfully complete their undergraduate studies within four years.

3.5.2.2 Overall matric performance by race

Even before the introduction of the NSC in 2008, the strength of matric performance as a predictor of HE outcomes and its appropriateness as the basis for selection into HE was often questioned.[62] The results in the previous section seem to suggest that there is indeed a positive association between matric performance and HE success and retention, even if this association is not as strong as that between matric performance and HE access. However, this does not mean that matric performance is equally predictive of HE outcomes for all groups.

Some have argued that the significant differentials in the quality of schooling available to historically disadvantaged versus historically advantaged groups effectively undermines the validity of matric performance as a measure of academic ability, particularly for Black and Coloured learners (Foxcroft, 2006:63).[63] By implication, matric performance may convey substantially more information about the likelihood of HE participation and success for, for example, White matrics than it does for Black or Coloured matrics.

In light of these arguments and the observed differences in HE outcomes between race groups, two critical questions thus remain regarding the relationship between race, matric performance, and HE access and success in South Africa. First, to what extent does the predictive power of overall matric performance for HE access, throughput, and retention differ between race groups? Second, to what extent are the observed racial differentials in HE access, completion, and dropout rates explained by underlying differences in overall matric performance?

The notion that performance on school leaving examinations or general scholastic achievement in secondary school might be differentially predictive of HE success across socio-economic or demographic groups is not unique to South Africa. A number of studies have asserted that the school-exit exam results of relatively disadvantaged learners in the United Kingdom, for example, understate their potential to succeed in HE, for reasons that have less to do with academic ability and more to do with the quality of schooling they receive (Hoare and Johnston, 2010:24).[64]

[62] See, for example, Herman (1995), Mitchell *et al.* (1997), Foxcroft and Stumpf (2005), and Koch (2007).

[63] See also Griesel (1999:27).

[64] In the current context, academic ability is crudely defined in terms of the ability to cope with the academic demands associated with HE study.

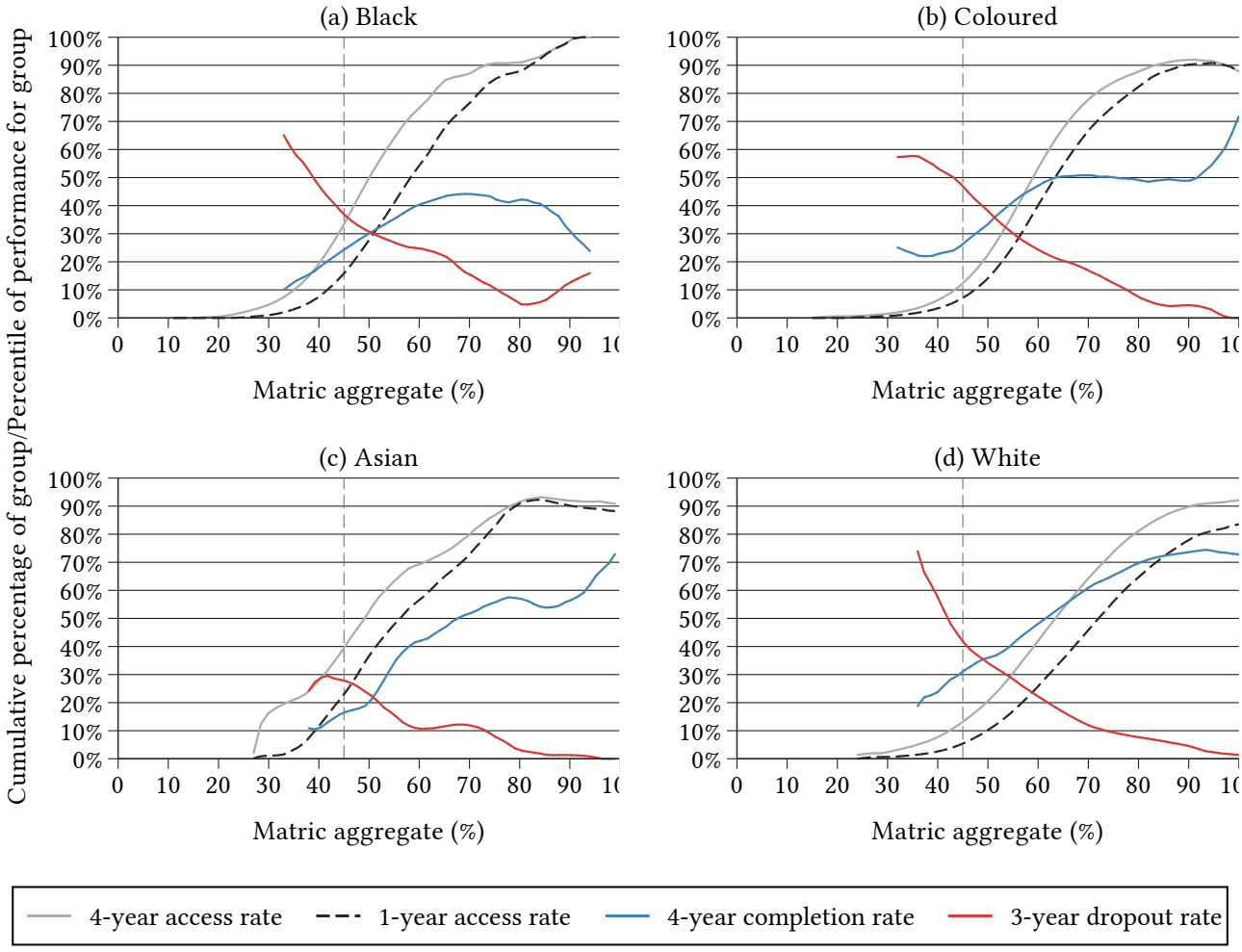
The hypothesis underlying this argument is that, due to limited opportunities for learning and development, the matric performance of learners from low quality or historically disadvantaged schools will tend to be downward-biased estimates of their true academic potential. An alternative hypothesis is that matric performance does not necessarily understate academic ability for disadvantaged learners, but that it is a significantly more noisy signal of academic potential than it is for learners who were exposed to high quality schooling.

Crucially, while both of the aforementioned hypotheses are based on the view that matric performance may not accurately reflect the potential to succeed in HE for certain groups, they predict different outcomes in terms of the observed relationship between matric performance and HE completion and retention rates. If it is true that matric achievement understates academic ability for learners from low quality schools then, with all else being equal, learners with the greatest exposure to low quality schooling - which in the South African case would largely be Black and Coloured students from the historically disadvantaged part of the schooling system - should, for any given level of matric performance, be expected to perform better, on average, in terms of HE throughput and retention than those learners for whom the matric aggregate is a more accurate reflection of their underlying ability. If, on the other hand, matric achievement does not necessarily understate the academic ability of learners exposed to low quality schooling, but instead simply tends to measure it with a considerable degree of error, then it is expected that there will be substantially more variation in HE throughput and retention at any given level of matric performance for learners from low quality schools than there is for learners from better quality schools.

Figure 3.3 shows the respective estimated associations between matric performance and HE access, throughput, and retention for Black, Coloured, Asian, and White learners in the 2005 WCED matric cohort between 2006 and 2009. The graph shows that the expected 4-year HE access rates for Black and Coloured learners from the cohort are higher than the 4-year access rates for White learners over most of the matric performance distribution. This difference is even more pronounced in the case of 1-year access rates. In fact, between a matric score of 50% and 90%, the 1-year access rate for Black learners is estimated to have been between 20 and 30 percentage points higher, on average, than the estimated 1-year access rate for White learners. Similarly, the 1-year access rate for Coloured learners was, on average, substantially higher than the 1-year access rate for Whites over the same range of the matric performance distribution. The implication is that, for any given level of matric performance, Black and Coloured learners from the cohort had a higher expected likelihood of accessing HE than White learners. This suggests that the observed differences in HE access among different race groups in the Western Cape, as shown in Table 3.14, can most likely be explained by the fact that, on average, matric performance among Black and Coloured learners in the Western Cape is much weaker than it is for Asian and White learners.

In contrast to the case for HE access rates, the estimated 4-year completion rate for White students in the WCED 2006 first-time entering cohort was higher than that for Black or Coloured students, regardless of the level of overall matric performance achieved. The estimated completion rates for the respective race groups were only similar at lower levels of matric achievement (between 50% and 60%). Above a matric aggregate of 60%, there was a noticeable divergence. While the 4-year completion rate for White students continued to increase over the matric performance distribution, the rates for Black and Coloured students stagnated at around 50% and 45%, respectively, beyond matric aggregates of 60. The apparent rise in the 4-year completion rates for Coloured students beyond matric aggregates of 90% and the decline in 4-year completion rates for Black students beyond matric aggregates of 85% is largely the result of the small sample sizes for the respective

Figure 3.3: Expected access, completion, and dropout rates for the 2005 WCED Matric cohort by matric aggregate (%) and race (2006 - 2009)



NOTES: Lines represent the expected 4-year access, 1-year access, 4-year completion, and 3-year dropout rates conditional on matric aggregate for each race group in the 2005 WCED cohort and were estimated using weighted local polynomial regression. Learners who achieved an "incomplete" pass on the 2005 SCE as well as learners who achieved an aggregate above 100% were excluded from the estimation sample. The dashed vertical line represents the minimum matric aggregate (45%) required for matriculation with endorsement.(UMALUSI, 2012:11).

race groups at the upper end of the matric performance distribution. Only 32 (1%) of the Coloured students and 22 (1.6%) of the Black students in the WCED 2006 first-time entering undergraduate cohort respectively achieved matric aggregates above 90% and 85%.[65]

Lastly, the probability of dropping out of HE within the first three years of study, conditional on overall matric achievement, appears to be remarkably similar for all race groups. The extent of the negative association between the estimated 3-year dropout rates and matric performance is virtually the same for Black, Coloured, and White students, declining from above an average of 20% dropout at a matric score of 60% to below 10% dropout at a matric score of 80%.

Several conclusions can be made based on these findings. First, the fact that differences in HE completion rates between race groups are persistent over the matric performance distribution suggests that it is unlikely that overall matric aggregate achievement understates the academic potential of Black and Coloured learners,

[65] Of the 22 Black learners who achieved 85% or higher in the 2005 SC and entered HE in 2006, 21 enrolled in 4-year bachelor's degree programmes while the remaining 1 enrolled in a 3-year Bachelor's degree programme.

at least insofar as true academic ability is revealed by the estimated 4-year completion rates among the WCED 2006 first-time entering undergraduate cohort.[66] Instead, the fact that the unconditional association between matric performance and the likelihood of HE programme completion seems to be so much weaker for Coloured and Black students than it is for White students offers support for the hypothesis that overall matric achievement may at best be only a noisy signal of the extent to which Black and Coloured matrics are likely to succeed in HE.

Second, the similarity of the estimated conditional 3-year dropout rates between the three race groups means that differences in the observed dropout rates for Black, Coloured, and White students may at least partly be driven by differences in the underlying matric performance distributions of the students in the WCED 2006 first-time entering undergraduate cohort.

Lastly, and in stark contrast to the previous point, it does not appear to be the case that racial differentials in 4-year completion rates are merely the result of differences in matric performance between race groups. Even for Black and Coloured learners who perform extremely well in matric, the probability that they will complete HE qualifications within four years of leaving school is still lower, on average, than it is for White learners. This suggests that there are most likely other underlying factors which are not accounted for in the present analysis that drive a wedge between the extent of observed HE success for students from different race groups. This point is revisited in the multivariate analysis presented in Section 3.6 below.

3.5.2.3 Subject-specific considerations

HE access and success is not only correlated with overall matric performance, but also with performance in certain key subjects. The literature commonly identifies the so-called "gateway subjects" of mathematics and physical sciences as being critical determinants of the likelihood of HE success among students. In addition, a number of studies have also pointed to the importance of language proficiency and performance in first-language subjects as potential indicators of academic success.

Table 3.17 summarises the expected HE access, completion, and dropout rates for the 2005 WCED matric cohort by specific subjects offered in the 2005 SCE. Several findings emerge from the estimates in the table.

First, learners who offered gateway subjects like biology, accounting, and, in particular, mathematics and physical sciences as part of the 2005 SCE were significantly more likely to have accessed HE within the first four years of matriculating than learners who did not.

Second, learners who offered gateway subjects at the higher grade were generally significantly more likely to proceed with HE study than learners who only offered those subjects at the standard grade level. This is particularly true in the case of the estimated 1-year access rate which was orders of magnitude higher, on average, for HG learners than it was for SG learners. This finding is at least partly a reflection of the fact that HEIs would have explicitly taken into account the grade at which applicants offered certain subjects in their admissions policies.

Third, there was a positive association between offering any of the gateway subjects, or offering it at the HG rather than the SG level, and the estimated 4-year completion rates for students from the WCED 2006

[66] In their assessment of extent to which NSC results predict the potential for HE success at Stellenbosch University, Nel and Kistner (2009:971) found that the NSC scores of learners who performed at the lower end of the matric performance distribution actually tended to overstate their academic abilities, particularly in terms of numeracy.

first-time entering undergraduate cohort, though the strength of this association clearly varies depending on the subject in question. Similarly, students who offered key subjects at the HG level were less likely to drop out of HE within the first three years than those who either did not offer those subjects or only offered them at the SG level.

Table 3.17: HE access, completion, and dropout rates for the 2005 WCED matric cohort by key subjects offered in the 2005 SCE (2005 - 2009)

	% of matric cohort	4-year access rate	1-year access rate	% Bachelor's[a]	4-year completion rate	3-year dropout rate
Mathematics - None	42.5	9.8	5.7	52.0	33.7	39.6
Mathematics - SG	45.3	30.2	19.1	61.1	47.2	23.6
Mathematics - HG	12.3	78.2	63.7	88.2	55.8	10.9
Physical Sciences - None	68.3	19.6	12.9	64.5	49.1	25.3
Physical Sciences - SG	20.2	26.5	15.6	56.1	39.3	26.6
Physical Sciences - HG	11.5	75.7	60.5	86.3	53.4	11.5
Biology - None	34.7	28.6	19.5	67.3	50.3	21.2
Biology - SG	44.6	11.4	5.9	45.7	35.8	37.9
Biology - HG	20.7	60.0	45.9	80.9	51.8	15.1
Accounting - None	67.2	23.2	14.8	69.3	46.0	23.9
Accounting - SG	22.9	20.3	13.0	48.1	44.8	25.9
Accounting - HG	9.9	72.8	60.5	85.6	56.2	11.9
English - None	0.8	30.1	19.4	43.7	26.3	24.6
English - Second Language	64.5	18.0	11.6	60.6	45.3	25.1
English - First Language	34.7	44.8	32.5	78.5	51.8	17.3
Afrikaans - None	17.7	21.2	11.2	42.6	33.5	30.9
Afrikaans - Second Language	36.4	35.1	24.1	72.2	47.3	20.6
Afrikaans - First Language	45.9	23.7	17.7	76.9	54.7	17.6

NOTES: Estimates are weighted and are calculated only for the sample of learners from the 2005 WCED matric cohort. Completion and dropout rates are estimated only for those learners who were part of the WCED 2006 first-time entering undergraduate cohort. [a] Figure reflects the estimated percentage of the students in the WCED 2006 first-time entering undergraduate cohort who offered a given subject in the 2005 SCE that were enrolled in 3- or 4-year undergraduate Bachelor's degree programmes in 2006.

While the NSC curriculum no longer distinguishes between HG and SG levels for subjects, it is reasonable to assume that the level at which learners offered subjects in the 2005 SCE would, on average and with all else being equal, have been reflective of their academic abilities in those subjects. Thus, it is likely that the estimates of programme completion and dropout in Table 3.17 will, to some extent, capture learners' underlying performance levels or underlying abilities in the subjects in question.

Fourth, in terms of the association between language and HE access, a far larger percentage of learners who took English at a first-language level entered HE between 2006 and 2009 than those who offered it at as a second language. By contrast, learners who took Afrikaans as a second language were more likely to access HE than learners who either did not take Afrikaans at all or who offered it as a first language. Crucially, the nature of the association between language subjects and HE access differs fundamentally from the association between other subjects and HE access in the Western Cape, due to the strong correlation between home language and race in the province. To an extent, the associations between the types of language offered in

the 2005 SCE and HE outcomes for the WCED 2006 first-time entering undergraduate cohort will therefore largely be a reflection of the associations between race and the various HE outcomes for the cohort .

These findings suggest that the subjects learners offer in the SCE are predictive of HE access and may also, to a lesser extent, be predictive of HE success even before performance in those subjects has been taken into account. At the same time, the fact that there appears to have been differences in HE access, completion, and dropout for HG and SG learners implies that performance in gateway subjects is likely to be an even stronger predictor of HE outcomes. To evaluate this, Figure 3.4 shows estimates of the HE access, completion, and dropout rates for the 2005 WCED matric cohort, conditional on performance in mathematics, physical science, biology, accounting, English, and Afrikaans.

The various panels of the graph indicate that there is a positive association between performance and HE access, throughput, and retention for all of the SC subjects under consideration. However, the strength and precise nature of these associations varies both between subjects, and between the various standards within subjects. For example, the estimates show that the 4-year access rates for learners who took mathematics, physical science, biology, or accounting at the HG level was higher, on average, than the estimated access rates for learners who offered those subjects at SG, regardless of the underlying level of performance. Similarly, the 3-year dropout rates for students from the WCED 2006 first-time entering undergraduate who took mathematics, physical science, biology, or accounting at the standard grade appear to be higher than the 3-year dropout rates for students who took those subjects at the higher grade over most of the performance distribution.

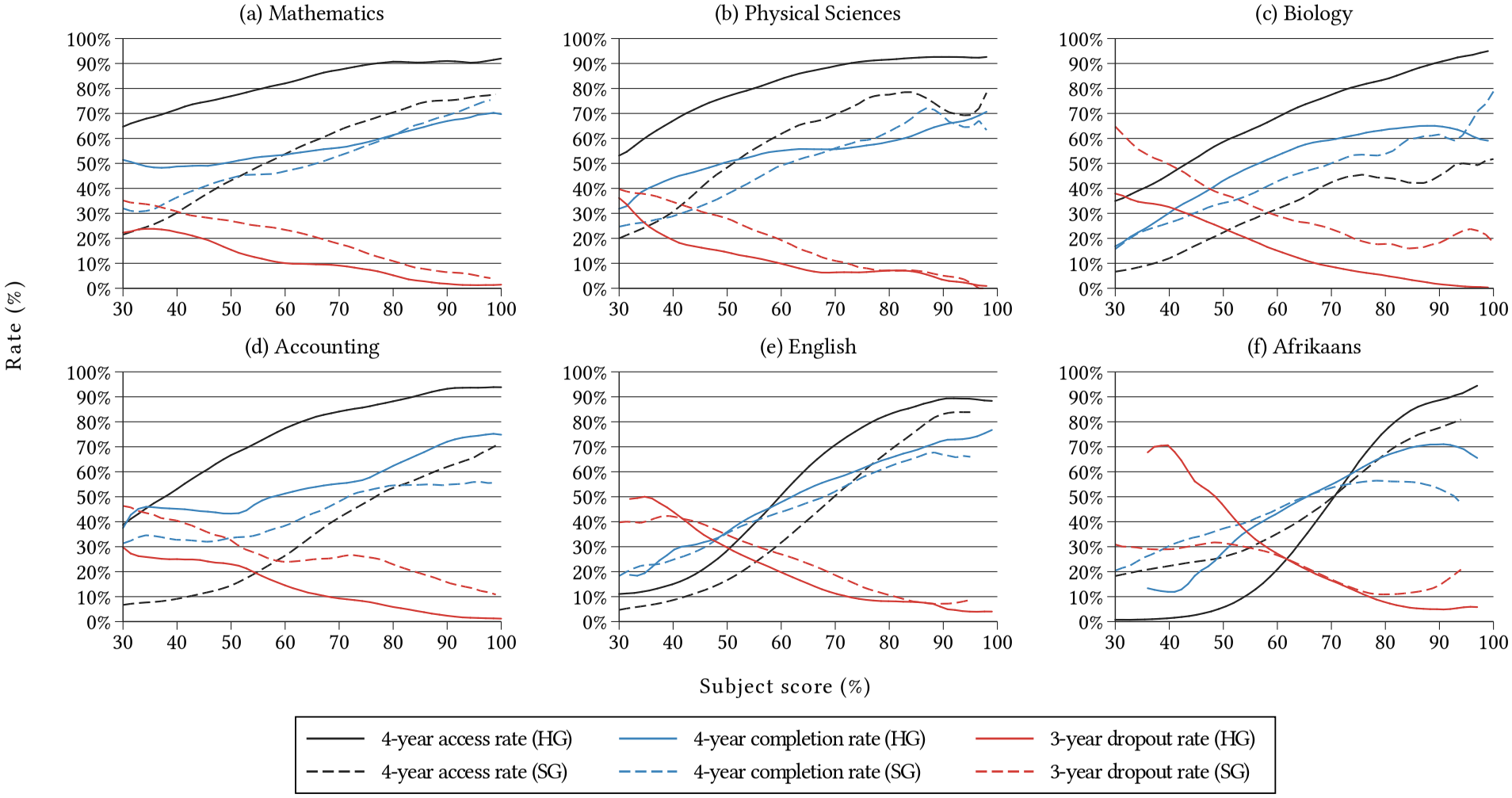
It is worth noting that, under the SC curriculum, the same levels of achievement on SG and HG subjects are expected to reflect different underlying capacities. For example, it is reasonable to expect a score of 70% in higher grade mathematics to be an indication of greater mathematical ability than a score of 70% in standard grade mathematics. When comparing the estimated associations illustrated in Figure 3.4, care should thus be taken not to implicitly equate performance across the different levels of a subject. This makes it somewhat surprising that the estimated 4-year completion rates for SG and HG students are broadly similar towards the upper end of the performance distributions for mathematics, physical science, biology, and English. However, this does not necessarily mean that the grade at which a particular gateway subject was offered had limited influence on student's likelihoods of completing undergraduate qualifications once they performed above a certain threshold. Instead, there may very well be unobserved underlying differences that could explain the observed outcomes. For example, the aforementioned finding would also be consistent with the theory that students who performed relatively well in standard grade mathematics were more likely to self-select into comparatively easier HE programmes than those who performed well in higher grade mathematics.

Abstracting from the differences between the various panels in Figure 3.4, it is evident that, as in the case of overall matric performance, subject-specific performance appears to be a stronger predictor of HE access than it is of throughput.

3.5.3 School type and school matric performance

Scholastic achievement and matric performance are not just functions of innate academic ability, but are also inextricably linked to the quality of education received and the types of schools that learners attend. The substantial heterogeneity in the quality of schooling and in the socio-economic backgrounds of learners across

Figure 3.4: Expected access, completion, and dropout rates for the 2005 WCED matric cohort by performance in key subjects (2006 - 2009)



NOTES: Lines represent the expected 4-year access, 4-year completion, and 3-year dropout rates conditional on performance (SC score) in the indicated subjects for the 2005 WCED matric cohort and were estimated using weighted local polynomial regression. Estimates of completion and dropout rates become unreliable at low levels of subject performance due to the small sample of students from the WCED 2006 first-time entering undergraduate cohort who performed at such levels. All subject-specific scores in the graph have therefore been truncated at 30%. Solid lines represent subjects which were taken at the HG level or, for languages, at the first-language level while dashed lines represent subjects taken at the SG or second-language level.

different parts of the South African schooling system therefore results in significant inequalities in observed schooling outcomes. It is well established that poorer learners from historically disadvantaged communities are disproportionately likely to be enrolled in the weakest parts of the primary and secondary schooling system and not only perform worse on standardized assessments such as the SCE than more affluent learners, but also have far fewer opportunities to access and succeed in post-secondary education (Spaull, 2013:4 -6).

While the data used in this chapter contains no direct measures of school quality or learner socio-economic background, it does contain some variables on school characteristics which are likely to be reflective of underlying school quality and learner socio-economic background. In addition, the information on learner SC performance can be used to create composite school performance indicators such as matric pass and matriculation endorsement rates. The associations between these school type and school performance proxies and HE access, throughput, and dropout are investigate below.

3.5.3.1 School type

Table 3.18 summarises estimates of HE access, throughput, and dropout for learners from the 2005 WCED matric cohort by school poverty quintile, ex-department, and the language of learning and teaching (LOLT).[67]

Table 3.18: HE access, completion, and dropout rates (%) for the 2005 WCED matric cohort by school quintile, ex-department, and school LOLT

	% of matric cohort	4-year access rate	1-year access rate	% Bachelor[a]	4-year completion rate	3-year dropout rate
Quintile 1	2.9	17.2	9.1	44.9	41.8	28.5
Quintile 2	6.8	16.0	8.6	36.5	30.6	33.9
Quintile 3	15.0	15.6	9.2	49.8	34.3	34.7
Quintile 4	18.3	13.3	8.5	60.0	38.5	30.6
Quintile 5	57.1	38.9	28.6	76.3	54.5	16.6
CED	38.3	46.8	34.6	78.3	55.6	15.5
DET	10.6	17.7	8.5	33.2	34.3	32.1
HOD	0.7	37.9	30.2	77.4	53.8	13.5
HOR	37.0	16.3	11.3	64.5	43.7	26.9
WCED	4.8	15.7	9.5	46.7	29.3	35.7
English	36.8	31.7	20.7	68.9	45.9	20.8
Afrikaans	24.8	23.9	17.9	76.8	52.7	19.4
Dual medium	38.4	24.5	17.4	70.4	51.1	20.4

NOTES: Estimates are weighted and are calculated only for the sample of learners from the 2005 WCED matric cohort. Completion and dropout rates are estimated only for those learners who were part of the WCED 2006 first-time entering undergraduate cohort. [a] Figure reflects the estimated percentage of the students in the WCED 2006 first-time entering undergraduate cohort who offered a given subject in the 2005 SCE that were enrolled in 3- or 4-year undergraduate Bachelor's degree programmes in 2006.

[67] Under Apartheid, separate education departments were tasked with the administration and provision of education for different race groups (Taylor *et al.*, 2012:2). Black schools were placed under the Department of Education and Training (DET), Coloured schools under the House of Representatives (HOR), Asian schools under the House of Delegates (HOD), and, in the Western Cape, White schools were placed under the Cape Education Department. New schools established in the Western Cape after abolition of the separate education departments fall under WCED schools.

The table shows that the various HE access, completion, and dropout rate estimates for learners from quintile 1 - 4 schools were, with only a couple of exceptions, remarkably similar.[68] Very few of the matrics (14.9%) from these schools accessed HE between 2006 and 2009 and those who did were far less likely to complete their programmes within four years and more likely to drop out of HE after three years than students from quintile 5 schools. Consequently, the quintile 1-4 learners from the cohort collectively accounted for less than 28% of all HE participants and less than 20% of the students who successfully completed their programmes between 2006 and 2009.

School enrolment patterns in the Western Cape remain strongly correlated with race and the racial profiles of many historically Black and Coloured schools have remained largely unchanged since apartheid. In the 2005 WCED matric cohort, for example, more than 99% of learners in ex-DET schools were Black and more than 90% of learners in ex-HOR schools were Coloured.[69] It is thus not surprising that the associations between ex-department and HE access, throughput, and retention that can be inferred from the estimates in Table 3.18 are largely reminiscent of the findings regarding the association between race and HE outcomes presented in Section 3.5.1.3.

It is clear that the HE access rates for learners from ex-DET and ex-HOR schools were significantly lower than the access rates for learners from ex-CED schools. Moreover, students from ex-HOR and ex-DET schools were also at a disadvantage in terms of their likelihoods of successfully completing undergraduate programmes and dropping out of HE within the first three years of study.

Lastly, the estimates show that learners from English LOLT schools were, on average, marginally more likely to enrol in HE between 2006 and 2009 than learners from Afrikaans or dual medium WCED schools. However, the reverse holds true in terms of the 4-year completion rate for students from the WCED 2006 first-time entering undergraduate cohort. Students from English schools were actually somewhat less likely to successfully complete their undergraduate studies within four years than students from other schools, despite the fact that the former group were less likely to have enrolled in 3- or 4-year undergraduate Bachelor's degree programmes. With the exception of the incidence of bachelor's programme enrolments, which were slightly higher among learners from Afrikaans schools, the estimated HE outcomes for learners from Afrikaans schools and those from dual medium schools were substantively the same. There were no significant differences in the 3-year HE dropout rates between learners from English, Afrikaans, or dual medium schools.

3.5.3.2 School performance

Figure 3.5 shows the estimated average HE access, completion, and dropout dropout rates for schools in the 2005 WCED matric cohort sample, conditional on four different performance measures: the matric pass rate, the matriculation endorsement rate, the average SC aggregate, and the percentage point difference between the average CASS mark and the average SCE mark in the school.

Panel (a) of the graph shows that there is a general positive association between the matric pass rate and the estimated HE access, completion, and retention rates for the cohort, even if this association is relatively weak

[68] The finding that quintile 1 - 4 schools in South Africa perform at similar levels of academic achievement and often produce similar outcomes is not uncommon. See, for example, Van der Berg (2006:6), Lewis (2008:99), and Branson and Zuze (2012:70).

[69] See Table E.17 for a full breakdown of the racial composition across different school quintiles, ex-departments, and LOLTs among learners in the 2005 WCED matric cohort.

over the majority of the distribution. The estimated average 1-year and 4-year access rates change marginally between matric pass rates of 30% and 90%, for example, only rising rapidly thereafter. While the average HE access rates for schools with matric pass rates between 60% and 90% were broadly similar, the average access rates for learners from schools with a 100% pass rate were therefore roughly 20 percentage points higher, on average.

There is a noticeable decline in the estimated 3-year dropout rates for learners from schools with pass rates of around 30% and those from schools with pass rates nearer to 70%, but thereafter the average 3-year dropout rate does not appear to change significantly. A similar result holds for the estimated average 4-year completion rates, which are shown to rise from 30% to 40% as the matric pass rate rises from 40% to 60%, but remain more or less constant thereafter.[70]

In contrast to the case for the matric pass rate, there appears to be a much stronger association between the matriculation endorsement rate (i.e. the percentage of the matrics in a school who passed the 2005 SC with endorsement) and HE access, throughput, and retention. This is particularly true in the case of the average 1-year and 4-year access rates, which are shown to rise fairly rapidly over the entire matric endorsement rate distribution. The changes in the estimated 4-year completion and 3-year dropout rates across the matric endorsement rate distribution are also larger than they were for most of the matric pass rate distribution.

Panel (c) of Figure 3.5 depicts the relationship between the average SC aggregate achieved in WCED schools in 2005 and HE access, throughput, and retention. The illustrated associations echo those found in terms of the matric pass and matriculation endorsement rates, with the exception that they are far stronger here. Significant differences across the average SC aggregate distribution are evident for all four HE outcome metrics considered. Again, the associations appear to be strongest in terms of the 1-year and 4-year HE access rates. Nonetheless, there are also clear differences in the expected HE completion and dropout rates for students from the WCED 2006 fist-time entering undergraduate cohort, depending on the average SC aggregate achieved in the schools that they attended. For example, the average 4-year completion rate for students from schools that achieved an average SC aggregate of 60% or higher was at least 15 percentage points higher, on average, than the estimated 4-year completion rates for students from schools that achieved an average SC aggregate of 45% or lower.[71] Similarly, a 15 percentage point difference is observed in terms of the average 3-year HE dropout rates between students from 60% average SC aggregate schools and those from schools that achieved an average SC aggregate of 45%.

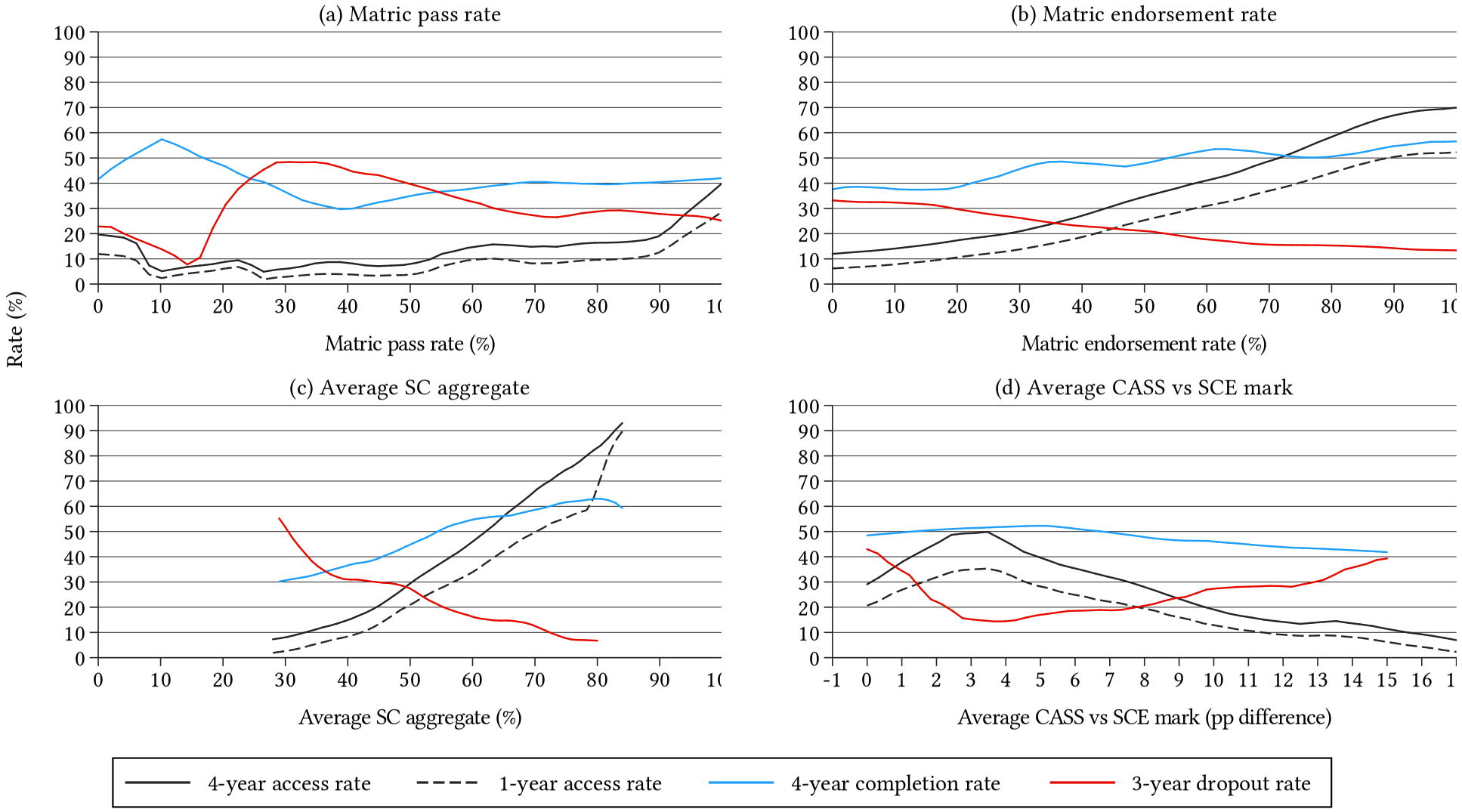
The final panel of Figure 3.5 relates HE access, throughput, and dropout to the percentage point difference in the average matric CASS mark and the average 2005 SCE mark (hereafter referred to as the *CASS-to-SCE differential*) for schools in the 2005 WCED matric cohort sample. Van der Berg and Shepherd (2010) show that unreliable school-based assessment in South Africa, as measured by the deviation between the average CASS and SCE marks in a school, is highly correlated with weak academic performance, both at the learner and at the school level. The data suggests that this is true also of the learners from the 2005 WCED matric cohort.

Learners for whom there were large differences in their average matric CASS and 2005 SCE marks are observed to have achieved significantly lower SC aggregates, on average, than learners who had only minor

[70] The apparent volatility in the completion rate and dropout rate estimates towards the lower end of the matric pass rate distribution can be attributed to the fact that only 16 out of the 390 schools in the 2005 WCED matric cohort sample achieved matric pass rates of 30% or lower.

[71] An average SC aggregate of 60% and 45% respectively represented the 80th and 50th percentiles of performance among the schools in the 2005 WCED matric cohort sample.

Figure 3.5: HE access, completion, and dropout rates for the 2005 WCED matric cohort by school performance measures (2006 - 2009)



NOTES: Lines represent average 4-year access, 1-year access, 4-year completion, and 3-year dropout rates conditional on (a) the matric pass rate, (b) the matriculation endorsement rate, (c) the average SC aggregate mark, and (d) the percentage point difference between the average CASS mark and the average 2005 SCE mark in the schools where learners from the 2005 WCED matric cohort wrote the 2005 SCE, and were estimated using weighted local polynomial regression. Completion and dropout rates are estimated only for those learners who were part of the WCED 2006 first-time entering undergraduate cohort. Learners who achieved an "incomplete" pass on the 2005 SCE were excluded from the estimation of the average SC aggregate in a school.

CASS-to-SCE differentials (Figure E.2). Moreover, there also appears to have been a strong negative association between the extent of students' CASS-to-SCE differentials and their likelihoods of accessing HE and completing undergraduate studies within four years of writing the 2005 SCE.

Figure 3.5 shows that the average CASS-to-SCE differentials at the school-level was also predictive of HE outcomes for the 2005 WCED matric cohort. The estimated 1-year and 4-year HE access rates were highest for learners from schools where the average CASS-to-SCE differential was only 3 - 4 percentage points. However, the access rates for learners from schools where the deviation was larger than 4 percentage points was, on average, significantly lower. Differences are also apparent in terms of the estimated average 3-year HE dropout rate which effectively mirrors the 4-year access rate curve in the graph. Though there is some variation in the estimated average 4-year completion rates over the school CASS-to-SCE differential distribution, this is only minor in comparison to the variation in the other HE outcome metrics.

In many ways, the findings regarding the associations between school-level performance and HE outcomes are analogous to those regarding the associations between learner matric performance and HE access, completion, and dropout. First, measures that are based on the average level of matric performance (i.e. the SC aggregate) appear to be stronger predictors of HE access and success than measures that are based merely on the types of matric passes achieved. Second, the slopes of the various curves in Figure 3.5 suggest that, much like in the case of learner-level matric performance, school-level matric performance is a stronger predictor of HE access than it is of HE throughput or dropout.

Lastly, the fact that school-level matric performance is strongly associated with expected HE outcomes implies that differences in the quality of schooling are likely to perpetuate inequalities of educational opportunity, including opportunities for access to and success through the HE system. To investigate the extent of these inequalities, Figure 3.6 uses Lorenz curves to illustrate the distribution of matric learners, HE participants, and HE completers among the 390 schools in the 2005 WCED matric cohort sample.

Schools vary considerably in terms of learner numbers. The graph shows, for example, that the smallest 50% of schools in the 2005 WCED matric cohort sample accounted for only 25% of the learners in the cohort. Based purely on this unequal distribution of learner numbers, it is therefore to be expected that the distribution of HE participants across the system would not be equal. Nevertheless, the extent of the inequality in the distribution of matric performance and HE outcomes between schools is startling.

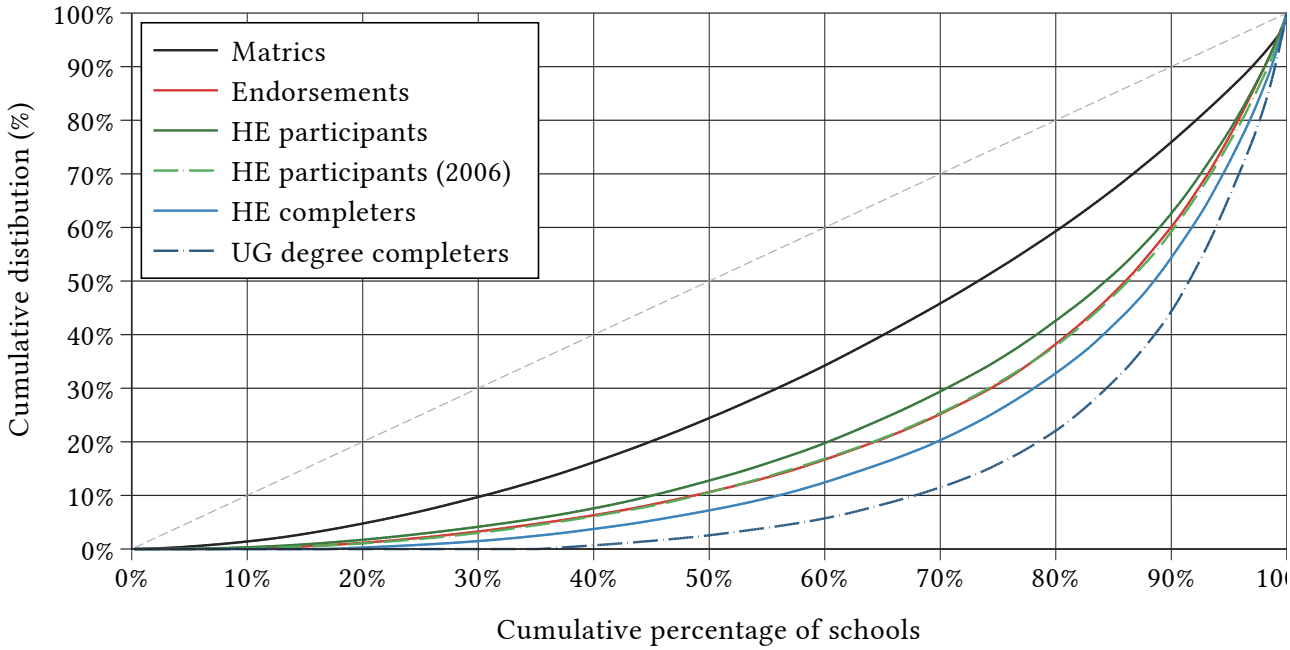
The best-performing 30% of schools in the cohort accounted for 75% of all matriculation endorsements. Interestingly, the distribution of the learners who were part of the WCED 2006 first-time entering undergraduate cohort was virtually identical to that of learners who achieved matriculation endorsements. By contrast, the distribution of learners who enrolled in HE between 2006 and 2009 was slightly more spread out across schools. This provides some evidence in support of the notion that learners who postponed HE entry were more likely to have come from relatively weaker-performing schools (i.t.o. matric performance) than learners who enrolled in HE immediately after writing the SCE.

The largest inequalities between schools clearly manifest in terms of HE completion. 80% of the learners from the cohort who successfully completed some form of HE qualification between 2006 and 2009 came from just 30% of the schools in the sample.[72] The level of inequality is even greater if one considers only those learners

[72] 13 Schools (3.3%) in the sample did not produce any HE entrants over the period while 65 schools (16.7%) did not produce any HE completers between 2006 and 2009.

who completed 3- or 4-year undergraduate Bachelor's degrees. In fact, the graph shows that nearly 90% of this group also came from only 30% of the schools in the sample.

Figure 3.6: Distribution of matrics, HE participants, and HE completers among schools in the 2005 WCED matric cohort



NOTES: Lines denote the cumulative percentage of schools in the 2005 WCED matric cohort sample (N = 390) that account for a given cumulative percentage of matrics, HE participants, and HE completers in the cohort. Schools are ranked from smallest to largest based on their contributions to each of the outcomes under consideration. Estimates are weighted. The 45-degree line denotes the line of perfect equality.

3.6 Multivariate analysis

The descriptive analyses in the preceding sections provide useful preliminary indications of the potential associations between various pre-entry correlates and HE access, throughput, and retention. However, HE access and success - even when measured simply in terms of access, completion, and dropout rates - are the products of highly complex interactions between multiple underlying individual and social factors. Very little of this complexity can be adequately captured through simple bivariate or trivariate comparisons. For example, while the analysis in Section 3.5.2.2 suggests that there is a strong association between race, matric performance, and HE outcomes for learners in the Western Cape, it provides no information on the extent to which this association may be driven by underlying differences in general school characteristics or school performance levels between race groups.

Drawing definitive inferences based purely on simple descriptive analysis, as is commonly done in studies of HE access and success in South Africa, often leads to conclusions that are highly misleading and tends to imply causal linkages where such linkages may not truly exist. In part, this is because such types of analyses cannot provide accurate information on the individual contributions that specific correlates make to HE outcomes after the contributions of other correlates have been taken into account (Bhorat *et al.*, 2010:112). In order to gain a deeper and more nuanced understanding of the marginal contributions of pre-entry correlates to

observed HE access, completion, and dropout rates, it is therefore necessary to account for the potential influence of multiple factors at the same time.

In the multivariate analysis that follows, linear probability models (LPM) are used to estimate the marginal associations between key demographic, learner matric performance, secondary school-level, and HE institution and study-specific variables and HE access, completion, and dropout. The objective is to gain a better understanding of the extent to which these factors influence HE access and success once other variables have been taken into account. The three outcome variables considered in the models remain the 4-year access rate among the 2005 WCED matric cohort and the 4-year completion and 3-year dropout rates among the WCED 2006 first-time entering undergraduate cohort.[73]

3.6.1 Matric performance and racial differentials in HE access, throughput, and dropout

The analyses in Section 3.5.2.2 showed that learners from different race groups in the Western Cape not only have vastly different levels of matric achievement, on average, but that they also subsequently face vastly different post-secondary outcomes in terms of their expected likelihoods of accessing and succeeding in HE. As noted in Section 3.2, this finding also holds true more generally for South Africa as a whole. Given the primacy of matric performance for the purposes of qualifying for HE access, and preliminary indications that matric performance is also predictive of HE throughput and retention, one of the central objectives in this chapter is to determine the extent to which the observed racial differentials in HE access, completion, and dropout rates can be explained by differences in average levels of matric performance between learners from different race groups.

Tables 3.19 and 3.20 show the results from three sets of rudimentary LPMs that estimate the expected racial differentials in HE access, completion, and dropout for learners in the 2005 WCED matric cohort, before and after taking matric performance into account.

Table 3.19: LPM - Estimated racial differentials in HE access, completion, and dropout rates before and after controlling for matric pass type

	4-year access		**4-year completion**		**3-year dropout**	
	(a)	(b)	(a)	(b)	(a)	(b)
Coloured	−0.023***	−0.096***	0.116***	0.106***	−0.048**	−0.022
Asian	0.400***	0.078**	0.160***	0.140***	−0.211***	−0.160***
White	0.260***	−0.040***	0.307***	0.288***	−0.187***	−0.137***
SC - Endorsement		0.494***		0.068***		−0.176***
SC - Fail		−0.128***				
Observations	28 463	28 463	6 083	6 083	6 083	6 083
Adjusted R^2	0.077	0.332	0.054	0.056	0.038	0.059

NOTES: All linear probability models (LPM) were estimated via Ordinary Least Squares (OLS). Estimates are weighted. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors. The 4-year access sample includes all learners from the 2005 WCED matric cohort. The 4-year completion and 3-year dropout samples include all students in the WCED 2006 first-time entering undergraduate cohort. Learner's who achieved an "incomplete" pass on the 2005 SCE are excluded from all estimation samples. Reference categories are as follows: Race (Black); Pass type (Pass without endorsement).

[73] For each of the LPMs presented, the coefficient on a particular covariate reflects the estimated expected percentage point change in the dependent variable (4-year access rate, 4-year completion rate, or 3-year dropout rate) associated with a unit change in the covariate in question, conditional on all other variables in the model being held constant.

In line with the discussion in the preceding sections, the regression results reveal significant differences in HE access, throughput, and retention between race groups. White and Asian learners from the cohort are not only significantly more likely to access HE than Black and Coloured learners, but also significantly more likely to graduate within 4-years and less likely to drop out within three years, conditional on having entered the HE system in 2006.[74]

The magnitudes and direction of the estimated access rate differentials change significantly once matric performance has been taken into account. The estimates in Table 3.19, for example, show that White learners were, on average, statistically significantly less likely to access HE within four years of writing the SCE than Black learners, once differences in the types of passes achieved are controlled for. Similarly, controlling for matric pass type reduces the estimated 4-year access rate premium for Asian learners from 40 percentage points to only 7.8 percentage points.

The changes in the estimated access rate differentials are even more pronounced when one controls for the matric aggregate achieved. Table 3.20 shows that the 4-year access rates for Black and Coloured learners are respectively estimated to be 24.4 percentage points and 8.9 percentage points higher, on average, than the rate for White learners over the matric performance distribution. In fact, once the matric aggregate has been taken into account, both White and Coloured learners are statistically significantly less likely to access HE than Black learners, while the access rate premium for Asian learners relative to Black learners becomes statistically insignificant.

Table 3.20: LPM - Estimated racial differentials in HE access, completion, and dropout rates before and after controlling for matric aggregate

	4-year access		**4-year completion**		**3-year dropout**	
	(a)	(b)	(a)	(b)	(a)	(b)
Coloured	−0.023***	−0.155***	0.116***	0.053**	−0.048**	0.022
Asian	0.400***	−0.042	0.160***	0.016	−0.211***	−0.049
White	0.260***	−0.244***	0.307***	0.128***	−0.187***	0.016
SC aggregate (%)		0.020***		0.008***		−0.009***
Observations	28 463	28 463	6 083	6 083	6 083	6 083
Adjusted R^2	0.077	0.392	0.054	0.095	0.038	0.119

NOTES: All linear probability models (LPM) were estimated via Ordinary Least Squares (OLS). Estimates are weighted. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors. The 4-year access sample includes all learners from the 2005 WCED matric cohort. The 4-year completion and 3-year dropout samples include all students in the WCED 2006 first-time entering undergraduate cohort. Learner's who achieved an "incomplete" pass on the 2005 SCE are excluded from all estimation samples. Reference categories are as follows: Race (Black).

The estimates in Table 3.19 show that controlling for matric pass type results in only minor differences in the estimated racial completion and dropout rate differentials for the WCED 2006 first-time entering undergraduate cohort. The only statistically significant differences are in terms of the estimated 3-year dropout rates which are found to be about 5 percentage points lower, on average, in the models that include the matric pass type variable.

In contrast to the case for the matric pass type, Table 3.20 suggests that there are significant differences in the estimated racial completion and dropout rate differentials before and after controlling for the matric

[74] The size of these differentials (i.t.o. percentage point differences) are virtually identical to those implied by the estimates presented in Table 3.14. The only reason for some minor differences is due to the fact that the regression samples exclude learners who achieved an "incomplete" pass on the 2005 SCE.

aggregate achieved. All of the coefficients on the racial indicator variables in the 3-year dropout estimation become statistically insignificant once the matric aggregate has been included as a covariate. This implies that Coloured, Indian, and White students from the WCED 2006 fist-time entering undergraduate cohort were no less likely to drop out of HE within three years of study than their Black counterparts once differences in matric achievement are taken into account. However, the same does not hold true for throughput. Even after controlling for overall matric achievement, the regressions suggests that the 4-year completion rate for Whites was still expected to be about 12.8 and 7.5 percentage points higher, on average, than it was for Black and Coloured students respectively (Table 3.20).

These results confirm many of the preliminary inferences drawn in Sections 3.5.2 and 3.5.2.2. First, it seems clear that the matric aggregate is a stronger predictor of HE access, completion, and dropout than the matric pass type. All of the goodness-of-fit measures for the models indicate that variation in the matric aggregate explains more (if not substantially more) of the variation in HE access, completion, and dropout than is the case for variation in the type of pass achieved.[75] Second, and perhaps most important, the results provide support for the notion that racial differentials in HE access are most likely explained by racial differentials in matric performance. A similar conclusion can be drawn in respect of the estimated 3-year dropout rate differentials. By contrast, differences in matric performance do not appear to fully explain why White students are more likely to complete their undergraduate studies within four years than Coloured or Black students. This is further evidence that completion rate differentials might at least partly be driven by factors other than academic performance in secondary school.

3.6.2 The marginal contributions of pre-entry correlates to HE access and success

To extend the analysis HE access, throughput, and dropout, this section presents the results from LPMs that incorporate a more comprehensive set of theoretically relevant pre-entry correlates as well as HEI and programme-specific factors. Many of these variables have already been discussed as part of the descriptive analyses in Sections 3.4 and 3.5, which provide the background and context for the results that follow.

In light of the discussion above, it is possible to categorise most of the pre-entry correlates that are available in the WCED matric data into one of three groups: (1) demographic factors such as age, gender, and race; (2) learner-level matric performance factors, including the type of pass achieved, the matric aggregate achieved, and the specific subjects offered in the SCE; (3) school type and school-level matric performance factors, including school quintile, ex-department classification, matric pass rate, and language of learning and teaching (LOLT). All of these determinants potentially had important bearing on the observed HE access, completion, and dropout rates for the learners from the 2005 WCED matric cohort.

In the case of completion and dropout among the WCED 2006 first-time entering undergraduate cohort, a further set of variables is likely to be important. These are the HEI- and programme-specific factors like the specific HEI attended and the qualification type and broad field of study of the programme for which a student was enrolled.

The primary objective of the multivariate analysis is to identify the partial correlations between the various pre-entry and HEI- and programme-specific correlates and 4-year HE access, 4-year completion, and 3-year

[75] In the absence of further controls, it is worth noting that the respective coefficients on the matric pass type and matric aggregate variables are likely to be biased upwards, and caution should be taken not to interpret their magnitudes too strongly.

dropout among the 2005 WCED matric cohort. To this end, an attempt was made to include as many critical covariates in the estimated LPMs as was feasible, while still maintaining relative parsimony and representativeness.[76] The set of variables included in the model was ultimately subject to limitations imposed by the data used and, as such, is by no means exhaustive.[77] Notably absent from the models are indicators of home background (parental education, household structure, etc.) and measures of socio-economics status (personal income, household income, labour market status, etc.).

Unfortunately, neither the WCED matric data, nor the version of the HEMIS data used in this chapter contain any information on learner/student home background or individual socio-economic status. This has important implications since, as noted in Section 3.2, studies have found that these factors play a particularly critical role in South Africa in terms of determining whether individuals are able to access HE and whether those who do are able to successfully complete their undergraduate studies. It follows that the omission of these and other crucial variables from the estimations is likely to affect the accuracy of the results and impose further caveats to the conclusions that can be drawn from the analysis. This issue is revisited in the conclusion to this chapter.

The results from the LPMs are discussed in four separate sections below and presented across four tables (Tables 3.21a - 3.21d), each of which reports the relevant coefficient estimates for a single subset of correlates. All of the results presented thus come from the same underlying LPMs and control for exactly the same set of variables. The variables included in the models are described in full in Section D.2.

3.6.2.1 Learner/student demographics

In line with the descriptive findings presented in Section 3.5.1.1, Table 3.21a shows that there are no statistically significant differences between the respective estimated conditional access, completion, and dropout rates for appropriately-aged and underaged matrics. By contrast, there is some evidence that overaged matrics are less likely to access HE and more likely to drop out of HE within three years than appropriately-aged learners, even once other factors have been taken into account. However, though the coefficients on the *overage* variables in the 4-year access and 3-year dropout LPMs may be statistically significant (at 1% and 10%, respectively), they are not very large.

The magnitudes suggest that the 4-year access rate for overaged matrics may be less than 2 percentage points lower, on average, than it is for appropriately-aged learners. Similarly, the 3-year dropout rate for overaged learners in the WCED 2006 first-time entering undergraduate cohort is estimated to only be about 4 percentage points higher, on average, than it is for their appropriately-aged counterparts. These differences do not appear to be particularly significant in economic terms. Moreover, it is unclear whether the differences that remain after controlling for other covariates arise because of the fact that overaged learners are more likely to have repeated grades in school than appropriately-aged learners, or because of other reasons.

Despite being no more or less likely to access HE within four years of writing the SCE than males, female students are, on average and with all else held constant, significantly more likely to complete their programmes within 4 years of study, and less likely to drop out of HE within 3 years, than their male counterparts. Even

[76] To aid the interpretability of the results, the LPMs were also specified without any interaction effects.

[77] Some of the variables considered in the descriptive analyses in Section 3.5, for example, had to be excluded from the estimations due to large numbers of missing observations.

Table 3.21a: LPM - HE access, completion, and dropout: *learner/student demographics*

	4-year access	4-year completion	3-year dropout
Underage	0.001	0.032	−0.004
Overage	−0.019***	−0.035	0.041**
Female	−0.000	0.066***	−0.039***
Coloured	−0.150***	0.029	0.032
Asian	−0.156***	0.047	−0.009
White	−0.267***	0.190***	−0.035
Includes controls for:[a]			
Matric Performance	X	X	X
Schooling	X	X	X
Higher Education		X	X
Observations	26 934	5 554	5 554
Adjusted R^2	0.428	0.188	0.175

NOTES: All linear probability models (LPM) were estimated via Ordinary Least Squares (OLS). Estimates are weighted. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors. The 4-year access sample includes all learners from the 2005 WCED matric cohort. The 4-year completion and 3-year dropout samples include all students in the WCED 2006 first-time entering undergraduate cohort. Learner's who achieved an "incomplete" pass on the 2005 SCE are excluded from all estimation samples. Reference categories are as follows: Age (appropriate age), Gender (Male), Race (Black). Estimations include controls for the various learner-level matric performance, school characteristics and school performance, and HEI and HE programme factors listed in Appendix D.2.

after controlling for a range of other factors, the estimated female 4-year completion rate is 6.6 percentage points higher, and the 3-year dropout rate 3.9 percentage points lower, on average, than the estimated rates for males. This provides further evidence that female students generally perform better in terms of throughput than males (Soudien, 2010:14).

The estimated conditional racial differentials in HE access, completion, and dropout rates in Table 3.21a are perhaps the most important set of results in terms of the demographic correlates of HE access and success. Once differences in matric performance as well as differences in school characteristics and school performance have been taken into account, Black learners are significantly more likely to enrol in HE within four years of writing the SCE, than learners from all three of the other race groups. The estimates suggest that the 4-year access rates for White, Asian, and Coloured matrics are respectively expected to be 26.7, 15.6, and 15.0 percentage points lower than the access rate for Black learners, once other factors have been controlled for.

These results provide the most compelling evidence so far that differences in HE access between race groups are largely driven by underlying differences in matric performance and, to a lesser extent, by school characteristics and school performance. In fact, a comparison between the estimates from the rudimentary LPM presented in Table 3.20 and the estimates presented here suggest that it is mainly differences in learner matric performance, rather than differences in school type and school performance, that explain why White and Asian learners have significantly higher unconditional 4-year HE access rates than Black or Coloured learners.

The results from the LPM for 3-year dropout shows that it is only Coloured students from the WCED 2006 first-time entering undergraduate cohort who were statistically significantly more likely to drop out of HE within 3 years than Black students. The unconditional differentials in terms of 3-year dropout between Black, Asian, and White learners (as shown in Tables 3.19 and 3.20) become statistically insignificant once matric performance and school-level factors are accounted for.

Lastly, it is striking that, even after controlling for a range of pre-entry and HE-level correlates, White stu-

dents from the WCED 2006 first-time entering undergraduate cohort were still significantly more likely to finish their undergraduate studies within four years than Black, Coloured, or Asian students. Moreover, the estimated 4-year completion rate differential is not only statistically significant, but also large in economic terms (19 percentage points). The implication is that the gap in HE throughput between White students and students from other race groups appears to be driven by factors other than matric performance, school type and school performance, and even HEI and programme-specific factors.

One possible reason for the persistent statistically significant White HE completion rate premium found in Table 3.21a may relate to differences in the nature of selection into HE for learners from different race groups. Specifically, if the selection process for White applicants is more effective at screening out applicants with low likelihoods of academic success than the selection processes for other race groups, it would be expected that White students would perform relatively better, on average, in terms of programme completion, even once other factors have been taken into account. The estimated conditional racial differentials in HE access rates suggest that there might well be significant differences in the ways in which White and, to a lesser extent, Asian and Coloured learners are selected into HE in comparison to Black learners. This issue is revisited in Section 3.6.4 below.

3.6.2.2 Learner matric performance

Table 3.21b shows that WCED learners who passed the 2005 SC with endorsement were significantly more likely (16.8 percentage points) to enrol in HE between 2006 and 2009 than learners who passed matric without endorsement, even after other measures of matric performance, as well as school and demographic factors, are accounted for. Given the fact that matriculation endorsement was a formal requirement for entry into Bachelor's degree studies at the time, this should hardly be surprising. However, as noted in Section 3.5.2, a non-negligible proportion of learners who passed the 2005 SC without endorsement in the Western Cape also enrolled in HE between 2006 and 2009.

In contrast to the results for the rudimentary LPMs in Table 3.19, the association between the SC pass type achieved and 4-year completion is not statistically significant and the association between the SC pass type achieved and 3-year dropout for students from the WCED 2006 first-time entering undergraduate cohort is only statistically significant at the 10% level. This is most likely a consequence of the fact that, unlike the LPMs in Tables 3.19 and 3.20, the present model not only includes an indicator of the type of SC pass achieved, but also several other measures of matric performance, including the SC aggregate achieved.

The estimated coefficients on the SC aggregate variable are statistically significant and economically meaningful in terms of all three of the HE outcome measures considered. The results suggest that a percentage point increase in the SC aggregate is associated with a 1.3 percentage point increase in the 4-year access rate, a 1.3 percentage point increase in the 4-year completion rate, and a 0.8 percentage point decrease in the 3-year dropout rate, on average, while holding all other factors constant.

This is a major finding for two reasons. First, since HE entry is, to a large extent, explicitly based on Grade 12 performance, it would be reasonable to expect that a significant part of the association between matric performance and undergraduate programme completion or HE dropout would already be captured by selection into HE. The mere fact that selection into HE is supposed to reduce the heterogeneity in academic ability among students means that one should expect the association between the SC aggregate and completion or

Table 3.21b: LPM - HE access, completion, and dropout: *learner-level matric performance*

	4-year access	4-year completion	3-year dropout
Endorsement	0.168***	0.005	−0.044*
SC aggregate (%)	0.013***	0.013***	−0.008***
Mathematics SG	0.060***	0.115***	−0.100***
Mathematics HG	0.110***	0.089***	−0.082***
Physical Science SG	0.013	−0.034	−0.016
Physical Science HG	0.051***	−0.044*	−0.006
Biology SG	−0.009	0.022	0.000
Biology HG	0.033***	0.017	−0.024*
Accounting SG	0.020***	−0.008	−0.062***
Accounting HG	0.079***	−0.000	−0.033**
Includes controls for:[a]			
Demographics	X	X	X
Schooling	X	X	X
Higher Education		X	X
Observations	26 934	5 554	5 554
Adjusted R^2	0.428	0.188	0.175

NOTES: All linear probability models (LPM) were estimated via Ordinary Least Squares (OLS). Estimates are weighted. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors. The 4-year access sample includes all learners from the 2005 WCED matric cohort. The 4-year completion and 3-year dropout samples include all students in the WCED 2006 first-time entering undergraduate cohort. Learner's who achieved an "incomplete" pass on the 2005 SCE are excluded from all estimation samples. Reference categories are as follows: Pass type (pass without endorsement), Mathematics (Did not offer Mathematics), Physical Science (Did not offer Physical Science), Biology (Did not offer Biology), Accounting (Did not offer Accounting), English (English Second Language), Afrikaans (Did not offer Afrikaans). [a] Estimations include controls for the various demographic, school characteristics and school performance, and HEI and HE programme factors listed in Appendix D.2.

dropout to be weaker than, for example, the association between the SC aggregate and HE access among matrics. Second, the inclusion of other matric performance covariates which are themselves correlated with the SC aggregate means that part of the covariation between the SC aggregate and HE access, completion, and dropout is likely to be partialled out.

The fact that there is a persistent statistically significant and strong association between the SC aggregate achieved and HE completion and dropout despite the aforementioned two factors, provides strong support for the notion that the SC aggregate was, in general, a good indicator of the underlying academic ability of students from the WCED 2006 first-time entering undergraduate cohort in terms of their likelihoods of completing qualifications and not dropping out of HE.

The last set of results in Table 3.21b pertain to the specific subjects that learners offered in the 2005 SCE. Though the ideal would have been to include measures of subject-specific performance in the estimations, this would have meant that all learners who did not offer a particular combination of subjects would be excluded from the estimation samples.[78] Therefore, the variables included are only indicators of whether or not learners offered a particular subject and the level at which they offered it.

In general, learners who offered Mathematics, Physical Science, Biology, and Accounting as subjects were, on average, statistically significantly more likely to access HE than learners who did not offer those subjects,

[78] For example, since fewer than 31% of learners in the 2005 WCED matric cohort offered both Physical Science and Mathematics in the 2005 SCE, including performance measures for these two subjects would have reduced the sample size for the 4-year access LPM to just 6 981 (26% of the sample used in the current LPM) and the 4-year completion and 3-year dropout LPMs to 2 577 (46% of the sample used in the current LPMs). More importantly, the underlying samples would no longer have been representative either of the 2005 WCED matric cohort or the WCED 2006 first-time entering undergraduate cohort.

conditional on the other variables included in the estimations. The positive association also appears to have been greater for learners who offered subjects at the HG level. This is partly expected, given that HEIs often also include subject-specific minimum entrance requirements for admission to certain HE programmes. Nonetheless, the magnitudes on some of these coefficients are surprisingly large, particularly considering the fact that various other measures of learner and school performance have already been taken into account. For example, the estimation results suggest that the 4-year access rate for learners who offered Mathematics HG in the 2005 SCE was, on average and with all else held constant, 11 percentage points higher than the access rate for learners who did not offer Mathematics as a subject. Similar results hold for Physical Science, Accounting, and Biology, although the magnitudes of the coefficients on these variables are not quite as large. The implication is that selection into HE is clearly not only dependent on overall levels of matric performance, as measured by the matric pass type or SC aggregate, but also on the set of subjects offered in matric.

Lastly, the LPMs offer mixed results in terms of the associations between taking subjects at the HG or SG and the likelihood of programme completion or HE dropout. It is evident that, even after other factors have been controlled for, students who offered Mathematics in matric were generally more likely to complete their programmes and less likely to drop out of HE than those who did not offer Mathematics. However, the association appears to have been larger for those students who took Mathematics SG than it was for those who took Mathematics HG.[79]

3.6.2.3 Secondary school type and matric performance

The results in Table 3.21c reveal that very few of the school type or school matric performance correlates discussed in Section 3.5.3 share statistically significant associations with HE access, throughput, or dropout once other factors have been taken into account. Due to the fact that learner matric performance is so closely correlated with school-level factors, the inclusion of various matric performance measures in the LPM specification has the effect of partialling out much of the unexplained covariation between school-type and school performance factors and HE outcomes. This also explains why the magnitudes of many of the coefficients are large, despite not being statistically significant.[80]

The only statistically significant association between any of the school-level matric performance measures and HE outcomes considered is the estimated negative association between the 4-year completion rate and the average SC aggregate achieved in a learner's school. While it may seem odd that students from better-performing schools (in terms of the average SC aggregate achieved) would be less likely to complete their programmes than learners from schools with weaker overall matric performance, it is important to interpret this coefficient in the context of the findings presented in the preceding section. The coefficient effectively implies that, for any two students with precisely the same level of matric performance (SC aggregate), the one from the weaker performing school would have been expected to be statistically significantly more likely to complete his/her undergraduate studies within four years than the one from the better performing school, conditional on all other factors being held constant. In other words, the results imply that students who performed comparatively well in the 2005 SC considering the average level of matric performance in their schools were more likely to successfully complete their programmes than students who performed comparatively poorly relative to the learners in their schools.

[79] These differences are statistically significant at the 10% level.

[80] The coefficients on the *Quintile 3* and *Quintile 4* indicator variables, for example, are not statistically significant. Yet, their magnitudes suggest that the expected 4-year completion rate among learners from Quintile 3 or 4 schools may respectively be 9.7 and 8.9 percentage points lower than it is for learners from Quinitile 1 school, *ceteris paribus*.

Table 3.21c: LPM - HE access, completion, and dropout: *school type and school-level matric performance*

	4-year access	4-year completion	3-year dropout
SC pass rate (%)	−0.000	−0.000	0.002
SC endorsement rate (%)	0.002	−0.001	−0.005
Average SC aggregate (%)	0.001	−0.004***	0.001
LOLT: English	−0.001	0.038	−0.015
LOLT: Afrikaans	−0.012*	−0.002	0.001
Quintile 2	−0.002	−0.121*	0.041
Quintile 3	0.011	−0.097	0.036
Quintile 4	0.013	−0.089	0.011
Quintile 5	0.016	−0.019	−0.047
DET	−0.040**	−0.037	−0.008
HOD	−0.032	0.072	−0.022
HOR	−0.028**	0.045	−0.007
WCED[b]	−0.055***	−0.060	0.056
Includes controls for:[a]			
Demographics	X	X	X
Matric performance	X	X	X
Higher Education		X	X
Observations	26 934	5 554	5 554
Adjusted R^2	0.428	0.188	0.175

NOTES: All linear probability models (LPM) were estimated via Ordinary Least Squares (OLS). Estimates are weighted. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors. The 4-year access sample includes all learners from the 2005 WCED matric cohort. The 4-year completion and 3-year dropout samples include all students in the WCED 2006 first-time entering undergraduate cohort. Learner's who achieved an "incomplete" pass on the 2005 SCE are excluded from all estimation samples. Reference categories are as follows: LOLT (Dual Medium), Quintile (Quintile 1), Ex-department (CED). [a]Estimations include controls for the various demographic, learner matric performance, and HEI and HE programme factors listed in Appendix D.2. [b] WCED refers to new schools established in the Western Cape after abolition of the separate education departments.

The most striking set of results in Table 3.21c are in terms of the associations between the ex-departments of schools and the likelihood of learners enrolling in HE within four years of writing the 2005 SCE. The coefficients show that learners from ex-DET, ex-HOR, and WCED schools were, on average, statistically significantly less likely to access HE than learners from ex-CED schools.[81] Moreover, though the coefficients may not be statistically significant, the results suggest that students from ex-DET or ex-WCED schools were also less likely to complete their studies within four years than learners from ex-CED schools.

The fact that the ex-department of a learner's school appears to matter for HE access and potentially also for HE throughput and dropout even after various other learner-level and school-level factors have been taken into account provides evidence that historic inequalities in the secondary education system may have enduring implications for post-secondary outcomes. However, though the signs and magnitudes of many of the estimated coefficients presented in Table 3.21c are in line with expectations, the fact that they are imprecisely estimated means that they should be interpreted with caution. For example, while the point estimates indicate that the 4-year completion rate for students from ex-DET schools were 3.7 percentage points lower than they were for learners from ex-CED schools, it is difficult to know how accurate this estimate truly is. Therefore, it would be prudent not to draw overly strong conclusions regarding the marginal contributions of individual school-level factors to HE access and success among the 2005 WCED matric cohort based purely on these results.

[81] The lack of statistical significance of the coefficient on the HOD indicator variable is likely to be driven by the fact that only 208 learners in the sample came from ex-HOD schools.

3.6.2.4 HEI and programme-specific factors

Table 3.21d shows that there was a statistically significant association between the types of qualifications for which students were enrolled and the likelihood that they completed those qualifications within the first four years of study. Unsurprisingly, the estimation results indicate that students who enrolled in more academically challenging qualifications with longer minimum study time requirements were significantly less likely to complete their programmes within four years than students who enrolled in easier, short-duration programmes. The implied differentials are substantial. On average and with all else held constant, the 4-year completion rates for 4-year and 3-year undergraduate degree students were respectively 33.7 and 17.3 percentage points lower than the 4-year completion rate for 1 to 2-year undergraduate certificate students. Again, given the nature of the other control variables included in the regressions, this result is likely to be driven mainly by differences in the regulation periods associated with the different qualification types rather than differences in the underlying academic abilities of students who enrol for those types of qualifications. The fact that there were no statistically significant differences in the estimated extent of dropout between students enrolled in different qualification types (once other factors are controlled for) adds further support to this hypothesis.

In terms of broad field of study, students who enrolled in HSS programmes had statistically significant higher 4-year completion rates, on average, than students enrolled in BCM or SET programmes, after other pre-entry correlates were taken into account. This supports the notion that HSS programmes may, on average, be less academically demanding than BCM and SET programmes. It is also found that BCM students were statistically significantly less likely to drop out of HE within three years of study than either HSS or SET students.

Table 3.21d: LPM - HE access, completion, and dropout: *HEI and programme-specific factors*

	4-year access	4-year completion	3-year dropout
3-year Diploma		-0.108^{**}	-0.043
3-year Degree		-0.173^{***}	-0.015
4-year Degree		-0.337^{***}	-0.037
BCM		-0.046^{**}	-0.040^{**}
SET		-0.108^{***}	-0.022
NSFAS award		0.058^{***}	-0.176^{***}
CPUT		0.301^{***}	-0.087^{*}
UCT		0.167^{***}	-0.076^{**}
US		0.146^{***}	-0.074^{***}
UWC		0.139^{**}	-0.050
Includes controls for:[a]			
Demographics	X	X	X
Matric performance	X	X	X
Schooling	X	X	X
Observations	26 934	5 554	5 554
Adjusted R^2	0.428	0.188	0.175

NOTES: All linear probability models (LPM) were estimated via Ordinary Least Squares (OLS). Estimates are weighted. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors. The 4-year completion and 3-year dropout samples include all students in the WCED 2006 first-time entering undergraduate cohort. Student's who achieved an "incomplete" pass on the 2005 SCE are excluded from all estimation samples. Reference categories are as follows: Qualification type (1 to 2-year undergraduate certificate), Field of study (Human and Social Sciences (HSS)), NSFAS (No NSFAS award/bursary), HEI (UNISA). [a] Estimations include controls for the various demographic, learner matric performance, and school type and school-level matric performance factors listed in Appendix D.2. The estimated coefficients on the indicator variables for other HEIs have been suppressed in the output.

The HEMIS data used in this chapter includes information on whether or not students received any National Student Financial Aid Scheme (NSFAS) loans or bursaries. This is the only variable in the data that provides some indication of student's socio-economic backgrounds and financial means, since NSFAS loans are awarded largely on the basis of financial need (De Villiers, 2012:58).

The estimation results show that students from the WCED 2006 first-time entering undergraduate cohort who received NSFAS awards during their studies were not only more likely to complete their programmes within four years, but also significantly less likely to drop out of HE within three years. This result is in line with the findings of De Villiers *et al.* (2013:71), who show that NSFAS students from the 2000 - 2004 national first-time entering undergraduate cohorts performed significantly better than non-NSFAS students in terms of both throughput and retention. However, the result presented here is even stronger than what is implied by the descriptive analysis presented in De Villiers *et al.* (2013). The statistically significant coefficients on the *NSFAS* variable in Table 3.21d suggest that NSFAS students perform better than non-NSFAS students, on average, even after differences in matric performance, school-level factors, and other HEI and programme-specific factors have been taken into account. Though more detailed information would be needed in order to explain precisely why this is the case, De Villiers *et al.* (2013:71) speculate that NSFAS awards may enable financially needy students to continue with their studies, even when they need to repeat failed courses or academic years.

Lastly, the estimates show that students who attended any of the four contact HEIs in the Western Cape (CPUT, UCT, US, and UWC) had statistically significantly higher 4-year completion rates and, with the exception of UWC, statistically significantly lower 3-year dropout rates, on average, than students who studied via UNISA. Based on the discussion in Section 3.4.5, it is to be expected that students who study via UNISA will take longer to complete their programmes than students who study at contact HEIs. However, the estimates in Table 3.21d show that this holds true even when a range of other factors have been taken into account.

Perhaps the most surprising result presented in the Table 3.21d is that the estimated conditional 4-year completion rate differential between CPUT and UNISA is so much larger than the differentials for the other three Western Cape HEIs. In fact, the estimates suggest that the 4-year completion rate for students who studied at CPUT was, on average and with everything else held constant, nearly 15 percentage points higher than the estimated 4-year completion rates for students who studied at UCT, US, or UWC.[82] Moreover, because of the controls included in the regression, this difference cannot be explained by differences in the types of qualifications or the fields of study for which CPUT students and students at other HEIs were enrolled. Instead, it is likely that other underlying factors which are not accounted for in the LPMs may explain CPUT's throughput performance relative to the other HEIs.

3.6.3 The relative contributions of demographics, matric performance, school-level factors, and HEI-level factors to HE access and success

The discussion of the LPM results in the preceding section focussed exclusively on the estimated partial associations between specific pre-entry and HE-level correlates and HE access, throughput, and dropout rates. While these findings are informative regarding the potential marginal contributions of individual predictor variables, they offer only limited information about the relative importance of different sets of correlates for

[82] The estimated coefficients on the *UCT*, *US*, and *UWC* indicator variables in the 4-year completion estimation are not statistically significantly different from one another.

predicting HE access and success. For example, it is not immediately clear from the results in Tables 3.21a - 3.21d how much of the observed variation in the 4-year HE access rates among the 2005 WCED matric cohort was explained by learner-level matric performance, rather than school-level factors. Similarly, the coefficient estimates presented do not convey whether HEI and programme-specific factors play a larger role in explaining observed 4-year completion rates than demographic factors do.

In order to gain a better understanding of the relative importance of demographic, learner-level matric performance, school type and school-level matric performance, and HEI and programme-specific factors for explaining HE access, completion, and dropout rates, this section uses the Shapley-Owen method proposed by Huettner and Sunder (2012) to additively decompose the goodness-of-fit measures from the LPMs in the previous section into their constituent components. Specifically, the approach is used to decompose the *R-squared* statistics from the LPM estimations into the parts that are respectively explained by variation in each of the three sets of pre-entry correlates, and the part that is explained by variation in HEI and programme-specific factors.

Table 3.22 shows the estimated decomposition of the explained variance in HE access, completion, and dropout for the LPMs in Tables 3.21a - 3.21d.

It is evident that the cumulative explanatory power of the correlates included in the estimations differs substantially depending on the HE outcome in question. The R^2 statistics indicate that 42.8% of the variation in the observed 4-year HE access rate for the 2005 WCED matric cohort is jointly explained by variation in the demographic, learner-level matric performance, and school type and school-level matric performance correlates. By contrast, only 18.8% and 17.5% of the variation in the estimated 4-year completion and 3-year dropout rates for the WCED 2006 first-time entering undergraduate cohort is explained by the joint variation in the pre-entry and HE-level correlates considered. This implies that, collectively, the correlates included in the LPMs are weaker predictors of HE success and retention than they are of HE access.[83]

Table 3.22: Decomposition of explained variance in HE access, completion, and dropout by pre-entry and HE-level correlates

	4-year access		**4-year completion**		**3-year dropout**	
	Abs	*Rel (%)*	*Abs*	*Rel (%)*	*Abs*	*Rel (%)*
Demographics	0.049	11.5	0.035	18.5	0.020	11.1
Performance	0.304	71.1	0.068	36.2	0.083	47.4
Schooling	0.075	17.5	0.013	6.7	0.017	9.4
Higher Education	—	—	0.072	38.5	0.056	32.0
R^2 / % of R^2	0.428	100.0	0.188	100.0	0.175	100.0

NOTES: Figures denote the respective contributions of demographic, learner-level matric performance, school type and school-level matric performance, and HEI and programme-specific factors to the explained variance in the estimated 4-year access, 4-year completion, and 3-year dropout rates for learners from the 2005 WCED matric cohort based on the LPMs presented in Tables 3.21a - 3.21d and were estimated using the user-written *shapley2* command in Stata 13.1 (Juárez, 2012). The *"Abs"* column denotes the absolute contribution of each group of correlates to the R^2 for the regression whereas the *"Rel (%)"* column denotes the relative contribution of each group of correlates to the R^2 of the regression.

In addition to differences in the overall extent of explained variance between the different LPMs, the estimates indicate that the relative predictive power of the various sets of correlates also differs depending on the HE outcome being considered. The vast majority (71.1%) of the explained variation in HE access, for example, can

[83] However, it is worth noting that all of the R^2 statistics in the LPMs are reasonably high in the context of cross-sectional regression.

be attributed to variation in matric performance among learners in the 2005 WCED matric cohort. In fact, the estimates suggest that matric performance explains roughly 30% of the observed variation in the 4-year HE access rates for the cohort. Once school-level factors and learner matric performance have been taken into account, gender, age, and race collectively explain less than 5% of the variation in access rates.

In contrast to the results for the decomposition of the explained variance in HE access, student matric performance appears to explain comparatively less of the variation in 4-year completion and 3-year dropout, both in absolute and relative terms, for students in the WCED 2006 first-time entering undergraduate cohort. Much of the explained variation in these outcomes instead appears to be attributable to HEI and programme-specific factors. For example, the estimates show that HE-level factors make a marginally larger contribution to the explained variation in 4-year completion rates than matric performance does. However, as already discussed above, selection into specific HEIs and HE programmes is non-random. It is likely that there will be significant multicollinearity between learner matric performance, school-level factors, and the types of HEIs that students attend and the programmes for which they are enrolled. Consequently, it is possible that the HEI and programme-specific factors in the 4-year completion and 4-year dropout LPMs may capture part of the variation in the outcome variables that may otherwise have been attributed to pre-entry correlates.

To test this hypothesis, Table 3.23 decomposes the estimated explained variance in 4-year completion and 3-year dropout for students in the WCED 2006 first-time entering undergraduate cohort based on LPMs that include the same pre-entry correlates as the regressions in Tables 3.21a to 3.21d, but exclude controls for HEI and programme-specific factors.

Table 3.23: Decomposition of explained variance in HE access, completion, and dropout by pre-entry correlates only

	4-year access		**4-year completion**		**3-year dropout**	
	Abs	*Rel (%)*	*Abs*	*Rel (%)*	*Abs*	*Rel (%)*
Demographics	0.049	11.5	0.036	29.6	0.021	14.7
Performance	0.304	71.1	0.070	58.3	0.105	72.4
Schooling	0.075	17.5	0.015	12.1	0.019	12.9
R^2 / % of R^2	0.428	100.0	0.120	100.0	0.144	100.0

NOTES: Figures denote the respective contributions of demographic, learner-level matric performance, and school type and school-level matric performance to the explained variance in the estimated 4-year access, 4-year completion, and 3-year dropout rates for learners from the 2005 WCED matric cohort. These contributions are based on LPM specifications that are identical to those presented in Tables 3.21a - 3.21d , with the exception that they exclude any controls for HEI and programme-specific factors, and were estimated using the user-written *shapley2* command in Stata 13.1 (Juárez, 2012). The *"Abs"* column denotes the absolute contribution of each group of correlates to the R^2 for the regression whereas the *"Rel (%)"* column denotes the relative contribution of each group of correlates to the R^2 of the regression.

It is clear that the extent of the total explained variation in completion (12%) and dropout (14.4%) for the cohort is less when HE-level factors are excluded. However, the absolute contributions of the various pre-entry correlates to the explained variation in completion and dropout are substantively the same as when HEI and programme-specific controls are included in the models. The implication is that student matric performance and school-level factors make greater relative contributions to the models' R^2 statistics in the absence of HE-level controls.

In terms of the relative explanatory power of the various correlate categories considered, the results in Tables 3.22 and 3.23 provide further evidence that matric performance is far more predictive of HE access, completion, and dropout than school-level or demographic factors are. That said, a non-negligible percentage

of the explained variation in all three of these HE outcome variables can still be attributed to demographic factors. This is particularly true in the case of 4-year completion among the WCED 2006 first-time entering undergraduate cohort.

In light of the fact that matric performance and many of the school- and HE-level correlates considered here are highly correlated with race, it is important to evaluate the extent to which the aforementioned findings respectively apply to Black, Coloured, Asian, and White learners from the 2005 WCED matric cohort. Specifically, it is important to understand whether the cumulative and relative predictive power of the various pre-entry and HE-level correlates for HE access and success differs between race groups. To this end, the LPMs from Section 3.6.2 were estimated separately for each race group, both with and without controls for HEI and programme-specific factors. The Shapley-Owen method was subsequently used to decompose the explained variation in HE access, completion, and dropout for each of the race groups, based on the respective LPM estimations. The results from these decompositions are summarised graphically in Figure 3.7.

The graph shows that many of the findings discussed above hold even when the results are disaggregated by race. For example, the cumulative explanatory power of the pre-entry correlates considered remains greater for HE access than it does for completion or dropout, regardless of the race group in question. Similarly, within each race group it remains the case that demographics and school-level factors collectively account for less of the relative explained variation in 4-year access, 4-year completion, and 3-year dropout than learner-level matric performance does. However, there are some subtle differences in the relative contributions of the various sets of pre-entry correlates between race groups and HE outcome metrics.

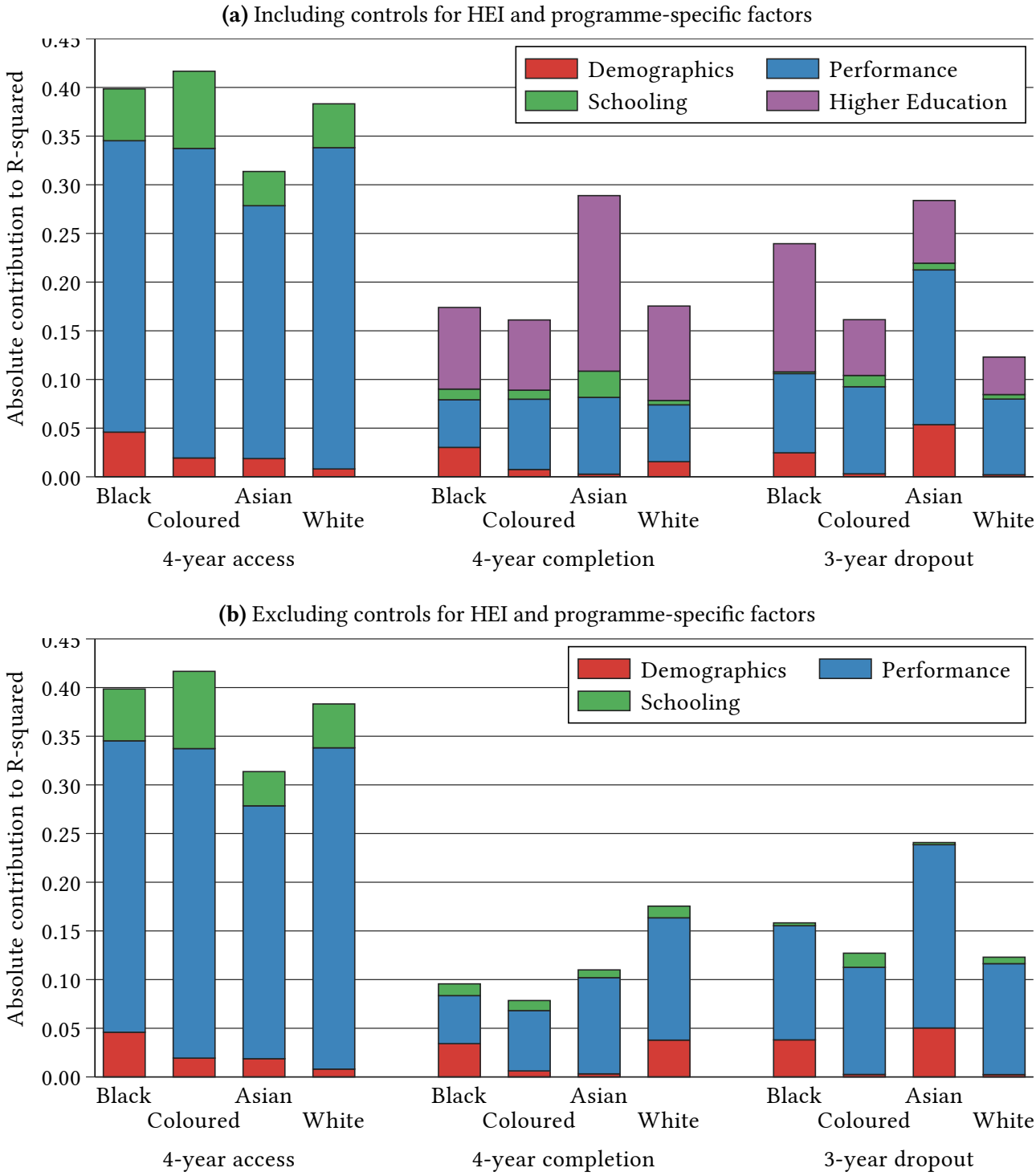
In relative terms, learner-level matric performance appears to explain marginally more of the variation in the 4-year HE access rates for Whites and Asians than it does for Blacks and Coloureds. However, these and other minor differences do not appear to change the fact that, with the possible exception of Asian learners, the cumulative predictive power of the various pre-entry correlates for HE access are broadly similar across race groups. Again, with the exception of Asian students, this also seems to be the case in terms of the extent of the explained variation in 4-year completion among students from different race groups.

The most significant differences between race groups appear to be in terms of the explained variation in 3-year dropout rates for the WCED 2006 first-time entering undergraduate cohort. Collectively, the correlates included in the estimations explain substantially more of the variation in 3-year dropout for Black and Indian students than they do for Coloured and, in particular, White students. Moreover, the relative importance of HE-level factors for 3-year dropout is much higher for Black students than it is for the other race groups.

A number of interesting changes occur when controls for HEI and programme-specific factors are excluded from the LPM estimations. While the extent of the explained variation in 4-year completion drops significantly for Black, Coloured, and Indian students, it remains virtually unchanged for White students. The implication is that there is most likely a much stronger association between pre-entry correlates and selection into specific HEIs and academic programmes for Whites than there is for the other race groups. Moreover, without controlling for HE-level factors, the extent of the explained variation in 4-year completion for White students is substantially higher (17%) than it is for the other race groups (8% - 11%).

Several general conclusions can be drawn from these results. First, across all race groups, matric performance is by far the most important pre-entry correlate of HE access and success considered, in terms of contributing far more to the explained variation in HE access, throughput, and retention than demographics or school-level

Figure 3.7: Absolute contribution of pre-entry and HE-level correlates to the estimated explained variation in HE access, completion, and dropout rates by race



NOTES: The heights of the shaded bars denote the respective contributions of demographic, learner-level matric performance, school type and school-level matric performance, and HE-level factors to the explained variance in the estimated 4-year access, 4-year completion, and 3-year dropout rates for learners from the 2005 WCED matric cohort, by race. These contributions are based on LPM specifications that are identical to those presented in Tables 3.21a - 3.21d , with the exception that they were estimated separately for each race group. The respective contributions to the R^2 statistics from these LPMs were estimated using the user-written *shapley2* command in Stata 13.1 (Juárez, 2012).

factors. Second, demographics and school-level factors remain non-negligible determinants of HE outcomes, and their relative importance seems to be greatest among Coloured and Black learners. Third, for some groups, most notably Whites, selection into specific HEIs and academic programmes is far more dependent on matric performance and school level factors than it is for other groups. Lastly, the pre-entry correlates, though clearly predictive of all three HE outcomes considered, are far more predictive of HE access than they are of HE success.

3.6.4 The relative contributions of HE access and HE throughput to observed graduation differentials

The analysis in the preceding sections provides important insight into the marginal contributions and relative importance of various pre-entry and HE-level correlates for observed HE access, completion, and dropout rates in the Western Cape. Ultimately, however, it is not HE access and throughput rates in and of themselves that are of importance, but rather how they relate to HE graduation outcomes. It therefore remains critical to understand to what extent differentials in observed HE graduations are driven by differentials in HE access rather than differentials in HE throughput. This is particularly relevant from the perspective of HE policy, since interventions aimed at improving the equitability of HE graduation outcomes can only be effective if they are appropriately targeted. To conclude the empirical analysis in this chapter, this section therefore considers the relative contributions of HE access and HE completion rates to the racial differentials in observed HE graduations among the 2005 WCED matric cohort.

The percentage of learners from the 2005 WCED matric cohort who entered HE in the year after writing the 2005 SCE and successfully completed their HE studies within four years can be expressed as $m_4 = a_1 \times c_4$, where a_1 and c_4 respectively denote the 1-year HE access rate for the 2005 WCED matric cohort and the 4-year completion rate for the WCED 2006 first-time entering undergraduate cohort. For the sake of convenience, m_4 is hereafter referred to as the 4-year *conversion rate* as it reflects the percentage of learners from the 2005 WCED matric cohort who were not only able to access HE in the year immediately following the 2005 SCE, but who were also able to convert that access into HE success by virtue of successfully completing their programmes within four years of study.

Table 3.24: HE access, completion, and conversion rates (%) for the 2005 WCED matric cohort, by race

	Black	Coloured	Asian	White	All
1-year access rate	11.7	14.6	52.1	34.4	18.9
4-year completion rate	31.9	43.0	46.9	62.1	49.0
4-year conversion rate	3.7	6.3	24.5	21.4	9.3

NOTES: Estimates are weighted. The 1-year access rate is estimated for learners from the 2005 WCED matric cohort while the 4-year completion rate is only estimated for students from the WCED 2006 first-time entering undergraduate cohort. The estimated 4-year conversion rate for each group is equal to the product of the 1-year access and 4-year completion rates for that group. The 1-year access and 4-year completion rates for the respective race groups correspond to those presented in Table 3.14.

Table 3.24 shows the 1-year access, 4-year completion, and 4-year conversion rates for different race groups in the 2005 WCED matric cohort. The estimates show that low levels of HE access among Black and Coloured learners are compounded by low levels of throughput. As a result, the estimated 4-year conversion rates for

Black (3.7%) and Coloured (6.3%) learners in the cohort are very low. Even among White and Asian learners, the estimated 4-year conversion rates are alarmingly low at only 24.5% and 21.4%, respectively.[84]

In the present context, it is not the levels of the various conversion rates that are of interest, but rather the differences in conversion rates between race groups. These differences are illustrated graphically in Figure 3.8. Due to the fact that Coloured, Asian, and White learners were all not only statistically significantly more likely to access HE within 1-year of writing the 2005 SCE than Black learners, but also statistically significantly more likely to complete their programmes within four years, all three race groups had statistically significantly higher unconditional 4-year conversion rates than Black learners. This is particularly evident for White and Asian learners, for whom the unconditional 4-year conversion rates are respectively estimated to have been 18 percentage points and 21 percentage points higher than the estimated conversion rate for Black learners.

In light of the discussion so far, it is not surprising that the unconditional conversion rates for Black and Coloured learners from the 2005 WCED matric cohort were so much lower than those for White and Asian learners. However, as explained in the preceding sections, the differences in HE access and throughput and, therefore, also in conversion are partly the result of significant underlying differences in matric performance and other pre-entry factors among different race groups. Recall that the estimates in Table 3.21a show that Coloured, Asian, and White learners are all statistically significantly less likely to access HE within 4-years, on average, than Black learners once demographic, matric performance, and school-level factors have been taken into account. A similar result is evident when looking at the estimated conditional 1-year HE access rate differentials presented in Figure 3.8.

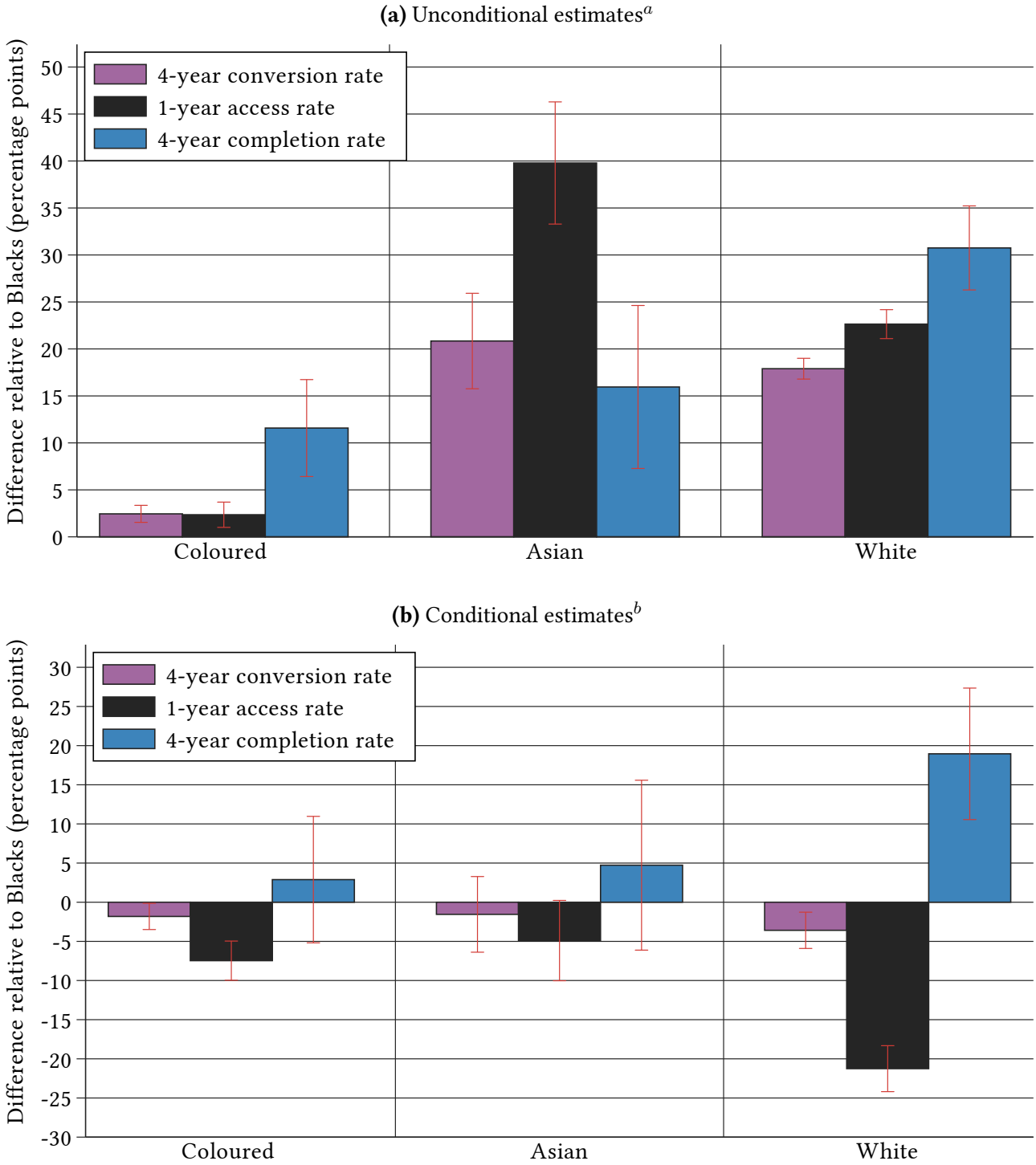
Both Coloured and White learners are estimated to have been statistically significantly less likely to access HE within one year of writing the 2005 SCE than Black learners, once other underlying differences have been controlled for. In particular, it is striking that the expected 1-year HE access rate for White learners from the cohort is estimated to have been more than 21 percentage points lower than the 1-year access rate for Black learners, *ceteris paribus*.

While there are likely to be numerous reasons why the conditional HE access rates for White learners, and to a lesser extent also for Coloured learners, were so much lower than those for Black learners from the 2005 WCED matric cohort, the finding is consistent with the notion that the HE admission criteria for prospective Black students may, on average, have been more lenient than it was for learners from other race groups. This does not necessarily mean that HEIs explicitly set different minimum entry criteria for applicants from different race groups. Instead, it may simply be the case that the types of programmes and HEIs for which Black learners from the 2005 WCED matric cohort applied had, on average, lower entry requirements than the types of programmes and HEIs for which learners from other race groups tended to apply. However, this should, to some extent, already be accounted for by the HEI and programme-specific variables included in the estimations underlying the figures in Figure 3.8.

If the reason for the statistically negative HE access rate differential for White relative to Black learners is reflective of differences in HE selection criteria between race groups, then it is reasonable to expect that there will also be racial differentials in HE throughput. Specifically, if the HE selection criteria that is generally applicable to White learners is more effective at screening out weak applicants than the selection criteria for

[84] As is to be expected, the estimated conversion rates for the 2005 WCED matric cohort rise when one also includes learners who entered HE for the first time in 2007, 2008, or 2009. Nevertheless, the conversions rates for Black (4.8%) and Coloured (6.9%) learners still remain far lower than those for Asian (28.8%) and White (24.3%) learners when these late HE entrants are included in the estimations.

Figure 3.8: Unconditional and conditional estimated racial differentials (percentage points) in HE access, completion, and conversion rates for the 2005 WCED Matric cohort



NOTES: Bars represent the estimated percentage point differentials between the respective 1-year access, 4-year completion, and 4-year conversion rates for Coloured, Asian, and White learners from the 2005 WCED matric cohort relative to those for the Black learners from the cohort. Capped lines denote the 95% confidence intervals surrounding the point estimates. The estimated 4-year conversion rate for each group is equal to the product of the 1-year access and 4-year completion rates for that group. [a]Figures are based on the unconditional regression estimates presented in Table E.18 [b]Figures are based on the conditional regression estimates presented in Table E.19.

Black learners, it would not only be the case that relatively fewer White learners would access HE, conditional on other factors, but also that those White learners who do gain access will, on average, perform better in terms of throughput than Black students. This is indeed what is seen in Figure 3.8, which shows that the estimated conditional 4-year completion rate for White students from the WCED 2006 first-time entering undergraduate cohort was 19 percentage points higher, on average, than the 4-year completion rate for Black students from the cohort.[85]

Despite the large 4-year completion rate premium for White relative to Black students, the even larger 1-year access rate deficit for White relative to Black learners from the 2005 WCED matric cohort means that the conditional 4-year conversion rate for White learners was estimated to be about 3.6 percentage points lower than that for Black learners. In other words, on average and conditional on the factors included in the estimations, Black learners from the 2005 WCED matric cohort were statistically significantly more likely to access HE and complete their undergraduate qualifications within four years than White learners from the cohort.

These findings have a several of important implications. First, they show that HE access in the Western Cape is fairly progressive in the sense that Black and, to a lesser extent also Coloured, matric learners are on average more likely to access HE than White learners, conditional on underlying differences in matric performance and school-level factors. Second, they suggest that there may be an inverse association between the racial differentials in HE access and the racial differentials in HE throughput. Again, such an association is expected if the reasons for lower HE access rates among certain groups can be attributed to differential HE entry requirements. Third, the findings indicate that policies aimed at redressing racial imbalances in HE graduations by focussing exclusively on the equitable expansion of HE access are unlikely to be particularly effective. This is especially true for policies that aim to increase access by lowering the minimum entrance requirements for certain groups. Ultimately, the emphasis on equitable access must be balanced with an emphasis on equal opportunity of success for learners who are able to access HE.

3.7 Conclusion

Despite the progress that has been made in expanding HE access in South Africa over the past two decades, the HE system is still not producing sufficient numbers of graduates to meet the demand for scarce skills in the economy (Fisher and Scott, 2011:1). HE access rates remain low overall and are moreover exacerbated by low levels of throughput and high levels of dropout in large parts of the public HE system. In addition, opportunities for HE access and success are still inequitably distributed across race groups.

In order to improve the outcomes produced by the HE system, it is firstly necessary to understand why they obtain. This chapter has contributed to the existing literature on HE participation, throughput, and dropout in South Africa by examining the extent and underlying correlates of HE access and success among secondary school leavers in the Western Cape. By explicitly linking unit-record data on matric learners with unit-record data on HE students, the chapter is the first study in South Africa to follow an entire cohort of matric learners into and through the public HE system at a provincially representative level.

[85] While the estimated conditional 4-year completion rate differentials for Coloured and Asian students relative to Black students from the WCED 2006 first-time entering undergraduate cohort are positive, they are not statistically significant.

The analysis presented provides new insights into the factors that underpin observed HE outcomes in the Western Cape and, in some respects, also in South Africa as a whole. However, it is important to emphasise that the results in this chapter are subject to several caveats. Though some of these have already been discussed at length in the preceding sections, it is worth briefly highlighting the most important caveats before concluding on the implications of the chapter's findings.

First, because of the short time frame over which learners from the 2005 WCED matric cohort could be tracked through the HE system using the 2006 - 2009 HEMIS data, the estimates of HE access, completion, and dropout that are presented in this chapter cannot be fully reflective of the ultimate extent of HE access and success among the cohort. As explained in Section 4.2, the 4-year access, 4-year completion, and 3-year dropout rates are all likely to understate the ultimate extent of HE access, throughput, and dropout among the cohort. Nevertheless, these metrics provide credible measures of HE access and success over the short run. More importantly, they are sufficient for illustrating the extent to which HE access and success vary at the hand of various pre-entry correlates and HE-level factors.

Second, given the underlying compositional differences between the 2005 WCED matric cohort and the 2005 national matric cohort as well as the differences in the HE landscape in the Western Cape relative to that of the rest of the country, many of the findings regarding the levels of HE access, throughput, and dropout among the 2005 WCED matric cohort may not necessarily be reflective of HE access, throughput, and dropout at the national level. Crucially, however, the associations between the various pre-entry correlates considered and the observed HE outcomes in the Western Cape, as identified in Sections 3.4 - 3.6, are expected to also be characteristic of the rest of South Africa more generally.

Third, while the multivariate analysis attempted to incorporate as extensive as possible a set of factors that may have bearing upon HE access and/or HE success, the list of variables that could be included in the estimations was ultimately subject to what was available in the respective versions of the WCED matric and HEMIS datasets that were used in this chapter. Notably absent from the regressions are measures of family background (parental education, etc.), household income and financial means, as well as personal preferences and behavioural factors. These and many other factors that are not accounted for in this chapter are likely to be important for explaining observed HE outcomes in the Western Cape. However, while this may indeed be the case, one of the major contributions of the analysis in this chapter is that it controls for a more extensive set of correlates than is commonly the case in representative quantitative studies on HE throughput and HE access in South Africa.

Fourth, and most importantly, the estimates from the LPMs presented in Section 3.6 cannot be interpreted as causal. Instead, they provide, at best, descriptions of the partial associations between certain correlates and HE outcomes in terms of access, completion, and retention. While it is plausible that at least some of these associations may be indicative of underlying causal relationships, the analysis presented in this chapter cannot offer any proof of such causality.

Despite the aforementioned caveats, it is possible to draw a number of stylised findings from the analysis presented.

It is evident that HE access and success in the Western Cape remains low and inequitably distributed across dimensions of race and socio-economic status. Black and Coloured individuals are not only significantly less likely to enrol in HE than White and Asian individuals, but also far less likely to complete their undergraduate

studies rather than drop out of HE. Crucially, however, these inequalities appear to be strongly rooted in underlying differences in scholastic achievement between learners from different race groups. Once these differences have been taken into account, racial differentials in most HE outcomes either become statistically insignificant or, in the case of HE access, are effectively reversed.

More generally, it is clear that observed HE outcomes in South Africa are strongly predicated on matric performance. Among all race groups it remains true that, on average, learners who perform better in matric are significantly more likely to accede to HE and complete their undergraduate studies. Of course, matric performance is not a noiseless measure of academic ability and there remains substantial variation in HE access and throughput rates at most points on the matric performance distribution. This is also evidenced by the fact that matric performance is a far weaker predictor of HE completion and dropout than it is of HE access.

Lastly, the findings regarding the differential conditional HE access and throughput rates for learners from different race groups have important implications for the ways in which inequalities in the outcomes produced by the HE system should be addressed. The results show that equitable HE access is not a sufficient condition for equitable HE success. The continued expansion of HE access is unlikely to result in commensurate improvements in HE outcomes unless the articulation gap between the secondary schooling system and HE, particularly among historically disadvantaged learners, is addressed. An overemphasis on access without due cognisance of the potential implications for subsequent success is therefore likely to have perverse consequences.

In the absence of meaningful interventions that focus specifically on ensuring that learners who gain access to HE have a real chance of succeeding in their studies, the HE system is likely to remain little more than a revolving door for many (CHE, 2014*a*:11). Though the rationale underlying the drive towards increased HE access is noble, it is important to recognise that access without any real chance of success is not really access at all.

Chapter 4

Initial Teacher Education (ITE) graduate production and teacher supply in South Africa

4.1 Introduction

In recognition of the central role that teachers play in the schooling system, much of the National Development Plan's chapter on *"improving education, training and innovation"* is devoted to underlining the importance of developing a competent, highly qualified, and highly motivated body of teachers in South Africa (NPC, 2011:261 - 294). Presently, however, the country is faced both with an absolute shortage of teachers and a relative shortage of adequately qualified and competent teachers, particularly in key areas like mathematics and the physical sciences (DBE and DHET, 2011:11). These shortages not only threaten to undermine the educational objectives set out in the NDP, but, more fundamentally, serve as a constraints to improving educational outcomes in South Africa.

While numerous studies on the issue of teacher supply and demand in South Africa have been conducted[1], there remains a need to improve our understanding of the underlying dimensions and pervasiveness of the country's teacher shortages, the reasons why such shortages persists, and the most appropriate policy interventions through which those shortages may be redressed (Arends, 2010; CDE, 2011). In particular, there is a need to better understand the extent to which current trends in the production of initial teacher education (ITE) graduates by the higher education (HE) system either undermines or strengthens the supply of qualified teachers to the schooling system and how it is likely to influence teacher supply in the foreseeable future. Such an understanding not only necessitates an evaluation of the numbers and types of individuals that are drawn into initial teacher training, but also comprehensive analysis of the size and composition of annual teacher education graduate flows from South Africa's HE system.

[1] For studies on teacher demand and supply in South Africa that have been conducted in the last ten years see, for example, DOE (2005*b*), Hall *et al.* (2005), Bertram *et al.* (2006), Bertram *et al.* (2007), CHEC (2009), Chisholm (2009), Gordon (2009), Mahomed (2009), Paterson and Arends (2009), Arends (2010), Deacon (2010*b*), SACE (2010), CDE (2011), DBE and DHET (2011), Onwu and Sehoole (2011), Deacon (2012), Diko and Meyiwa (2012), Adendorff *et al.* (2014), CDE (2015).

Given that the public HE sector is the primary provider of new, technically qualified teachers to the schooling system, this chapter uses aggregate data from the Higher Education Management Information System (HEMIS), to analyse teacher education graduate production in the country between 2004 and 2013.[2] Improving teacher supply is not simply about getting sufficient numbers of technically qualified educators into schools, but rather about getting sufficient numbers of adequately prepared, appropriately trained, competent and motivated teachers into the right schools. However, because of several limitations imposed by the nature of the aggregate HEMIS data, this chapter is forced to assume a narrow perspective on teacher supply, focussing primarily on the numbers and demographic composition of individuals who enter and graduate from ITE programmes in the public HE system. Despite this restricted focus, the objective throughout is to identify the major constraints to increasing the supply of qualified teachers in South Africa in terms of ITE graduate production.

The chapter seeks to answer six main research questions: (1) What are the dominant trends in first-time enrolments and graduations in ITE programmes at public HE institutions (HEIs) and what are the potential factors that might explain those trends? (2) What does the demographic composition and geographic distribution of new ITE programme students and graduates look like, and how has it changed over time? (3) Given South Africa's current and projected future demand for teachers, are enough individuals entering ITE programmes? (4) Are enough qualified potential new teachers being produced by the HE system? (5) If the numbers of ITE graduates being produced is not sufficient to satisfy demand, is it because too few individuals are entering ITE programmes or because HEIs are failing to convert student enrolments into graduations to a sufficient extent? (6) How does the timing and extent of programme completion and throughput vary between cohorts of ITE programme students and how do completion rates in ITE programmes at distance institutions (UNISA) compare with those at contact HEIs?

The findings from the analysis presented below show that first-time enrolments in ITE programmes at public universities have risen substantially since 2006, not just in absolute terms, but also when compared to first-time enrolments in other comparable university programmes. However, while the trends in ITE programme enrolments and, more recently, also in graduations are arguably encouraging, current levels of ITE graduate production are not.

The higher education system is still not producing sufficient numbers of ITE graduates to meet the annual demand for qualified new teachers. As is illustrated below, this is partly due to the fact that the rise in the number of individuals entering ITE programmes is only a fairly recent phenomenon, but also because this rise has coincided with changes in the underlying composition of ITE programme students which may have served to temper graduations to some extent. In particular, it is evident that UNISA now accounts for a far larger share of all ITE students in the public higher education system than it did in 2004 and this share only appears to be increasing over time. This has important implications for current and future levels of ITE graduate production as ITE students at UNISA not only have far lower completion rates than those at contact universities, on average, but also tend to take far longer to complete their qualifications.

Despite the compositional changes between 2004 and 2014, the projections of ITE graduations presented in this chapter indicate that, conditional on the HE system's ability to sustain the current rise in the number

[2] Though recent studies have noted that the numbers of ITE graduates produced by private HEIs in South Africa may be increasing over time (see, for example, Adendorff *et al.* (2014:5) and CDE (2015)), private ITE graduate production still accounts for only a small proportion of overall ITE graduate production in South Africa (CDE, 2015:11). In fact, DBE and DHET (2011:11) notes that *"The number of new teachers currently being produced by private higher education institutions is negligible."*.

of individuals entering ITE programmes without experiencing a decline in throughput rates, the system as a whole may be expected to start producing sufficient numbers of ITE graduates to satisfy projected levels of annual qualified teacher demand within the next decade. However, the data also suggests that, while the numbers of ITE graduates that are likely to be produced in the near future may be high enough, it remains unlikely that the system will be producing sufficient numbers of the types of ITE graduates that are most needed in South African schools.

The chapter proceeds as follows:[3] Section 4.2 describes the HEMIS data used in the analysis, explains the rationale for focussing on the 2004 - 2013 period, and provides a comprehensive overview of the limitations imposed by the nature of the HEMIS data and the methodology underlying the identification of ITE programme students.

Section 4.3 investigates the major trends in first-time enrolments and graduations in both undergraduate and postgraduate ITE programmes, highlights the increasing centrality of UNISA in the teacher graduate production landscape, discusses the respective roles that the status of the teaching profession in South Africa and the availability of financial support play in explaining the rise in the numbers of students entering ITE programmes, explains the distinction between new ITE graduate production and new qualified teacher supply, and evaluates current and projected levels of ITE graduate production in the context of estimated and projected teacher demand.

Section 4.4 focusses on the demographic composition and geographic distribution of ITE students and graduates in South Africa, how this composition has changed since 2004, how it is likely to change in the future, and what the potential implications of these changes are for numbers and types of ITE graduates that the HE system produces. Specifically, the section disaggregates the trends in first-time enrolments and graduations in ITE programmes by gender, race, home language, geographical location, and age.

Section 4.5 assesses the extent to which the public HE system successfully converts first-time enrolments in ITE programmes into ITE graduations by considering throughput rates among cohorts of ITE students. In addition to explaining why completion rates are preferable to simple graduation rates as measures of student throughput, outlining the methodology employed to estimate completion rates using the HEMIS data, and describing the general structure, timing, and nature of throughput in ITE programmes in the public HE system, the section investigates the extent of completion rate differentials between cohorts of ITE programme students and identifies the major demographic and institutional dimensions along which those differentials are delineated.

Lastly, Section 5 synthesises and contextualises the chapter's main findings within a conceptual framework of teacher supply which argues that, in order to increase the supply of qualified teachers in South Africa, targeted interventions are required in each of the four phases of the teacher supply chain, namely (1) the recruitment of new ITE programme students, (2) the conversion of ITE programme entrants into ITE graduates, (3) the absorption of qualified potential teachers into the schooling system, and (4) the retention of employed teachers within the schooling system.

[3] This chapter does not present a self-contained literature review. Instead, findings from the extant literature on teacher supply and demand in South Africa are integrated throughout the analysis.

4.2 Data and Methodology

4.2.1 The Higher Education Management Information System (HEMIS)

The data used in the analysis below comes from the Department of Higher Education and Training's (DHET) Higher Education Management Information System (HEMIS) which is the national repository for management information on all South African public HEIs (Paterson and Arends, 2009:21). Each HEI submits administrative information from its own institutional management information system to national HEMIS on an annual basis, under the agreement that DHET may not release any personal or sensitive institutional information to third parties.[4]

In its original form, the national HEMIS database contains comprehensive detailed student and institutional unit-record information for every individual who enrolled at a public HEI in South Africa since 2000. However, because of the aforementioned agreement between DHET and the respective HEIs, this database cannot be accessed directly.[5]

Publicly available versions of the HEMIS data contain only limited information and, for the most part, simply report the annual numbers of student enrolments and graduations for each HEI, disaggregated over a small subset of institutional and student characteristics. Although these data are derived from the HEMIS student unit-records, they contain such a restricted subset of the original HEMIS variable fields and are aggregated in such a way that it is no longer possible to identify individual student records. While this ensures that one cannot access sensitive personal or institutional information from the data, it also severely restricts the depth of the analysis that the data can be used for.

Some aggregate HEMIS data can be accessed via the DHET's own annually published *HEMIS indicator tables*[6] or via the Centre for Higher Education Transformation's (CHET) *South African Higher Education Open Data Portal*.[7] The aggregated HEMIS data used in the this chapter, however, comes from IDSC's Higher Education Data Analyser (HEDA).[8] For the sake of brevity, the HEDA version of HEMIS is hereafter simply referred to as *HEMIS* or *aggregate HEMIS* whilst the full unit-record original HEMIS database is referred to as *original HEMIS*.

As mentioned above, the structure of the aggregate HEMIS data imposes several limitations on the types of research questions that its analysis can potentially address. For example, it is not possible to use the data to track the performance of individual students, nor is it possible to conduct the kind of nuanced, disaggregated analysis of trends and student or institutional performance correlates (which are essential for informing policy) that would be possible with richer unit-record data. Nonetheless, the data can be used to answer basic questions regarding broad trends and patterns in the numbers of enrolments and graduations from South Africa public HEIs.

[4] In addition to its administrative and internal monitoring roles, HEMIS also informs institutional planning at HEIs and determines the allocation of financial support from DHET (Paterson and Arends, 2009:21).

[5] Only four director-level staff members within the DHET have access to the full HEMIS database (van Schalkwyk, 2013).

[6] See http://www.dhet.gov.za/SitePages/Org_Universities.aspx

[7] See http://www.chet.org.za/data/sahe-open-data

[8] The HEDA (2015) data can be accessed via the IDSC homepage at http://www.idsc.co.za/

4.2.2 Period of analysis

The primary analysis presented below covers the period 2004 - 2013. There are at least three good reasons for focussing on this particular period.

First, the period represents the most recent decade of available audited HEMIS data and the data series is therefore both long enough in a longitudinal sense to uncover long-term trends and also up-to-date enough to shed light on recent short-term patterns and changes.

Second, South Africa's 36 public technikons and universities were amalgamated into 23 HEIs comprising 11 traditional universities, 6 comprehensive universities, and 6 universities of technology in 2004. Therefore, 2004 presents a natural "breaking point" in the HE data with the data for the period following the amalgamation being significantly less fragmented and institutionally heterogeneous than the data for the period which preceded it.

Third, while public HE data is available for the period before 2004, the available pre-2000 data is not nearly as rich as the data for the post-2004 period. More importantly, Paterson and Arends (2009) already provide a comprehensive and nuanced review of teacher graduate production from public HEIs in South Africa between 1995 and 2004 based on the available public HE data for the period.[9] The present chapter does not seek to replicate their analysis. Instead, what follows is intended to update and extend Paterson and Arends (2009)'s research by offering new insights based on more contemporary and, in some ways, more detailed data.

4.2.3 Methodology

The objective of the empirical analysis is to use the available information on both student inputs (enrolments) and student outputs (graduations) in the HEMIS data to estimate, describe, and evaluate the trends in, and the institutional and socio-demographic dimensions of, teacher education qualification production in South Africa. This firstly requires identification of teacher education qualifications in the data.

4.2.3.1 Teacher education qualifications

The National Qualifications Framework Act 67 of 2008 describes the minimum requirements for teacher education qualifications in South Africa and clearly identifies which diplomas, certificates, and/or degrees qualify or used to qualify individuals to work as teachers in South African schools and the conditions under which they do so (DHET, 2011*a*). Teacher education programmes offered at HEIs can broadly be separated into Initial Teacher Education (ITE) programmes and Continuing Professional Teacher Development (CPTD) programmes.

While ITE qualifications are meant to qualify unqualified individuals as beginner teachers in specific phases and/or subjects, CPTD qualifications are meant to qualify underqualified or unqualified existing teachers as qualified teachers or to further enhance and refine the teaching capacity of qualified teachers (DHET, 2011*a*:15). The respective approved teacher education qualifications and their classifications into ITE or CPTD are presented in Table 4.1. The focus throughout this chapter falls on ITE, rather than CPTD qualifications.

[9] The aggregate HEMIS data used in this study, while superficially different from the HEMIS data used by Paterson and Arends (2009) in a number of ways, produces the same results for the period 2000 - 2004.

Table 4.1: Current and former HE teacher education qualifications in South Africa

Qualification	Acronym/Abbreviation	Type	NQF Level
Current qualifications[a]			
Bachelor of Education degree	BEd	ITE	7
Post Graduate Certificate in Education *or* Advanced Diploma in Teaching	PGCE Adv Dip (Teaching)	ITE	7
Advanced Certificate in Education *or* Advanced Certificate in Teaching	ACE Adv Cert (Teaching)	CPTD	6
Advanced Diploma in Education	Adv Dip (Ed)	CPTD	7
Postgraduate Diploma in Education	PG Dip (Ed)	CPTD	8
Bachelor of Education Honours degree	BEd Hons	CPTD	8
Master of Education Degree	MEd	CPTD	9
Doctor of Education Degree	DEd	CPTD	10
Diploma in Grade R Teaching	Dip (Grade R Teaching)	Grade R	6
Other/Former qualifications[b]			
National Professional Diploma in Education	NPDE	CPTD	6
National Diploma in Education	NDE	ITE	6
National Higher Diploma in Education	NHDE	CPTD	7
Further Diploma in Education	FDE	CPTD	7

NOTES: [a] Qualifications and programmes for ITE and CPTD as set out in (DHET, 2011*a*). [b] Qualifications that are still offered at some HEIs and are listed as approved current of former teaching qualifications by SAQA.

In theory, one could identify teaching qualifications in the original HEMIS data based on the approved names or designators given to those qualifications by the respective HEIs. Although the choice of appropriate qualification names/designators is discretionary and there is no standard naming convention applied across institutions or even over time, most qualification names captured in HEMIS should be sufficiently descriptive to allow one to distinguish not only between teacher education programmes and non-teacher programmes, but also between ITE and CPTD qualifications (Paterson and Arends, 2009:85).

Even if a particular qualification name/designator is too vague to allow for immediate identification as either a teaching or non-teaching qualification, it would be possible to query that qualification on the South African Qualifications Authority (SAQA) qualification database in order to determine its precise nature.[10] In the absence of any other information, the qualification name would thus provide the definitive basis for accurately identifying teacher education qualifications. Unfortunately, although qualification names/designators are captured by the *QUALNAME* variable when HEIs report to HEMIS[11], this variable field is not available in the aggregate HEMIS data that can be accessed via HEDA.[12]

In the absence of any descriptive qualification name or designator field(s), the only variables that are available in the aggregate HEMIS data with which one can attempt to identify teaching qualifications are the qualification type (*QUALTYPE*) and Classification of Educational Subject Matter (*CESM*) fields. The nature of these variables and the potential biases they may introduce when used to classify qualifications as teacher education programmes or non-teacher education programmes is discussed below.

[10] The SAQA database contains detailed information on all current and historic approved, formal study programmes at South African public HEIs.

[11] See http://41.72.139.116/Valpac_Help/Ded_001_010.htm

[12] To the author's knowledge, the *QUALNAME* field is not available in any publicly accessible nationally representative version of HEMIS.

4.2.3.2 HEMIS *qualification type*

The *qualification type* field (*QUALTYPE*) in HEMIS is a standardised scheme with which HEIs indicate the highest, most relevant qualification for which an individual is enrolled when they report to HEMIS. Importantly, the *QUALTYPE* field only describes the level of the programme for which a student is enrolled and conveys no information about the associated field(s) of study or focus area(s). The HEMIS qualification type scheme was changed in 2005 following the amalgamation of South Africa's traditional universities and Technikons and again in 2009 in order to accommodate further changes in the HE system and homogenise the new qualification types being offered at HEIs. The HEMIS qualification type schemes corresponding to the three different periods are shown in Table A.1.

Inspection of the table should make it clear that, even in ideal circumstances where all HEIs consistently classify their qualifications under the HEMIS qualification type scheme in exactly the same manner, the *QUALTYPE* field simply is not detailed enough to allow one to distinguish between certain qualification types. For example, it is conceivable that a HEI offering both the Post Graduate Certificate in Education (PGCE) and the National Professional Diploma in Education (NPDE) could jointly classify them under the HEMIS qualification type of *"Post-graduate Diploma or Certificate"* despite the fact that the former is an ITE qualification and the latter is a CPTD qualification. Moreover, while the HEMIS *QUALTYPE* scheme is supposed to guide institutions in how they should classify their qualifications, it is ultimately up to them to choose how they do so. This not only means that different HEIs may classify what is effectively the same teaching qualification under different HEMIS qualification types, but also that institutions may classify the same qualification differently over time or even across individuals. Table H.2 gives an indication of the various ways in which different approved teacher education qualifications may be classified under the HEMIS qualification type scheme.

The implications of likely inter- and intra-institutional "inconsistencies" in classifying qualifications under the HEMIS qualification type scheme is simple: While in theory the HEMIS *QUALTYPE* field could be used to broadly identify the qualification level/type for which an individual is enrolled, it is not a definitive indicator and using it as such when conducting analysis on aggregate HEMIS data is likely to bias results in potentially significant and unknown ways.

4.2.3.3 Classification of Educational Subject Matter (CESM)

All formal qualifications in HEMIS are arranged according to Classification of Educational Subject Matter (CESM) codes (DOE, 2008). These codes are part of a standardised classification scheme and are used to describe the focus and/or specialisation areas of academic qualifications in a way that ensures comparability between HEIs. The CESM scheme is hierarchically structured and comprises three nested descriptor levels, each of which describes the focus area of an academic module or course in further detail. First-order CESM codes (CESM1) are the top-level descriptors and separate fields of study and specialisation areas into broad categories.[13] These categories are then subdivided into second-order CESM codes (CESM2) which are themselves subdivided into third-order CESM codes (CESM3), providing more nuanced classifications of the knowledge

[13] First-order CESM codes (CESM1) can, for example, tell you whether the content of a course or module broadly falls more within the ambit of "Education" (CESM1 = 07) rather than "Engineering" (CESM1 = 08).

content associated with the major subject matter (DHET *et al.*, 2008:5).[14] Table H.3 provides a breakdown of the CESM2 codes that fall under the broad CESM1 category of "Education".[15]

Critically, CESM codes are used as descriptors at the course level rather than at the qualification level. In other words, they are used as standardised designators to describe the focus areas of specific subjects and/or modules that individuals complete as part of their academic programmes. In addition, HEIs exercise discretion when classifying their own programmes/courses into CESM categories (Paterson and Arends, 2009:108). This implies that there is not necessarily a one-to-one correspondence between a specific academic qualification offered at a HEI and a specific CESM category or code. Up to four CESM codes may be used to describe the focus areas of courses/modules taken as part of a qualification. In such cases, students' academic qualifications are fractionally partitioned across the various CESM codes under which they are classified when reporting to HEMIS (Paterson and Arends, 2009:110).

All of the information on student enrolments and graduations in the aggregate HEMIS data is based on the *fractional counts* that result from institutions classifying their academic programmes under the CESM scheme. This has important implications for the identification of teacher education programmes in the data.

For individuals who are enrolled in non-teacher education programmes, but take some education-related modules as electives, it is likely that part of those programmes will be apportioned under the CESM1 category of "Education". Similarly, for students who are enrolled in teacher education programmes, but take non-education modules as electives, it is likely that part of those programmes will be apportioned under other CESM1 categories. This means that one cannot fully distinguish between teacher education programmes and non-teacher programmes on the basis of CESM codes alone. In other words, the totals of the fractional counts for student headcount enrolments and graduates under the CESM1 "Education" category in the aggregate HEMIS data are likely only to approximate the total number of enrolments in, and graduations from, teacher education programmes in the HE system. A hypothetical illustration of this is given in Section H.3 of the appendix.

4.2.3.4 Identifying initial teacher education (ITE) programmes in aggregate HEMIS

Given the constraints imposed by the structure of the aggregate HEMIS data, the only way of identifying teacher-education programmes is to use information on *qualification type* and *CESM categories* in conjunction. This approach is similar to that used by Paterson and Arends (2009) who effectively classify all programmes that are apportioned under the CESM1 category of "Education" as teacher education qualifications. This approach, while simple, is likely to result in large numbers of non-teacher education qualifications erroneously being classified as teacher education qualifications. For example, none of the *General (3-year) Academic First Bachelor's Degrees* offered at South African HEIs qualify individuals as teachers.[16] Furthermore, with the exception of the Post Graduate Certificate in Education (PGCE), none of the post-graduate CPTD qualifications

[14] CESM2 could, for example, tell you if an "Education" module focusses on "Educational/Instructional Media Design" (CESM2 = 07.04) or on "Teacher Education and Professional Development" (CESM2 = 07.12). CESM3, in turn, adds even more depth and, in the case where a course is designated to deal with "Teacher Education and Professional Development", for example, may tell you whether the specific focus is "Mathematics - ECD and GET" (CESM3 = 07.11 12) or "FET: History" (CESM3 = 07.12 16).

[15] While CESM3 codes have existed since 2000, they the were not used for reporting to HEMIS until 2010. For the period 2000 - 2009, it is only CESM1 and CESM2 codes that are available in HEMIS. For a detailed breakdown of the CESM3 codes that fall under the category of "Education", see Erens *et al.* (1982:34 - 36) and DOE (2008:14 - 16) for the pre- and post-2010 periods, respectively.

[16] The only undergraduate degree offered at South African HEIs that can qualify individuals as teachers is the BEd degree which is offered either as a *4-year Bachelor's degree*, a *post-graduate Bachelor's degree*, or a *Baccalaureus Technologiae degree*.

listed in Table 4.1 qualify individuals as teachers for the first time. In order to enrol for a *BEd Hons*, *MEd*, or *DEd* degree, for example, it is necessary to already be qualified to teach in South African schools by virtue of having successfully completed at least a BEd degree.

Since the primary objective is to estimate how many newly qualified potential teachers are being produced by the public HE system and how many individuals enrol in programmes for the first-time with the aim of becoming newly qualified potential teachers, the approached employed here is slightly more nuanced than that employed by Paterson and Arends (2009). Specifically, the focus will be on identifying undergraduate and postgraduate ITE programmes/qualifications as accurately as possible, given the data constraints.

Broadly speaking, teacher education qualifications in this chapter are defined as (a) all programmes that are apportioned under the HEMIS CESM1 category of "Education" and (b) are classified as one of the *HEMIS qualification types* listed in block A of Figure 4.1. Such qualifications thus include undergraduate diplomas and certificates (some of which may be CPTD qualifications), undergraduate and postgraduate ITE programmes, and postgraduate CPTD degrees. By contrast, all programmes that are not apportioned under the CESM1 "Education" category are defined as non-teacher education qualifications (block B of Figure 4.1).

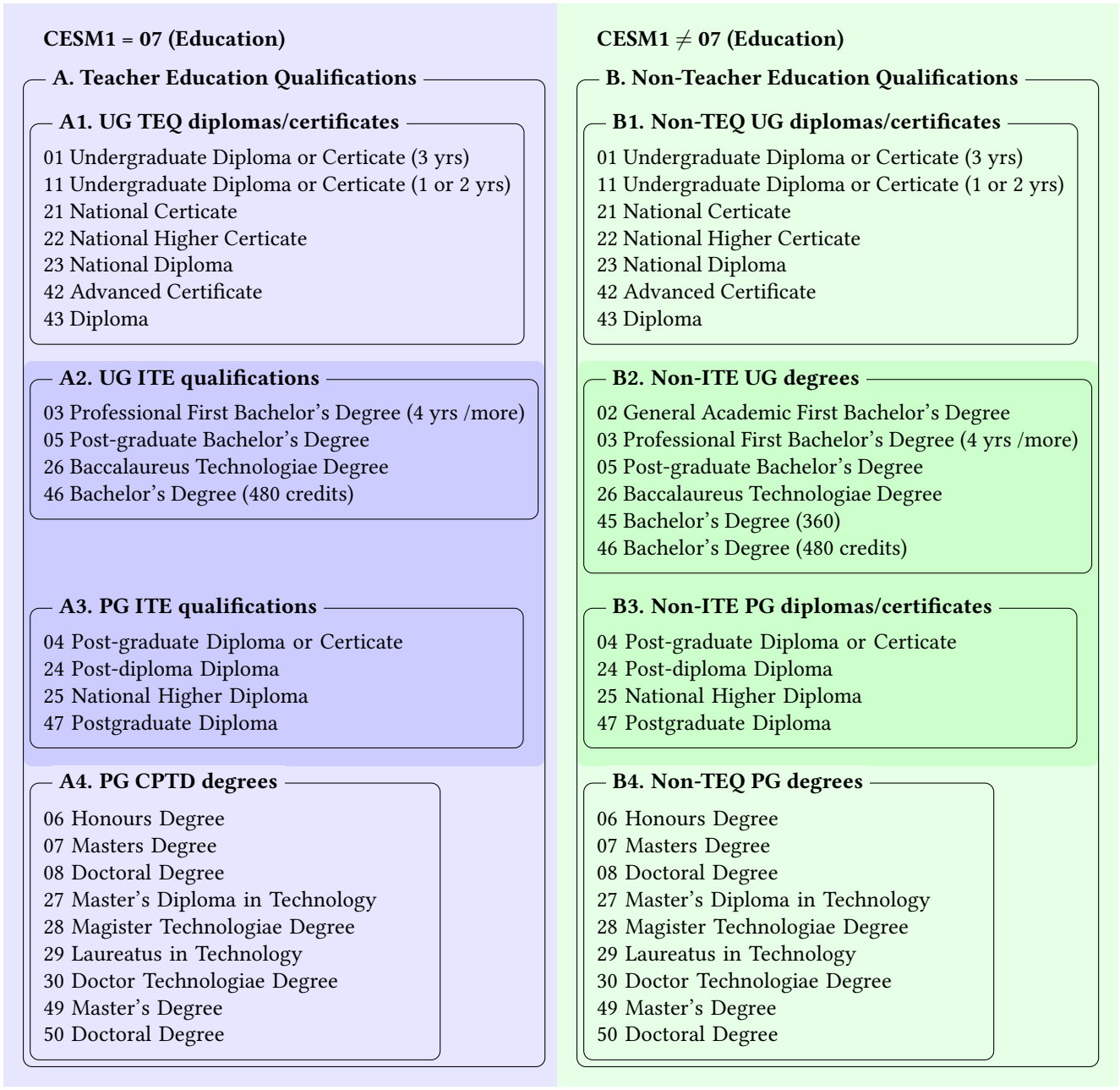
Blocks A2 and A3 respectively list the types of teacher education qualifications in HEMIS that are classified as undergraduate and postgraduate ITE qualifications. The focus throughout this chapter falls primarily on these two sets of qualifications. For the purposes of comparative analysis, however, blocks B2 and B3 also list the sets of qualification types that are hereafter respectively referred to as *non-ITE undergraduate degrees* and *non-ITE postgraduate diplomas/certificates* (collectively, *non-ITE programmes* or *qualifications*). These qualification types represent the most comparable programme alternatives for individuals who, while they may qualify to enter ITE programmes, choose not to do so.

In addition to the potential biases introduced due to differential qualification type and CESM classifications applied at HEIs, as explained above, it is important to note that ITE programmes as defined here will, in some instances, also include CPTD qualifications. In other words, the group of students enrolled in ITE programmes is likely to include existing underqualified teachers who are endeavouring to upgrade their qualifications via, for example, an Advanced Certificate in Education (ACE) or similar upgrading qualification. This cannot be avoided since the data simply is not sufficiently detailed to fully distinguish between ITE and CPTD qualifications at the postgraduate level that may or may not be classified within the same HEMIS qualification type. Therefore, the analysis of the trends in ITE graduations in this chapter is unlikely to provide a perfect description of the number of potential new teachers being produced by the public HE system, but more so of the number of newly qualified potential teachers that are being produced.[17] It is this latter group that is the focus of the analysis.

Lastly, because of the way in which HEIs classify programme levels and fields of study when reporting to HEMIS, calculations of summary measures such as totals and averages are likely to be biased in unknown ways, and to varying extents. All of the results from the analysis that follows are therefore only estimates and should be viewed as indicative rather than definitive.

[17] While the former group excludes all individuals who are already practising teachers, the latter group may include previously underqualified or unqualified practising teachers.

Figure 4.1: Classification of ITE and non-ITE programmes using the *type-field methodology* in aggregate HEMIS



NOTES: UG: undergraduate; PG: postgraduate; TEQ: teacher education qualifications; ITE: initial teacher education; CPTD: continuing professional teacher development. Qualification types and codes are as per the official HEMIS qualification type classification shown in Table A.1.

4.2.4 Metrics and measures of interest

4.2.4.1 Numbers of first-time enrolments and graduations in ITE programmes

As stated above, the primary focus of this chapter relates to the supply of newly qualified potential teachers in South Africa. Specifically, the aim is to evaluate the trends in, and examine the demographic composition of, new ITE graduates who graduated from public HEIs over the period 2004 - 2013. These trends and compositions are in themselves functions of the numbers and types of individuals who enrolled in ITE programmes over the period and the throughput rates among them. The analysis that follows thus not only considers

annual numbers of ITE graduations, but also the initial enrolments and extent of programme completion that ultimately lead to those graduation numbers.[18]

The number of individuals who graduate with ITE qualifications is fundamentally constrained by the number of individuals who enrol in ITE programmes. Understanding enrolments in ITE programmes is thus critical for understanding the production of ITE graduates and the supply of newly qualified teachers. Most studies on teacher production in South Africa recognise this fact and incorporate in their analyses evaluations of either annual total headcount enrolments or full-time equivalent (FTE) enrolments in ITE programmes.[19] However, the changes in these quantities are inherently dependent on changes in HE success, retention, drop-out, and throughput rates. If, for example, the number of total headcount enrolments in ITE programmes increases from one year to the next, it is not clear to what extent this is because of low levels of drop-out, low levels of programme completion, high levels of repetition and retention, or high levels on new entry into ITE programmes. By implication, neither total headcount enrolments nor FTE enrolments offer pure indications of the extent to which individuals intend to complete ITE programmes and/or become teachers. Instead, they also partially reflect information about factors that relate to the progression of ITE students through the HE system.

In appreciation of the shortcomings of total headcount enrolments and FTE enrolments, this chapter instead focuses on the annual numbers of first-time enrolments (FTEN) in ITE programmes as a measure of collective intent to graduate with ITE qualifications and/or qualify to teach in South African schools. The way in which FTEN is defined in this chapter is discussed in greater detail in Section H.1.1.

4.2.4.2 Growth in FTEN and graduations in ITE programmes

The importance of having accurate aggregate and disaggregated estimates of the annual numbers of FTEN and graduations in ITE programmes is clear from a policy perspective. However, what is arguably of even greater importance is the need to understand how and why ITE FTEN and graduation numbers have changed over time and how they are likely to continue to do so in the future. The analysis below thus also focuses on the estimated growth rates in ITE FTEN and graduations between 2004 and 2013.

While there are other studies on teacher graduate production in South Africa that present estimates of the growth in enrolments and graduations in ITE programmes, many of these studies focus only on the overall extent of change in these quantities over what is usually a relatively short period of time (often only 1 or two years).[20] That is, they calculate growth rates by selecting the data point at the beginning of a certain period and the data point at the end of the period and then expressing the difference between the two points as a percentage of the first. Growth figures that are estimated in this way may be criticised on at least two grounds. First, they are highly sensitive to the specific start and end data points that are used. This means that they tend to not be robust to minor changes in the chosen start or end points of the data series under consideration and can be highly misleading if either the start or end point is an outlier in the data. Second, such growth rates completely disregard any intermittent changes that occur between the chosen start and end points.

[18] Unless explicitly stated otherwise, all estimates, tables, and figures presented in the analysis that follows are the author's own calculations and are based on aggregate HEMIS data.

[19] See, for example, CHE (2010*b*), DHET (2011*b*), Adendorff *et al.* (2014), and CDE (2015).

[20] See, for example, CHE (2010*b*:112), DBE and DHET (2011:56 - 59), and Adendorff *et al.* (2014:10).

Given the aforementioned shortcomings, it is problematic when growth rates that are calculated as described above are used to draw inferences about trends in data that do not change monotonically or smoothly over time, but instead exhibit some volatility. Given the inherent volatility in ITE FTEN and graduations, particularly at disaggregated levels as illustrated below, the total change in these numbers between any two periods in time can often give a misleading impression of the true rate at which they are changing over time.

In the interest of mitigating any biases that may result from working with data that does not just change smoothly over time, this chapter presents estimates of the *average annual growth* in FTEN and graduations over various periods between 2004 and 2013 as measures of the ways in which these quantities change over time. Throughout this chapter, average annual growth rates are estimated via ordinary least-squares. This methodology is described in greater detail in Section G.1.

In addition to estimating average annual growth rates in FTEN and graduations in ITE programmes, the analysis below also compares these growth rates, where applicable, to the average annual growth rates in comparable non-ITE FTEN and graduations. This is done in order to gauge the extent to which changes in enrolments and graduations in ITE programmes are a reflection of more general underlying changes in the HE system as a whole rather than unique factors that relate specifically to ITE programmes.

4.2.4.3 Completion rates among cohorts of ITE programme students

Lastly, as noted above, graduations in ITE programmes are not just a function of the number of individuals who enter such programmes, but also of the extent to which those individuals are able to successfully complete their academic studies. Chapter 4.5 therefore focusses on the extent of throughput among cohorts of ITE students over the 2004 - 2013 period by estimating completion rates and evaluating the time-invariant dimensions along which ITE programme completion rate differentials are delineated.

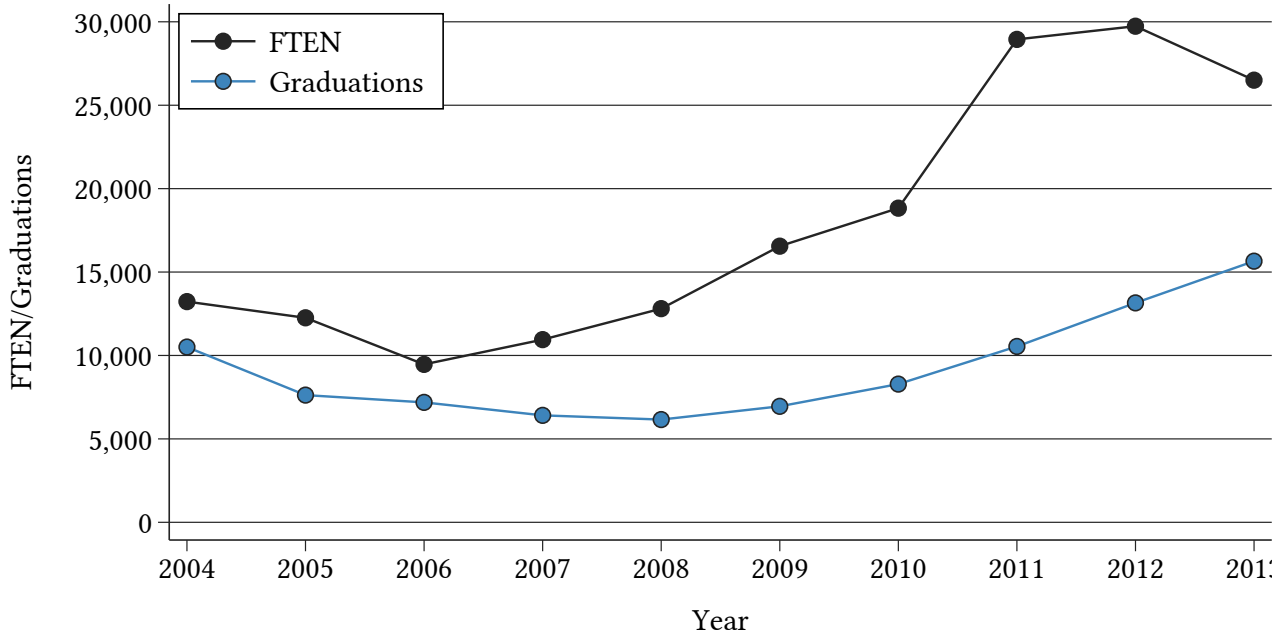
4.3 First-time enrolments (FTEN) and graduations in ITE programmes and teacher supply

4.3.1 General trends

Over the period 2004 to 2013, FTEN in ITE programmes doubled, rising from just over 13 200 in 2004 to 26 500 in 2013 (Figure 4.2 and Table F.1 in Appendix F). At the same time, ITE graduations grew by a more modest 49% in total, from around 10 500 in 2004 to 15 650 in 2013. Not only did the total growth in ITE FTEN and graduations differ over period as a whole, but the two data series also appear to exhibit slightly different patterns of rise and decline over short-run periods between 2004 and 2013.

It is clear that movements in ITE FTEN are more volatile than movements in ITE graduations, with several large and sudden changes occurring during the period. The 54% rise in the number of FTEN in ITE programmes between 2010 and 2011 and the subsequent 11% fall between 2012 and 2013, in particular, reflect volatility in the number of FTEN in ITE programmes. The precise reasons for these and other changes in ITE FTEN are investigated further below, but it is worth noting that they were not driven purely by changes in overall FTEN in undergraduate degree and postgraduate diploma/certificate programmes at HEIs.

Figure 4.2: FTEN and graduations in ITE programmes (2004 - 2013)



NOTES: Figures represent the estimated numbers of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes. Figures are based on the estimates in Table F.1.

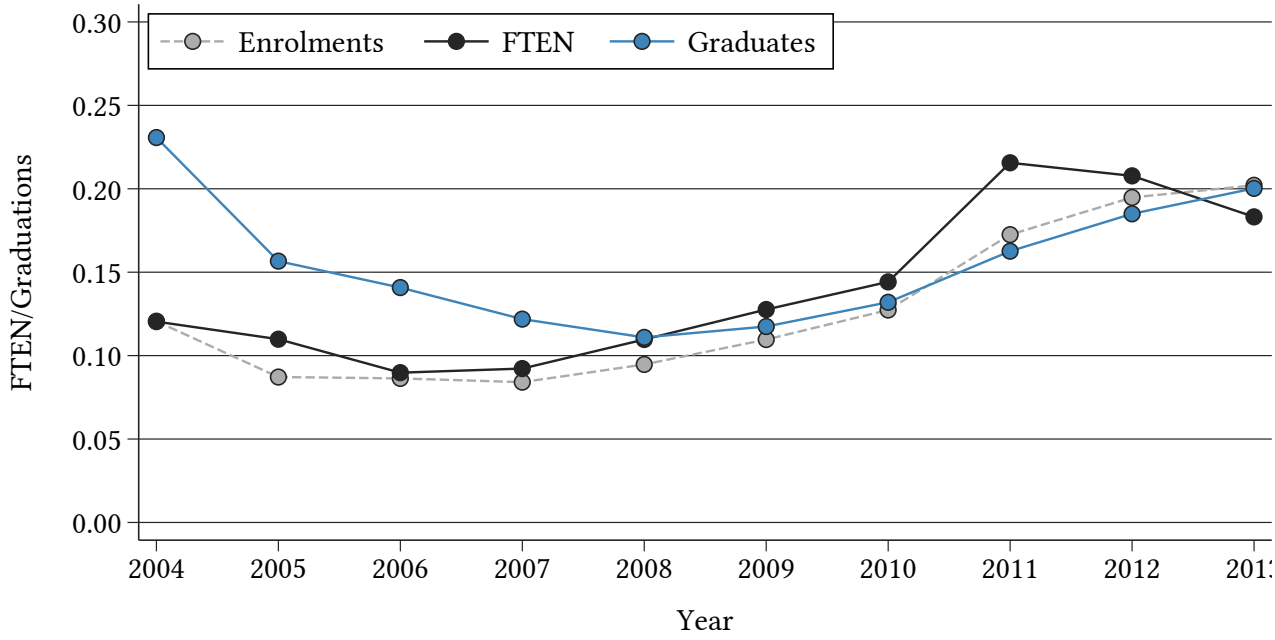
While ITE graduations increased in absolute terms over the period, the data shows that until 2008, there was a constant downward trend in ITE graduations relative to those in non-ITE programmes (Figure 4.3). In fact, while the ratio of ITE to non-ITE graduations began to rise again after 2008 and has continued to do so ever since, the ratio in 2013 was still lower than it had been in 2004. For every 100 non-ITE graduates, the public HE system produced 23 ITE graduates in 2004. By comparison, it produced only 20 ITE graduates in 2013. This despite the fact that the number of FTEN in ITE programmes relative to those in non-ITE programmes increased over the period.[21] In other words, while comparatively more and more individuals are enrolling in ITE programmes, the HE system as a whole is producing comparatively fewer and fewer ITE graduates relative to non-ITE graduates over time.

Figure 4.3 provides a preliminary indication that, despite the increases in ITE FTEN and graduations over the past decade, the HE system has been performing below average in terms of converting ITE student inputs into graduate outputs. This is illustrated also in Table F.2 which shows the total growth and estimated average annual growth rates in enrolments, FTEN, and graduations for both ITE and non-ITE programmes over several periods between 2000 and 2013.

The estimates confirm that, with the exception of the 2004 - 2008 period, total enrolments in ITE programmes grew at least as fast, if not significantly faster than total enrolments in non-ITE programmes (Figure 4.4). Similarly, with the exception of the 2004 - 2008 period, the average growth in FTEN in ITE programmes was significantly higher than the average annual growth in non-ITE FTEN. By contrast, the only period in which the rate of growth in ITE graduations was statistically significantly greater than the rate of growth in non-ITE graduations was between 2008 and 2013. The upshot of this is simple: while the ITE share of total enrolments and FTEN among HE programmes appears to have been increasing consistently since 2006, the same is not true of the ITE share of graduations. It is only in more recent years that graduations in ITE programmes have

[21] FTEN in ITE programmes grew by more than 118% between 2004 and 2011, but decreased by 8.5% between 2011 and 2013.

Figure 4.3: Ratio of headcount enrolments, FTEN, and graduations in ITE programmes to non-ITE programmes (2004 - 2013)



NOTES: Figures represent the respective ratios of total enrolments, FTEN, and graduations in undergraduate and postgraduate ITE programmes to non-ITE undergraduate degree and postgraduate diploma/certificate programmes. Figures are based on the estimates in Table F.1.

begun to rise in relative terms. Moreover, the extent of this relative rise has not been sufficient to offset the relative decline between 2004 and 2008. As a result, the public HE system was producing fewer ITE graduates in relative terms in 2013 than it did in 2004. Insofar as this trend is accurately identified and persistent, it clearly has negative implications for the public HE system's ability to meet current and future demand for qualified teachers in South Africa.

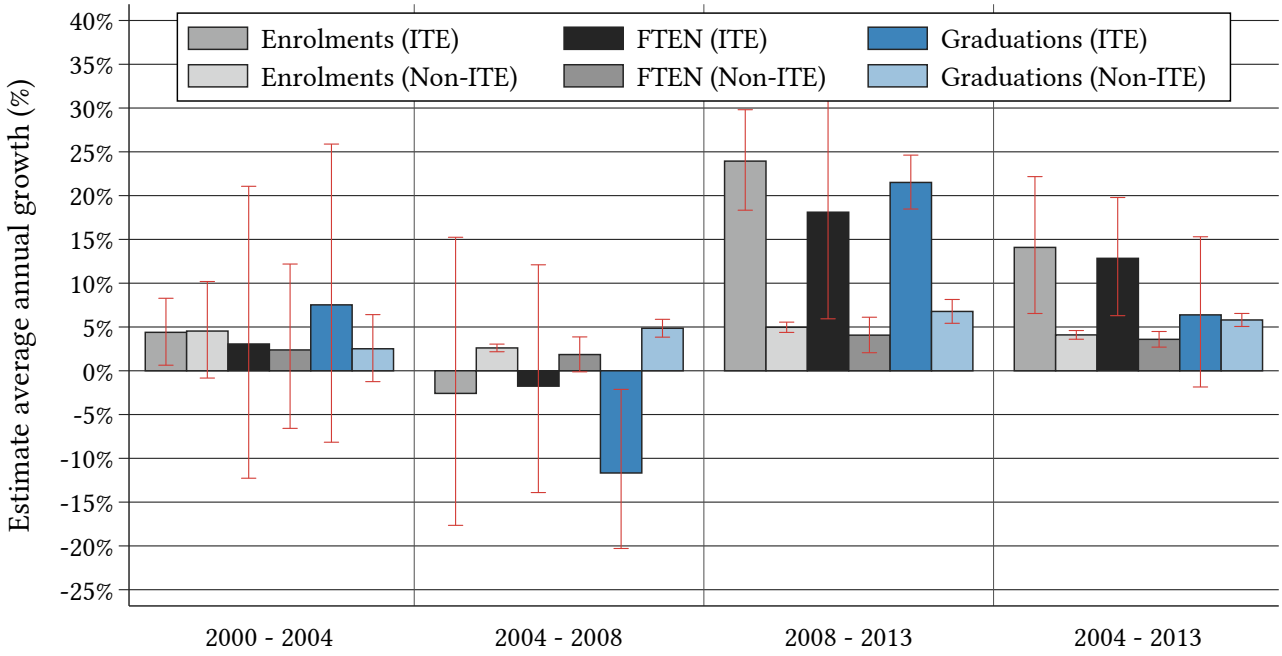
4.3.2 Trends for undergraduate and postgraduate ITE programmes

The aggregate trends in overall ITE FTEN and graduations mask substantial differences in the FTEN and graduation trends for undergraduate and postgraduate ITE programmes.

Figure 4.5 reveals that the growth in overall FTEN in ITE programmes between 2004 and 2013 was driven primarily by the significant growth in the number of FTEN in undergraduate degree programmes and to a lesser extent postgraduate diploma and certificate programmes. The number of FTEN in undergraduate ITE programmes increased by 238% between 2006 and 2011, far exceeding the 26% growth for FTEN in non-ITE undergraduate degree programmes (Figure 4.5 and Table F.3). Thus, where FTEN in undergraduate ITE programmes accounted for fewer than 7 in every 100 FTEN in undergraduate degree programmes in 2006, by 2011 this ratio had more than doubled to almost 16 in every 100. However, though the number of FTEN in non-ITE undergraduate degree programmes continued to grow between 2011 and 2013, the number of FTEN in undergraduate ITE programmes declined somewhat. Nonetheless, the estimated rate of average annual growth in undergraduate ITE FTEN over the period (14.9%) was still significantly higher than the average rate of growth in non-ITE undergraduate degree FTEN (3.2%) (Table F.4).

The number of individuals graduating with undergraduate ITE qualifications more than doubled between

Figure 4.4: Estimated average annual growth rates in headcount enrolments, FTEN, and graduations in ITE and non-ITE programmes (2004 - 2013)



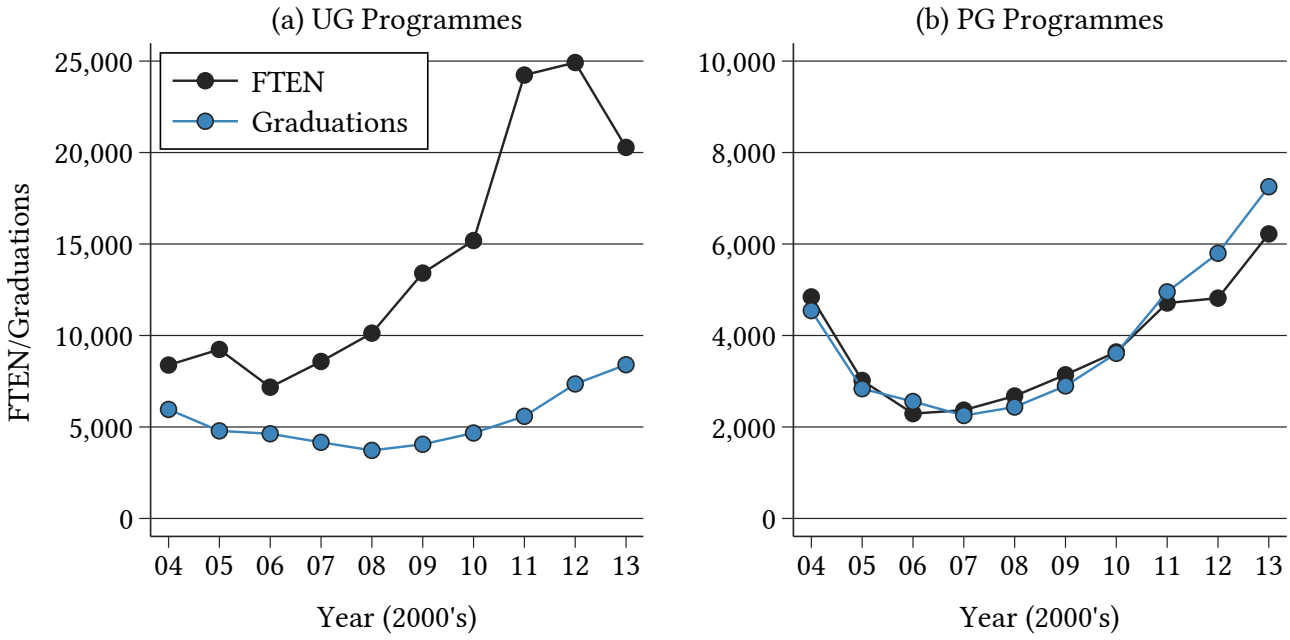
NOTES: Bars represent the estimated average annual growth rates (%) in total enrolments, FTEN, and graduations for the respective dependent variables over the period and were estimated using the least-squares methodology described in G. Capped lines represent the 95% confidence intervals surrounding each point estimate. Figures are based on the estimates in Table F.2.

2008 and 2013, while the number of postgraduate ITE graduations nearly tripled over the same period (Tables F.3 and F.4). The estimates indicate that by 2013, the public HE system was producing approximately 8 400 ITE graduates with undergraduate degrees and 7 250 ITE graduates with postgraduate diplomas/certificates per annum (Table F.4).

As explained above, it is instructive to contextualise the trends in the absolute numbers of FTEN and graduations for different types of ITE programmes by viewing them relative to the trends in the equivalent metrics for different types of non-ITE programmes, as illustrated in Figure 4.6. For example, the rise in the absolute number of FTEN in undergraduate ITE programmes between 2004 and 2013 only represented a relative increase between 2004 and 2011. Between 2011 and 2012, growth in undergraduate ITE FTEN stagnated and by 2013, the number of FTEN in such programmes (20 281) had fallen to about 81% of the number of FTEN in 2012 (24 921). By contrast, FTEN in non-ITE undergraduate degree programmes continued to grow steadily between 2011 and 2013. The implication is that the ITE share of FTEN in undergraduate degree programmes declined marginally from a high of 15.9% in 2011 to around 13.1% in 2013 (Table F.3). Despite this short-run decline, however, FTEN in undergraduate ITE programmes in 2013 represented a far greater share of FTEN in overall undergraduate degree programmes than it did in 2004 (7.4%). In other words, the data suggests that FTEN in undergraduate ITE programmes not only increased in absolute terms between 2004 and 2013, but also that it increased relative to FTEN in other undergraduate degree programmes.

The precise reasons behind the marginal absolute and relative decline in FTEN in undergraduate ITE programmes between 2011 and 2013 are unclear, but are investigated further below. However, even if this short-run downward trend has subsequently been reversed, it is likely to have had a negative knock-on effect on the number of individuals who will be graduating with undergraduate ITE qualifications within the next 3 to 4 years. This is all the more worrisome when considered in light of the fact that, relative to non-ITE pro-

Figure 4.5: FTEN and graduations in undergraduate and postgraduate ITE programmes (2004 - 2013)



NOTES: Figures represent the estimated numbers of first-time enrolments (FTEN) and graduations in (a) undergraduate and (b) postgraduate ITE programmes and are based on the estimates presented in Table F.3.

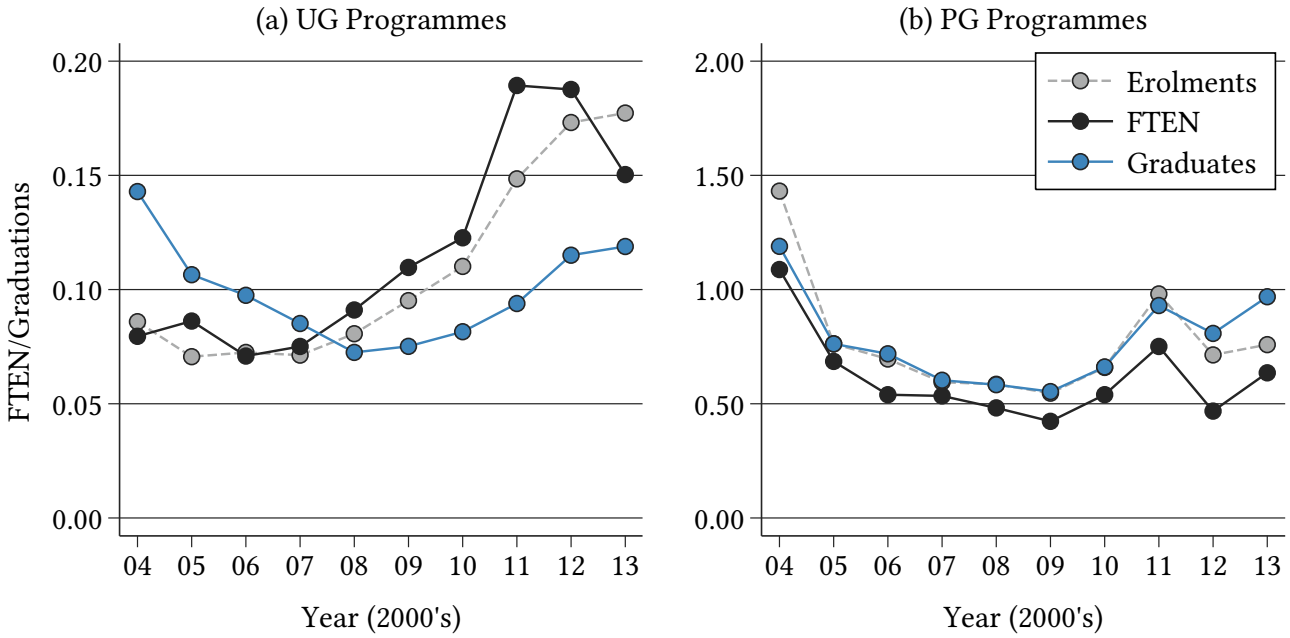
grammes, the public HE system was producing fewer graduates with either undergraduate or postgraduate ITE qualifications in 2013 than it did a decade before (Figure 4.6).

4.3.3 Understanding trends in FTEN in ITE programmes

Understanding the trends in ITE programme FTEN is fundamental to understanding the trends in teacher production in South Africa. Holding all other factors constant, the number of FTEN in ITE programmes places an upper limit on the number of ITE graduates that the HE system can ultimately produce. Interventions aimed at increasing the supply of qualified teachers by, for example, improving the throughput of ITE students can only be effective if large enough numbers of individuals are electing to enter teacher training in the first place.

As shown in the previous section, the trends in FTEN in ITE programmes in South Africa cannot be attributed purely to the general expansion of the HE system or to fluctuations in aggregate enrolments at HEIs between 2004 and 2013. Rather, a host of complex and interrelated factors are likely to have influenced the levels of and changes in the number of individuals choosing to enrol in ITE programmes over the past decade. A comprehensive discussion of all of these factors is beyond the scope of this chapter and some of the major issues are already dealt with in great depth in DOE (2005*b*), Armstrong (2009) Arends (2010), Steyn *et al.* (2014), and other studies. However, in order to better understand and contextualise the trends in FTEN in ITE programmes as presented in the previous section, it is necessary to highlight two major issues. The first is the role that the University of South Africa (UNISA) plays in the HE system and, more importantly, in the production of ITE graduates, while the second is the roles that the status of the teaching profession, the attractiveness of teaching as a field of study, and the availability of financial support for ITE students in South Africa plays in incentivising or disincentivising enrolments in ITE programmes.

Figure 4.6: Ratio of ITE to non-ITE enrolments, FTEN, and graduations for undergraduate and postgraduate programmes (2004 - 2013)



NOTES: Figures represent the respective ratios of total enrolments, FTEN, and graduations for (a) undergraduate ITE vs non-ITE undergraduate degree programmes and (b) postgraduate ITE vs non-ITE postgraduate diploma/certificate programmes and are based on the estimates presented in Table F.3.

4.3.3.1 The central role of UNISA

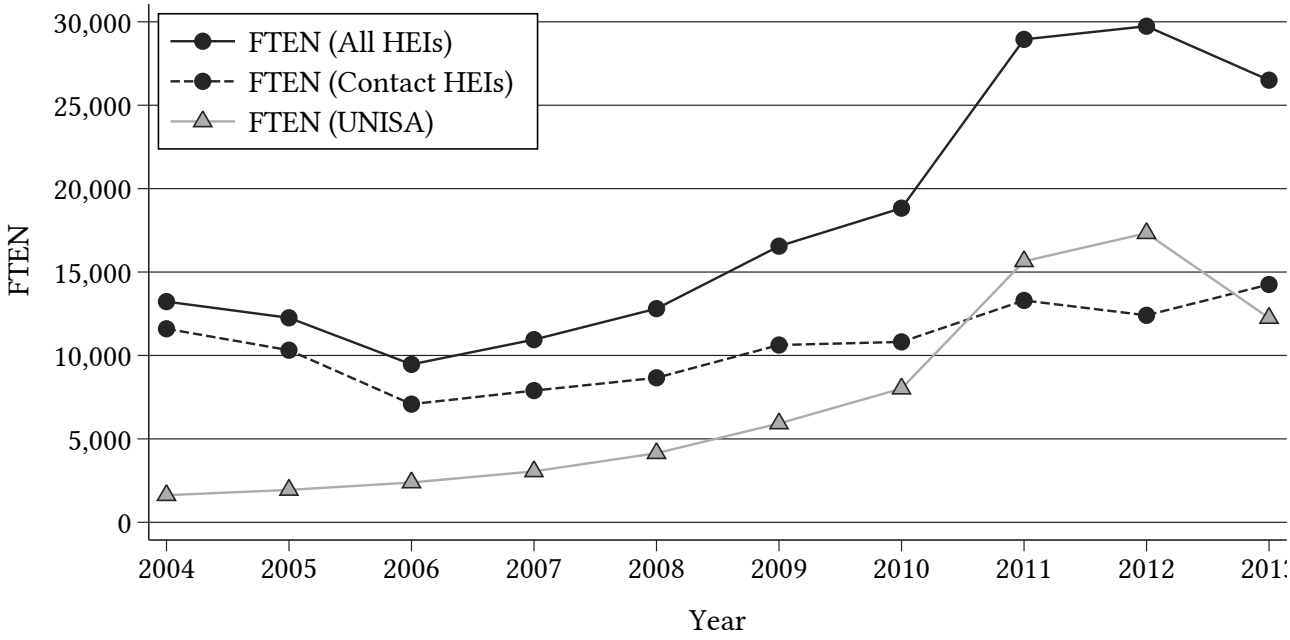
UNISA, South Africa's only distance learning university, has long been the largest HEI in the country and its share of total enrolments and graduations in the HE system has continued to grow significantly over time. By 2013, it accounted for 36% of all enrolments, 30.5% of all FTEN, and 19.15% of all graduations in the public HE system each year. It is therefore to be expected that trends in South African HE enrolments and graduations will, to a large extent, be a reflection of the underlying trends in enrolments and graduations at UNISA. This is particularly true in the case of enrolments and graduations in ITE programmes.

UNISA's College of Education (CEDU), which comprises the School of Educational Studies and the School of Teacher Education, is its second largest faculty in terms of headcount enrolments, and has been growing significantly in both absolute and relative terms since 2000 (Van Zyl and Barnes, 2012*b*:6). The extent of this growth and of UNISA's contribution to FTEN in ITE programmes in the public HE system is illustrated in Figure 4.7.

Between 2008 and 2013, UNISA accounted for nearly 48% of all FTEN in ITE programmes in South Africa and in both 2011 and 2012 the number of students entering ITE programmes at UNISA exceeded the collective number of students entering such programmes at other (contact) public HEIs (Table F.5). However, it is not the fact that UNISA dominates new enrolments in ITE programmes that is of concern, but rather that the rise in ITE programme FTEN numbers in the HE system since 2006 appears to have been driven to such a great extent by the rise in FTEN at UNISA.

Table F.6 shows that FTEN in ITE programmes at UNISA grew by 32.3%, on average, per annum between 2004 and 2013 with the total number of ITE FTEN at the institution increasing more than sevenfold over the

Figure 4.7: FTEN in ITE programmes including and excluding UNISA (2004 - 2013)



NOTES: Figures represent the estimated respective number of first-time enrolments (FTEN) in undergraduate and postgraduate ITE programmes in the entire public HE system, at contact HEIs, and at UNISA. Figures are based on the estimates in Table F.5.

period. By contrast, the data shows that FTEN in ITE programmes at other HEIs grew by an estimated 4.6%, on average, per year over the period and that the number of individuals entering ITE programmes at contact HEIs in 2013 was only 23% higher than it had been in 2004 (Figure 4.8).

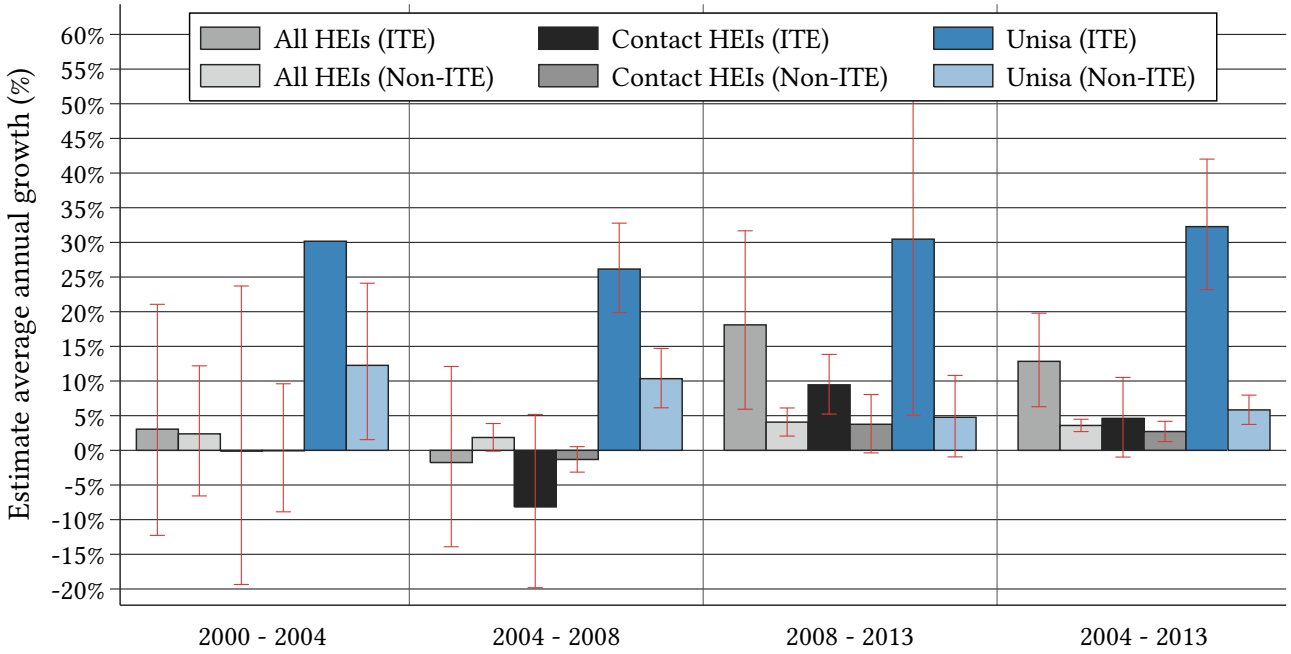
The comparatively subdued growth in FTEN in ITE programmes at contact HEIs is partly a reflection of a general lack of growth in FTEN in all academic programmes at South Africa's contact HEIs. Only 8 of South Africa's 22 contact HEIs experienced statistically significant positive average annual growth in first-time academic program enrolments between 2004 and 2013.[22] However, FTEN at UNISA increased in general, with the numbers of students entering ITE programmes growing even faster than the numbers entering non-ITE programmes.[23]

On the basis of the aforementioned figures, it is tempting to conclude that the majority of South Africa's HEIs have been comparatively performing poorly with regard to increasing the number of individuals enrolling in ITE programmes. However, it is important to remember than UNISA is not subject to many of the physical infrastructural constraints that limit the rate at which contact HEIs can accommodate increasing numbers of students. Moreover, a somewhat different picture emerges when one disaggregates the trends in ITE programme FTEN at UNISA and other HEIs by programme level as done in Figure 4.9. This graph reveals that there was reasonably strong growth in FTEN in undergraduate ITE programmes at contact HEIs over the period. Since 2006, the same has also been true for FTEN in postgraduate ITE programmes at contact HEIs. However, the sharp decline in FTEN in postgraduate ITE programmes at contact HEIs between 2004 and 2006, coupled with a decline in FTEN in undergraduate ITE programmes at the such institutions over the

[22] Collectively, non-occasional FTEN at these institutions accounted for between 27% and 38% of all FTEN at contact institutions, growing by an estimated 3%, on average, per year between 2004 and 2013.

[23] These findings hold more generally. Overall FTEN at UNISA (excluding students enrolling for occasional studies) is estimated to have grown by 6.2%, on average, per annum between 2004 and 2013. By contrast, the estimated average annual growth in overall FTEN in the rest of the public HE system, while positive (0.47%) , was not statistically significant over the period.

Figure 4.8: Estimated average annual growth rates in FTEN in ITE and non-ITE programmes including and excluding UNISA (2004 - 2013)



NOTES: Bars represent the estimated average annual growth rates (%) in FTEN in undergraduate and postgraduate ITE programmes and non-ITE undergraduate degree and postgraduate diploma/certificate programmes for the entire public HE system, contact HEIs, and UNISA over the indicated periods and were estimated using the least-squares methodology described in Appendix G. Capped lines represent the 95% confidence intervals surrounding the each point estimate.

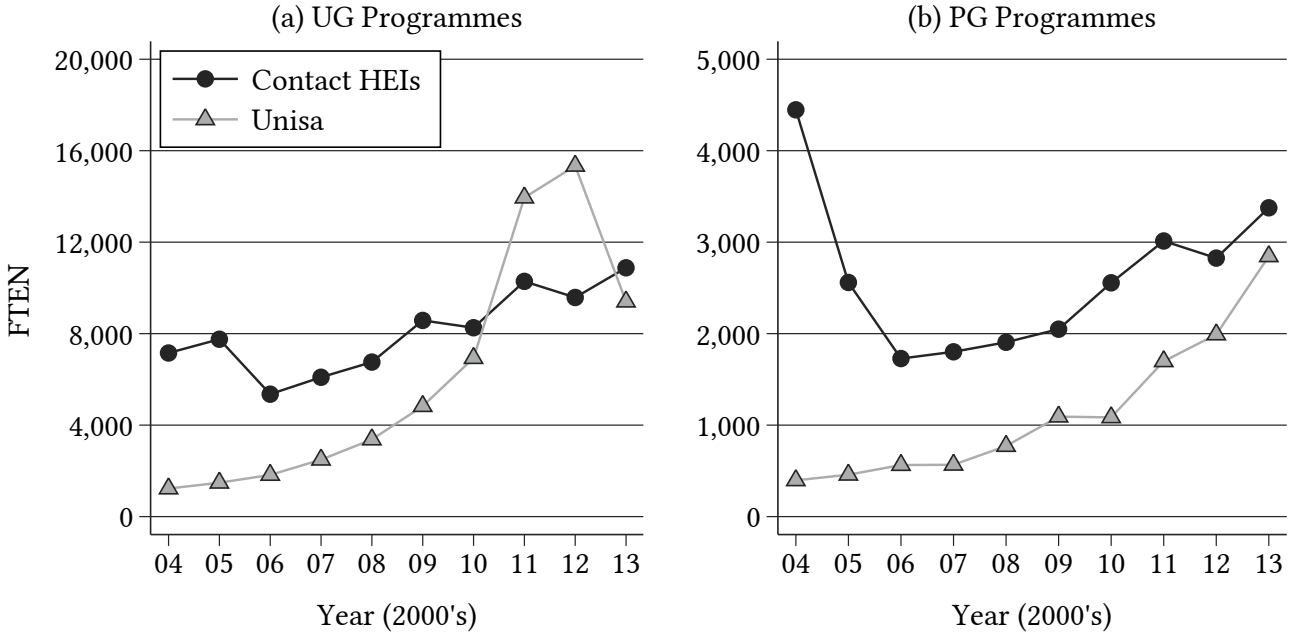
same period has had the effect of partially confounding the estimated average annual growth rate in overall FTEN in ITE programmes at contact HEIs between 2004 and 2013.

Although the estimated average annual growth in undergraduate ITE FTEN at contact institutions between 2004 and 2013 was much lower than at UNISA (34%), it was still positive and statistically significant at 6% per annum (Table F.8). By 2013, 52% more students were entering undergraduate ITE programmes at these institutions than in 2004. When looking at postgraduate ITE programmes, the situation is slightly different. While FTEN in postgraduate ITE programmes at contact HEIs grew fairly rapidly between 2008 and 2013, the growth was insufficient to fully counteract the strong decline in FTEN in the years that preceded it. As a result, FTEN in postgraduate ITE programmes at contact institutions were still 24% lower in 2013 than in 2004.

The estimates of the average annual growth in ITE FTEN (Table F.8) between 2004 and 2013 may give a somewhat skewed account of the current growth trajectories for undergraduate and postgraduate ITE FTEN at contact HEIs. Figure 4.9 shows that, while the number of FTEN in these programmes declined sharply between 2004 and 2006, they have been on a consistent upward trend ever since. If one considers only the post-2006 period, FTEN in undergraduate and postgraduate ITE programmes at contact institutions have respectively been growing at an estimated 10.6% and 10.7%, on average, per annum. While these growth rates are much lower than the comparable estimates for UNISA (35% and 26.8%), they are also noticeably higher than the estimated average annual growth rates in non-ITE undergraduate degree programmes (4%) and postgraduate diploma/certificate programmes (7.1%) at contact institutions between 2006 and 2013.

Collectively, the evidence presented here suggests that UNISA is likely to remain the foremost driver of FTEN in ITE programmes in South Africa for the foreseeable future. Not only does it represent the largest share

Figure 4.9: FTEN in undergraduate and postgraduate ITE programmes at contact HEIs and UNISA (2004 - 2013)



NOTES: Figures represent the estimated number of first-time enrolments (FTEN) in (a) undergraduate ITE programmes and (b) postgraduate ITE programmes at contact HEIs and at UNISA. Figures are based on the estimates presented in Table F.7.

of enrolments in ITE programmes, but its FTEN in such programmes have been growing much faster than comparable FTEN at contact HEIs over the past decade.[24] At the same time, the data shows that FTEN in ITE programmes at contact institutions have been increasing relatively rapidly since 2006, even if not quite to the same extent as at UNISA. Thus, while present levels of FTEN in such qualifications at contact institutions may not seem particularly encouraging when viewed relative to what they were in 2004, it is encouraging to know that they are on a strong upward trajectory.

It is important to appreciate the implications of the aforementioned points. Insofar as FTEN in ITE programmes ultimately translate into the production of qualified new potential teachers, they imply that any intervention aiming to materially raise the production of new teachers in South Africa must speak to the number of FTEN in ITE programmes and the quality of such programmes at UNISA. Similarly, if contact institutions are to continue to contribute meaningfully to the production of qualified teachers in South Africa, it is crucial for the recent upward trend in undergraduate and postgraduate ITE FTEN to persist.

4.3.3.2 The status of the teaching profession in South Africa

Having established that FTEN in ITE programmes have risen significantly in absolute terms since 2004 and that UNISA has been the primary contributor to this trend, it remains important to ask why FTEN in ITE programmes have also been growing rapidly in relative terms since 2006. Various push and pull factors have bearing on whether individuals ultimately decide to enrol in ITE programmes rather than alternative programmes at university. Many of these factors are discussed at length in DOE (2005*b*), DoE (2006), Cosser

[24] Between 2004 and 2013, UNISA's share of all FTEN in undergraduate degree and postgraduate ITE programmes in South Africa grew by an estimated 4.8 percentage points (or 17.22%), on average, per annum, rising from just 12.3% in 2004 to a high of 58.3% in 2012.

(2008), Cosser (2009), and SACE (2010). While those discussions will not be reproduced here, two of the most commonly cited factors affecting enrolments in ITE programmes are worth highlighting. The first is the status of the teaching profession in South Africa and the attractiveness of teaching as a career. The second, is the relative attractiveness of ITE programmes as fields of study and, closely linked to this, the availability of financial support for students who enrol in such programmes.

It is widely believed that the low status of the teaching profession in South Africa has had negative effects on teacher supply, not only in terms of increasing voluntary attrition among existing teachers, but also in terms of discouraging prospective students from enrolling in ITE programmes at universities (CDE, 2011). DOE (2005*b*:58, 68), for example, asserts that the low prestige associated with teaching relative to other occupations is one of the primary reasons why the rate at which existing teachers have been leaving the schooling system exceeds the rate at which newly qualified potential teachers are being produced by the public HE system.

The detrimental impact of low teacher esteem has also been exacerbated by a range of adverse factors that characterise the teaching profession in South Africa in general (OECD, 2008:299). These include poor working conditions, low levels of job satisfaction, lack of career advancement opportunities, overcrowded classrooms, inadequate parental involvement and support, excessive administrative duties, and perhaps most importantly, comparatively low salaries (Deacon, 2010*a*:40).

Armstrong (2009:29) shows that South African teachers are at a distinct disadvantage relative to their non-teaching counterparts in terms of remuneration levels. Moreover, this disadvantage is found to be greatest for qualified teachers with university degrees or postgraduate qualifications. This relative socio-economic deprivation is often cited as one of the main reasons why many existing and newly qualified teachers choose to enter other, more lucrative and prestigious professions or emigrate to teach in other countries (Manik, 2014:152).

All of the aforementioned factors arguably reduce the attractiveness of pursuing a career in teaching in South Africa (Chisholm, 2009:23). However, insofar as these and other adverse considerations have indeed served to reduce FTEN in ITE programmes at universities, the HEMIS data suggest they have done so only to the extent of moderating the absolute and relative rise in ITE FTEN since 2006. This indicates that there are other, additional factors that affect the relative attractiveness of ITE programmes as fields of study which may not necessarily be linked to the attractiveness of teaching as a profession.

Cosser (2008:20 - 21) argues that not all individuals who enrol in ITE programmes do so because they find the teaching profession in South Africa particularly alluring or because they intend to pursue a career in teaching subsequent to graduating. Instead, for many, such considerations may be secondary to issues pertaining to the differences in tuition fees, admission requirements, academic challenges, and availability of financial support for different fields of study.

In general, comparatively low entry requirements mean that enrolling in an ITE programme is one of the few viable options available to individuals who wish to study at university but fail to qualify for their chosen academic programmes (JET, 2014:8). Tracking a cohort of matric learners, Cosser (2009), for example, finds that many learners who perform poorly in the Matric exams ultimately enrol in ITE programmes, even if they previously had no intention of doing so or indicated that they wished to pursue other fields of study (Arends, 2010:2).

4.3.3.3 The availability of financial support for ITE programme students

For some individuals, perhaps the most crucial factor underpinning their enrolment decisions at university is the availability of financial resources. Given the relatively high cost of HEI attendance in South Africa, generally low levels of household income and inadequate access to finances serve as major constraints to HE participation (Cosser, 2008). For many, the ability to enrol in university is entirely dependent on the ability to secure funding in the form of bursaries or loans (OECD, 2013:38). Gurgand *et al.* (2011:41), for example, find that the ability to secure a loan may increase the probability of enrolling in university in South Africa by as much as 50%. However, differences in tuition fees and the availability of bursaries and loans for various academic programmes mean that financial constraints often also restrict the programme choices available to some students (Branson *et al.*, 2009*a*:1 - 3). Therefore, the relative attractiveness of different university programmes may in certain instances be heavily influenced by the availability of financial support for students who choose to enrol in those programmes.

The Funza Lushaka Bursary Programme (FLBP)

In recognition of the central role that financial constraints play in shaping students' enrolment and academic programme choices, the Department of Education (DOE) has introduced various initiatives that aim to increase the number of qualified teachers being produced by the HE system (Onwu and Sehoole, 2011:132). Chief among these is the Funza Lushaka Bursary Programme (FLBP).

Introduced in 2007, Funza Lushaka is a multi-year, service-linked bursary scheme designed to raise the number of newly qualified teachers entering South African public schools, particularly in poor and rural areas, by offering full-cost bursaries to eligible students who enrol in specific ITE programmes. In order to be eligible for an award, students must either be enrolled for a 4-year Bachelor of Education degree (BEd) or 1-year Postgraduate Certificate in Education (PGCE) and specialise in at least two of the priority teaching areas identified by the DOE (DBE, 2009:19 - 25).[25] The conditions of the scheme stipulate that recipients must be appointed to schools by the relevant provincial education departments upon graduation where they are obligated to teach for the same number of years that they received the bursary.

Unfortunately, aggregate HEMIS data does not contain any information about whether or not students are Funza Lushaka recipients. In addition, information about the annual numbers and composition of Funza Lushaka bursars that is available elsewhere tends to be fragmented and often inconsistent between sources.[26] Nonetheless, Table 4.2 provides a summary of some of the available information on Funza Lushaka bursary recipients alongside the estimated numbers of total headcount enrolments and FTEN in ITE programmes as per aggregate HEMIS between 2007 and 2013.[27]

It is clear that the FLBP has expanded considerably over a relatively short period of time, with the number of bursaries being awarded each year rising by an estimated 22.4%, on average, per annum from 3 670 in 2007

[25] Students who enrol in non-ITE undergraduate degree programmes may in some instances also qualify for FL bursaries if they commit to completing a PGCE programme subsequent to completing their undergraduate studies. For example, 4.5% of the 14 507 FL recipients in 2013 were enrolled in non-ITE undergraduate degree programmes (figures based on FLBP database as received from DBE).

[26] For example, there are significant discrepancies between the total value of Funza Lushaka bursaries paid out per year that are presented in NSFAS's various *Annual Reports* for the years 2009 - 2014. There are also discrepancies between NSFAS figures for the number of Funza Lushaka recipients and those presented in National Treasury's respective annual budget documents.

[27] In a number of instances, there are discrepancies between the numbers presented in Table 4.2 (which are based, in part, on FLBP data received from the DBE) and the figures reported in ANC (2014:21), CEPD (2009*b*:27), (DBE, 2012*b*), and National Treasury (2014:2).

Table 4.2: Total enrolments and FTEN in ITE programmes vs numbers of Funza Lushaka bursary recipients (2007 - 2013)

	ITE Programmes[a]		*Funza Lushaka Bursary Recipients*[b]			
Year	**Enrolments**	**FTEN**	**All**[c]	**All (%)**[d]	**New**[e]	**New (%)**[f]
2007	29 926	10 950	3 669	12.3	3 669	12.3
2008	34 641	12 807	5 189	15.0	2 881	8.3
2009	42 151	16 553	9 190	21.8	5 744	13.6
2010	52 477	18 832	10 073	19.2	3 745	7.1
2011	74 038	28 947	8 716	11.8	1 732	2.3
2012	86 880	29 737	11 455	13.2	5 527	6.4
2013	94 127	26 503	14 512	15.4	6 847	7.3

NOTES: [a] Estimated numbers of total headcount enrolments and FTEN in undergraduate and postgraduate ITE programmes. These figures correspond to the estimates presented in Table F.1. [b] Figures on the number of Funza Lushaka recipients derived from various sources, including DBE (2012*a*:11), and FLBP data received from the DBE. [c] Total number of Funza Lushaka bursary recipients. [d] Total number of Funza Lushaka bursary recipients (as in column 4), expressed as a percentage of the estimated total number of headcount enrolments in ITE programmes (as in column 2). [e] Number of students receiving Funza Lushaka bursaries for the first time. [f] Number of new Funza Lushaka bursary recipients (as in column 6), expressed as a percentage of the estimated total number of headcount enrolments in ITE programmes (as in column 2).

to just over 14 500 in 2013. One of the programme's aims is to fund at least 25% of ITE students at public HEIs (DBE, 2012*a*:7). To date, the closest it has come to achieving this objective was in 2009 and 2010 when the total number of FLBP bursary recipients respectively amounted to 21.8% and 19.2% of the numbers of individuals enrolled in ITE programmes.[28] It should be noted though that these percentages are likely to be inflated estimates since at least some of the bursaries in each year would have been awarded to individuals who were enrolled in non-ITE undergraduate degree programmes.[29]

In reviews of teacher graduate production in South Africa, it is often implied that Funza Lushaka has had a major hand in explaining the rise in the number of individuals enrolling in ITE programmes in recent years.[30] However, the fact that the introduction and subsequent expansion of the FLBP coincided with a rise in ITE programme enrolments between 2006 and 2013 is not, in itself, evidence that Funza Lushaka has had a causal impact on the number of individuals deciding to enrol in such programmes. Without more compelling empirical evidence to that effect, such interpretations wrongly infer causality from correlation.[31]

In addition to unjustified causal inferences, studies that only report on the number of Funza Lushaka bursaries awarded each year do not give an accurate picture of the number of individuals who have benefited from the bursary scheme over the period. Specifically, it is not always clear from the way in which Funza Lushaka figures are presented that there is a distinct difference between the total number of Funza Lushaka bursaries that have been awarded since 2007 and the number bursars who have received Funza Lushaka bursaries.

The figures in column 4 of Table 4.2 represent the annual numbers of Funza Lushaka bursaries awarded. Since 2008, many of these bursaries were awarded to individuals who had already been recipients of Funza Lushaka

[28] DBE (2012*a*:8) claims that 28% of ITE students in 2012 received Funza Lushaka bursaries. However, this figure is based on the notion that there were only around 40 000 students enrolled in ITE programmes in 2012. This figure is less than half of the headcount enrolment estimate presented in this chapter (86 880), an estimate which is in itself already lower than the estimate of 94 237 as presented in Simkins (2015:4) which is based on DHET's own statistics.

[29] I.e. individuals who formally committed themselves to completing PGCE programmes subsequent to completing their undergraduate studies in order to qualify for Funza Lushaka funding.

[30] For example, CEPD (2009*b*:24), CEPD (2009*a*:15), CHE (2010*b*:41), DBE and DHET (2011:39), HSRC (2013:44), OECD (2013:69), Adendorff *et al.* (2014:4), and CDE (2015:12) all either directly assert or imply that the introduction and expansion of the FLBP has had a causal impact on enrolments and/or graduations in ITE programmes.

[31] For example, when discussing the reasons underlying the growth in enrolments in ITE programmes in recent years, CDE (2015:12) state that *"There is no doubt that Funza Lushaka bursaries have been a major contributing factor to the growth..."*. This is a fairly strong claim, yet it is never fully substantiated in the report, nor is any compelling empirical evidence presented to support it.

bursaries at least once before. Column 6 of Table 4.2 shows the number of new Funza Lushaka bursars for each year. With the exception 2007 (when all FLBP bursars were first-time recipients), the number of bursaries awarded to students who had not previously received such bursaries has, on average, amounted to only 45% of the total number of bursaries awarded each year. Thus, while a total of 62 804 Funza Lushaka bursaries were awarded between 2007 and 2013, there were only a total of 30 145 unique recipients over the period. Consequently, the number of new Funza Lushaka bursars each year on average amounted to only 8.2% of total number of students enrolled in ITE programmes at the time.

One of the critical questions regarding the impact of the FLBP relates to the extent to which it has resulted in increased numbers of individuals deciding to enter ITE programmes rather than merely providing financial support for individuals who were either already planning on enrolling in ITE programmes of their own accord or who were already existing ITE programme students. Only some of the new Funza Lushaka bursars each year are new (entering) ITE programme students. The rest are existing senior ITE students. The question is thus: to what extent do students entering ITE programmes for the first time have access to Funza Lushaka funding?

In 2013, only 2 695 (39.4%) of the 6 847 new Funza Lushaka bursary recipients were first-year BEd students. Similarly, only 372 (5.4%) new bursars were first-time PGCE students. This means that less than 45% of the Funza Lushaka bursaries awarded to new bursars in 2013 went to individuals who were entering ITE programmes for the first time.[32] Similar figures for the 2007 - 2012 period are unfortunately not readily available. However, if one were to extrapolate from the 2013 data and assume that only around 50% of new Funza Lushaka bursars each year are first-time entering ITE students, it would imply that, on average, only 11.5% of FTEN in ITE programmes between 2007 and 2012 would have been Funza Lushaka recipients.

The discussion above suggests that the availability of Funza Lushaka bursaries to first-time ITE students may have been far more limited than annual bursary numbers would suggest at face value. Moreover, it does not appear as though the percentage of entering ITE students who receive Funza Lushaka bursaries has really increased since 2007. In light of this, it is not immediately clear how the introduction of the FLBP could explain the extent of the rise in FTEN in ITE programmes since 2006. Nonetheless, it remains plausible at the very least that the availability of some additional funding opportunities coupled with potentially inflated perceptions of the availability of Funza Lushaka bursaries could have lead some individuals to enrol in ITE programmes.[33]

It is important to emphasize that, in terms of affecting enrolments and graduations in ITE programmes, the purpose of the FLBP is not just to increase the numbers of individuals who graduate with ITE qualifications, but, more importantly, to increase the numbers of individuals who are qualified to teach specific priority subjects in certain school phases. Thus, even if it was the case that Funza Lushaka has had no real effect on the numbers of new enrolments in ITE programmes, it may still have had a positive impact on the specialisation choices of prospective and existing ITE students. However, a far more in-depth and rigorous analysis is required to determine whether Funza Lushaka has had a causal impact on enrolments and graduations in ITE programmes, and what the precise nature of that impact is.[34]

[32] These figures are based on FLBP data received from the DBE.

[33] It is conceivable, for example, that some students may elect to enrol in ITE programmes in the hope that they will qualify for a Funza Lushaka bursary, if not during their first year of studies, then at least in subsequent years.

[34] An impact evaluation of the FLBP is currently being conducted by the Joint Education Trust (JET) (NATIONAL PRESIDENCY, 2013:23).

Lastly, from the perspective of this chapter, whether or not the FLBP has indeed led to increased FTEN and graduations in ITE programmes is not the most important question. Instead, it is whether it has led to an increase in the supply of qualified teachers in the country. This is a critical issue since Funza Lushaka bursars are, in principal, not only guaranteed teaching positions after graduating, but are also contractually obliged to take up those positions (DBE, 2009:14). In a sense, the extent to which Funza Lushaka ITE graduates are absorbed into the teaching profession subsequent to graduation therefore provides what could be viewed as a best case scenario for the employment of newly qualified potential teachers in South Africa.

Given the explicit link between Funza Lushaka recipiency and teacher service, it is disconcerting that an increasing number of reports have noted that the uptake of Funza Lushaka graduates in the schooling system has been slow in general and that some graduates are never allocated to schools by the provincial departments in some instances (DBE and DHET, 2011:40).[35]

Deacon (2010*b*:25) notes that by 2009, only 73% of all 2008 and 2009 Funza Lushaka graduates had been placed in schools. Similarly, of the 2 136 FLBP bursars available for placement in 2012, 11.5% had not yet been placed in teaching positions by the end of June 2012 DBE (2012*a*:8). Even more recent reports show that, while there has been progress, uptake and placement of FLBP graduates into the teaching profession remains slow. For example, DPME (2015:4) states that only 83% of the Funza Lushaka bursary graduates who were available for placement at the beginning of 2014 had been placed by March of 2015. Moreover, many of the Funza Lushaka bursars that are placed are only employed in temporary positions (DBE and DHET, 2011:40).

In the absence of more available data, it is unfortunately not possible to comment on the true extent to which Funza Lushaka graduates effectively contribute to the supply of qualified new teachers in South Africa. Nonetheless, the experience of the FLBP in terms of teacher uptake not only provides a poignant illustration of the difference between the number of ITE graduates being produced and the supply of new teachers, but also of the fact that interventions aimed at increasing the numbers of qualified teachers in South Africa can only be effective if they are appropriately implemented, monitored, and evaluated.

The National Students Financial Aid Scheme (NSFAS)

While aggregate HEMIS does not contain any information on whether or not students received Funza Lushaka bursaries, it does contain information on whether or not they received awards from the National Students Financial Aid Scheme (NSFAS).[36] Introduced in the mid-1990's, NSFAS was established to improve HE access by providing financial aid in the form of bursaries or loans to disadvantaged students from poor socio-economic backgrounds (De Villiers *et al.*, 2013:6).[37] The number of NSFAS recipients has grown steadily over time and in 2013 an estimated 15.9% of all undergraduate degree and 6.1% of all postgraduate diploma/certificate programme students at public HEIs received some sort of NSFAS funding.[38]

[35] DBE (2012*a*:27) also notes that some Funza Lushaka graduates refuse to take up positions at the schools to which they are allocated by the provincial departments.

[36] There are reasons to believe that HEMIS under-captures the numbers of students who receive NSFAS awards each year. However, the under-capturing of NSFAS in the HEMIS data is unlikely to substantively affect the inferences that can be drawn from the analysis presented in this section unless the extent of this under-capturing is non-random across fields of study and, therefore, across the various CESM classification field in HEMIS. There does not appear to be any good reason why this would be the case.

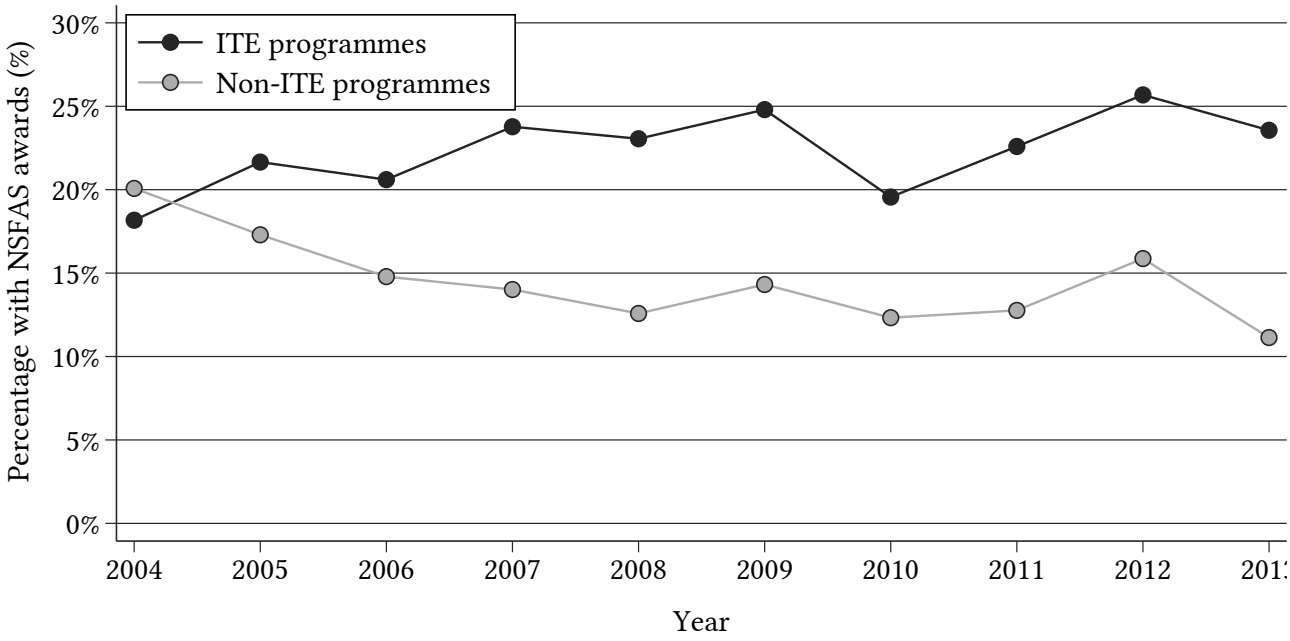
[37] It should be noted that, in contrast to Funza Lushaka bursaries, NSFAS loans tend to cover only part of the costs of studying at HEIs.

[38] A far greater share of annual NSFAS awards are allocated to undergraduate degree programme students than to students enrolled in postgraduate diploma/certificate programmes.

Insofar as the availability of financial support increase the likelihood that students will enrol in certain programmes, one may expect that, similar to the rationale for the FLBP, the trends in the NSFAS funding opportunities available to ITE students may have influenced enrolments in ITE programmes.

Paterson and Arends (2009:84) show that between 1996 and 2004 there was a decline in the proportion of teacher education students who received NSFAS awards as well as a decline in the share of NSFAS awards that were allocated to teacher education programme students. These trends, coupled with falling numbers of FTEN in teacher education programmes over the period, subsequently lead the DOE to allocate ring-fenced NSFAS funding specifically for students enrolled in teacher education programmes (Gordon, 2009:35). As a result, the percentage of ITE students receiving NSFAS awards increased significantly in the early 2000s (Table F.10). However, the rate of change in the percentage of first-time ITE students receiving NSFAS awards since 2004 has been more moderate (Figure 4.10). Between 2004 and 2013, the percentage of FTEN in ITE programmes with NSFAS funding increased by only 2.1%, on average, per year, rising from 18.2% in 2004 to 23.6% in 2013 (Tables F.9 and F.10).

Figure 4.10: Percentage of FTEN ITE and non-ITE programme students with NSFAS awards (2004 - 2013)



NOTES: Figures represent the estimated annual percentages of (a) undergraduate and postgraduate ITE programme students and (b) non-ITE undergraduate degree and postgraduate diploma/certificate programme students receiving NSFAS awards. Figures are based on the estimates presented in Table F.9.

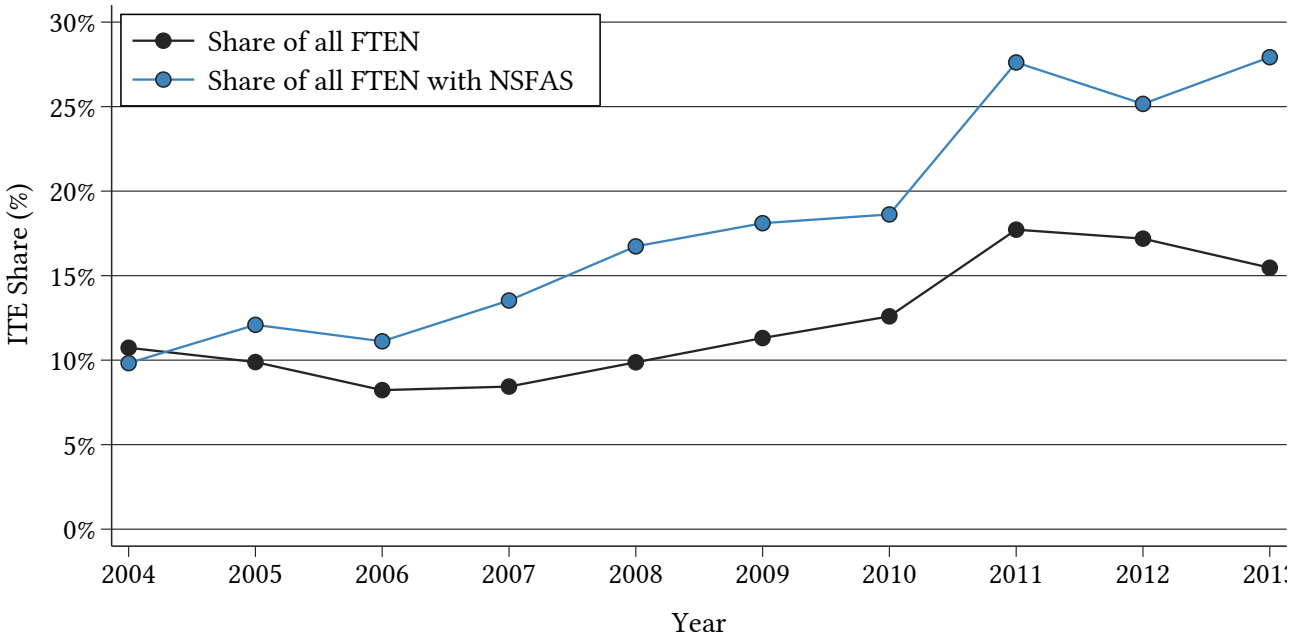
The share of NSFAS awards that are allocated to ITE students remains far lower than the share allocated to non-ITE students. However, the number of FTEN in ITE programmes also represent a far smaller share of total FTEN than the number of FTEN in non-ITE programmes. In 2013, for example, FTEN in ITE programmes accounted for only 15.5% of all FTEN in undergraduate degree and postgraduate diploma/certificate programmes. For the purposes of understanding the potential role that NSFAS may have played in explaining the relative rise in ITE FTEN over the period, it is therefore important to focus on the ways in which the respective ITE and non-ITE shares of NSFAS funding have changed in relation to one another over time.

Table F.10 shows that the average rate of growth in the relative number of NSFAS awards allocated to ITE students between 2004 and 2013 was significantly greater than it had been for non-ITE students. Because of

this rapid growth, the share of NSFAS awards allocated to first-time enrolling ITE students in 2013 (27.9%) exceeded the ITE share of total FTEN (15.5%). The relative allocation of NSFAS awards to first-time ITE programme students is thus progressive. Moreover, it has become increasingly progressive since 2004 (Figure 4.11).

In light of these results, it is plausible that the relatively rapid rise in the number of FTEN in ITE programmes since 2004 could partly be explained by the relatively rapid rise in the availability of NSFAS funding to ITE students which, with all other factors held constant, may have increased the attractiveness of enrolling in ITE programmes rather than other programmes. However, the evidence presented here and the data on which it is based is by no means sufficient to conclude that this has indeed been the case. For example, while aggregate HEMIS may contain information on which students received NSFAS awards, it does not contain any information on the size of those awards or whether they were allocated as bursaries or loans. If it is the case that differential access to NSFAS funding impacted positively on the relative attractiveness of ITE vs non-ITE programmes since 2004, these factors would arguably have had important bearing on the extent to which it did so. In the absence of more complete data and compelling evidence, the notion that increased relative access to NSFAS funding may have incentivised enrolments in ITE programmes therefore remains largely conjecture.

Figure 4.11: ITE student share (%) of NSFAS awards among undergraduate degree and postgraduate diploma/certificate programme FTEN (2004 - 2013)



NOTES: Figures represent the estimated annual ITE student share of all NSFAS awards that are awarded to FTEN in undergraduate degree and postgraduate diploma/certificate programmes. In each year, the respective ITE and non-ITE shares should thus sum to 100. Figures are based on the estimates presented in Table F.9.

4.3.4 Teacher supply vs teacher demand in South Africa

The discussion thus far has focussed primarily on the changes in FTEN and graduations in ITE programmes between 2004 and 2013 and on some of the potential reasons underlying the relatively rapid rise in ITE enrolments and, more recently, also in ITE graduations. In order to contextualise the analysis, the discussion now

turns to the implications that the aforementioned findings may have for qualified teacher supply in South Africa.

As noted above, the reason why the focus in this chapter falls on the production of ITE graduates in South Africa is that, in the long run, it effectively determines how many individuals can enter the teaching profession as qualified new teachers. This implies that, ultimately, the key question is not just whether sufficient numbers of ITE graduates are being produced, but whether the numbers of new ITE graduates that are being produced translate into sufficient numbers of qualified new teachers. In light of the findings presented above, three fundamental questions thus remain. First, is the current supply of new qualified teachers to the system sufficient to meet the current demand for new teachers? Second, will the future supply of new qualified teachers to the system be sufficient to meet the future demand for new teachers? Third, if insufficient numbers of qualified new teachers are being produced to meet current or future demand, why is this the case and what can be done to change it? The remainder of this section seeks to provide some answers to the first two of these questions, starting with the issue of teacher demand in South Africa.

4.3.4.1 Teacher Demand in South Africa

While most research studies agree that South Africa has a growing shortage of qualified teachers owing to a gap between the demand for and the supply of new teachers, there appears to be little consensus on the precise extent and dimensions of this shortage. This is partly due to the fact that the precise extent of the current and future demand for new teachers is often unclear.

Table 4.3 presents a range of estimates of the numbers of new teachers that need to enter the schooling system each year in order to replace teachers who are leaving the system, as found in the existing literature on teacher demand and supply in South Africa. The table not only makes it clear that there is considerable variation in estimates between studies, but also that most of the estimates tend to span a fairly wide range. This is partly a reflection of the fact that the type of data required to accurately estimate how many teachers enter and exit the schooling system each year is rarely available to researchers and, when it is, often contains serious inconsistencies that affect the degree of accuracy with which projections and estimations can be made.[39] However, the majority of the estimates and projections suggests that South Africa requires between 20 000 and 30 000 new teachers each year.

Projections of teacher demand, such as those presented in Table 4.3, are generally based on assumptions regarding population growth, learner enrolment rates, teacher attrition rates, teacher utilization, learner-educator ratios, and retention, progression, and repetition rates (DBE and DHET, 2011:31). This means that they are predicated on the relative stability and/or predictability of various underlying parameters. Moreover, most projections tend to focus purely on teacher attrition rates and the need to maintain learner-educator ratios. In doing so, they ignore the fact that learner-educator ratios in many South African schools, particularly in rural areas, need to decrease substantially if the quality of education that learners receive is to improve (DOE, 2005*b*:59). What makes this even more problematic is that CDE (2015:10) estimates that, due to rising learner enrolments, the number of employed teachers in South Africa will have to experience a net increase of 30 000 between 2013 and 2025 just to maintain current learner-educator ratios. These issues imply that the teacher demand estimates presented in Table 4.3 may in truth only constitute crude lower-bound estimates of the numbers of new teachers that need to enter the South African schooling system every year.

[39] See, for example, Simkins (2015:11) for a brief discussion on some of the problems with data on the numbers of educators entering and exiting the South African schooling system.

Table 4.3: Projections and estimates of the numbers of new teachers needed per annum in order to replace the number of teachers leaving the public school system each year

Estimate[a]	Study[b]
12 000 - 20 000	CEPD (2009*a*:16)
17 000 - 20 000	Pretorius (2008:173)
20 000	Crouch and Perry (2003:496)
20 000	Deacon (2010*a*:41)
20 000	OECD (2013:68)
20 000	Keevy *et al.* (2014:88)
17 500 - 22 500	Bertram *et al.* (2007:79)
20 000 - 25 000	Bertram *et al.* (2006:2)
20 000 - 25 000	Deacon (2010*b*:3)
20 000 - 25 000	Onwu and Sehoole (2011:127)
25 000	CDE (2011:10)
20 000 - 30 000	Gordon (2009:28)
20 000 - 30 000	DOE (2005*b*:41)
30 000	Lewis (2008:35)
30 000	CHE (2010*b*:14)

NOTES: [a]Figures represent estimates numbers of new teachers that need to enter the public school system each year in order to replace the number of practising teachers exiting the public school system each year. [b] Study which cites, estimates, or projects the specified numbers of new teachers required per annum.

4.3.4.2 Current ITE graduate production and teacher supply

Given the projections of teacher demand presented above, the question that remains is whether South Africa is currently producing sufficient numbers of qualified new teachers to meet current demand. Insofar as it is true that between 20 000 and 30 000 new teachers need to enter the public schooling system every year, the simple answer to this question would appear to be a resounding "no".

If every single ITE graduate produced by the public HE system between 2004 and 2013 was immediately absorbed into the teaching profession as a new first-time teacher immediately after graduating, this would have amounted to around 92 500 new teachers over the entire period (Table F.1). Even if the annual required number of new teachers was as low as 10 000 per year - far lower than any of the estimates found in Table 4.3 - this would still mean that the number of new teachers produced amounted to only 92.5% of what was required. However, the reality of teacher supply in South Africa is more nuanced than such comparisons would suggest for the simple reason that the number of new ITE graduates is not the same as the number of potential new qualified teachers.

In contrast to what is sometimes implied, the number of ITE graduates produced by the HE system every year constitutes an inflated estimate of the number of new individuals who become available for employment as qualified first-time teachers in the schooling system. Each new group of ITE graduates effectively includes some individuals who are already employed as teachers, some who have no intention of seeking employment as teachers or at least not to do so in the immediate future, some who seek to become teachers, but cannot find employment despite applying for teaching posts, and some who both want to work as teachers and are able to find suitable positions in which they are subsequently employed. In the short run, it is only this last group of new ITE graduates that increases the supply of qualified teachers in the country.

The distinction between different types of ITE graduates is important, as research suggests that the number of individuals who fall into one of the first three of the aforementioned categories constitute a non-negligible proportion of new ITE graduates each year. For example, while it is well known that the bulk of individuals who graduate with CPTD qualifications are existing teachers, many ITE graduates may also already be employed as teachers. According to DHET (2011*b*:7), an estimated 37% of UNISA's ITE graduates in 2009 were employed teachers. Given that UNISA accounted for an estimated 21.9% of all ITE graduations in 2009, this implies that at least 8.1% of the graduates for that year were existing teachers.[40] While the number of practising teachers who enrol in ITE programmes at UNISA is likely to be much greater than the number who enrol in such programmes at contact HEIs, this nonetheless conveys the fact that a substantial proportion of each year's new ITE graduates do not contribute to the supply of qualified new teachers by virtue of the fact that they are already part of the teachers corps.[41]

In addition to the fact that some new ITE graduates every year will already be existing teachers, there are others who may not immediately seek employment as teachers, if at all, and if they do, may seek out opportunities to teach abroad rather than in South Africa. A survey conducted by Bertram *et al.* (2006), for example, showed that more than 7% of newly qualified potential teachers had no plans to enter the teaching profession and that more than a quarter planned to work abroad immediately after graduating for at least two years before returning to South Africa. Similarly, CDE (2011:12) asserts that at least a quarter of all newly qualified potential teachers in South Africa never become practising teachers in South African schools. This further reduces the pool of new ITE graduates who can contribute to the supply of qualified teachers.

Lastly, an increasing number of studies have alluded to the fact that, in a similar vein to the situation for Funza Lushaka graduates, some new ITE graduates struggle to find employment as teachers after graduating, particularly in urban areas (DBE and DHET, 2011:40). The inability of recently graduated ITE students to find employment as teachers is partly evidence by the widespread temporary employment of young first-time teachers. Chisholm (2009:27) , for example, notes that, despite the need for individuals to fill permanent positions, provincial education departments employed 31 950 temporary teachers in July 2008. In light of pervasive teacher shortages, this is deeply disconcerting. However, again it implies that the already limited number of individuals who could be added to the stock of qualified teachers in the country is further whittled down.

If it was the case that each year's pool of new ITE graduates represented the sole source of qualified new teachers to the schooling system, the aforementioned issues would collectively imply that the HE system should be producing far more than 20 000 to 30 000 ITE graduates each year in order for supply to satisfy the demand. However, new ITE graduates are not the only source of new teachers to the South African schooling system.

Table 4.4 shows the numbers of employed teachers in public and independent schools for the years 2004 to 2014. The estimates in the table reveal an important and often overlooked feature of current teacher supply in South Africa. The figures indicate that the net increase in the number of employed teachers in the country between 2004 and 2014 (63 048), amounted to about 68.2% of the estimated number of ITE graduates produced between 2004 and 2013 (92 477). In other words, if one were to assume that there was no teacher attrition

[40] Similarly, DHET (2010:2) notes that 344 of and 447 of UNISA's ITE graduates in 2007 and 2008, resepctively, were already employed in teaching posts. This again implies that at least 5.4% of all 2007 ITE graduates and 7.3% of all 2008 ITE graduates were practising teachers.

[41] DOE (2005*b*:13) claim that as much as a third of all ITE graduates produced by public HEIs in 2004 may have already been practising teachers. However, this figure seems implausibly high.

whatsoever over the period, this would seem to imply that 68.2% of new ITE graduates were employed as new teachers over the period. However, it is well known that teacher attrition in South Africa is high, with most studies estimating that between 4% - 6% of practising teachers leave the system every year (CEPD, 2009*b*:61). Factoring in the effects of teacher attrition, a net increase in the number of employed teachers would mean that far greater numbers of new teachers would have had to enter the schooling system over this period. Given that not all ITE graduates will try to find employment as teachers after graduating and even among those who do, not all will succeed in finding a post, this means that some of the new teachers entering the schooling system must have come from a source other than the stock of new ITE graduates that were produced over the period.

Table 4.4: Estimated teacher exit and entry vs ITE graduate production (2004 - 2014)

Year	Total Teachers Employed[a]	Teachers exiting (Estimated 4%)[b]	Teachers entering (Estimated)[c]	ITE graduates produced in previous year
2004	362 042	14 504	13 948	8 074
2005	382 133	14 482	34 573	10 506
2006	386 595	15 270	20 122	7 626
2007	395 452	15 464	24 321	7 188
2008	400 953	15 818	21 319	6 413
2009	411 164	16 038	26 249	6 159
2010	418 109	16 447	23 392	6 953
2011	420 608	16 724	19 223	8 284
2012	425 167	16 824	21 383	10 540
2013	425 023	17 007	16 863	13 153
2014	425 090	17 001	17 068	15 655
Total		175 594	238 086	100 551

NOTES: [a] Figures represent the total numbers of educators in public and independent South African schools and were taken from DOE (2005*a*:4), DoE (2007:2), DoE (2009:2), DBE (2011:1), and DBE (2014*b*:1). [b] A gross attrition rate of 4% per annum is assumed. Figures are equal 4% of the total number of teachers employed in the previous year. [c] Figures are equal to the total teachers employed in the current year minus the total teachers employed in the previous year, plus the estimated number of teachers exiting the profession.

To get a better sense of the extent to which current teacher supply in South Africa differs from the number of ITE graduates that are being produced by the public HEI system, Table 4.4 presents crude estimates of the number of existing teachers leaving the profession and the number of teachers entering the schooling system between 2004 and 2014, based on the assumption of a constant, 4% national annual gross attrition rate. Despite the fact that this 4% attrition rate is conservative compared to what is generally reported in other studies[42], the figures indicate that the estimated total number of individuals who entered teaching between 2006 and 2014 was more than double (238 000) the estimated number of ITE graduates produced between 2003 and 2013 (100 550). In other words, even if one were to assume, unrealistically, that all of the ITE graduates produced over the period in question gained employment as new teachers, this implies that more than half of all individuals entering teaching in South Africa came from some "reserve stock of potential teachers" (hereafter *reserve teacher stock*).

South Africa's *reserve teacher stock* is likely to comprise a diverse group of individuals. Some may be former practising teachers who, having left the profession at some stage, decide to join it again at a later juncture. Some may be young ITE graduates who have been looking for work, but have not yet been able to find suitable teaching positions. Given the prevalence of teacher emigration in South Africa, some may be returning

[42] See (DHET, 2010:12), CDE (2011:10), Deacon (2010*a*:41), and HSRC (2013:6), for example.

emigrant teachers who intend to continue teaching in South Africa. The group may even include technically unqualified individuals who nevertheless seek to gain employment as teachers.

The existence of a *reserve teacher stock* in South Africa is arguably a good thing, since it can serve to supplement teacher supply in times when new teacher production is insufficient to meet teacher demand. However, what is disconcerting is that the vast majority of individuals entering teaching in South Africa since 2004 and possibly even earlier, appear to have been sourced from this *reserve teacher stock*, a stock that is ultimately finite unless it is being replenished at the same rate at which it is being depleted.[43] It is not immediately clear how many studies take this point into account when they report estimates of the number of teaching graduates that should be produced by the HE system in order to satisfy teacher demand in the country.

It is not clear how large South Africa's *reserve teacher stock* is or how long it will be able to sustain current levels of teacher supply in the country. However, the estimates in Table 4.4 show that the number of ITE graduates being produced each year is steadily converging on the estimated number of individuals entering teaching every year, suggesting that fewer and fewer new teachers are coming from this reserve stock. Unfortunately, these estimates are crude and it is not possible to verify their accuracy without access to PERSAL data. However, insofar as they can be taken to be indicative, they imply that the public HE system may have to produce far more newly qualified teachers than other studies have suggested and, indeed, far more ITE graduates than are currently being produced. Again, without more detailed data, such claims remain partly conjecture. What is certain, however, is that South Africa's *reserve teacher stock* cannot serve as the primary source of teacher supply in the country indefinitely.

4.3.4.3 Future ITE graduate production and teacher supply

Taken together, the points raised above suggest that South Africa is still not producing sufficient numbers of ITE graduates to ensure that the supply of qualified new teachers can satisfy current levels of demand. The question thus becomes whether the HE system will produce sufficient numbers of ITE graduates in the near future and, if so, when. Answering this question requires projections of future ITE graduation numbers based on some underlying model of ITE graduate production. This section proposes such a simple model.

The most up to date and comprehensive model of current teacher supply and demand in South Africa is presented by CDE (2015) and incorporates forecasts of ITE graduation numbers for the period 2013 to 2025.[44] These forecasts are predicated on an assumed schedule of growth in total ITE programme headcount enrolments over the period and constant graduation rates. The model proposed here takes a different approach. First, instead of focussing on the estimated growth in total headcount enrolments in ITE programmes, the focus falls on the estimated trends in FTEN in ITE programmes. Second, rather than relying on graduation rates, the ability to estimate completion rates using the HEMIS data is exploited.[45]

As with any model, it is necessary to make assumptions in order to ensure tractability. The proposed model firstly assumes that FTEN in undergraduate and postgraduate ITE programmes at UNISA and contact HEIs

[43] Simkins (2015:12) finds that the reserve teacher stock is *"...continually replenished by some of the leavers in previous years"*. However, it is also acknowledged that the stock of qualified teachers is being depleted faster than it is being replenished (Simkins, 2015:18). Moreover, given the shortfall between the projected annual teacher demand and ITE graduation numbers, it does not seem plausible that the current cycle of depletion and replenishment can be sustainable in the long run.

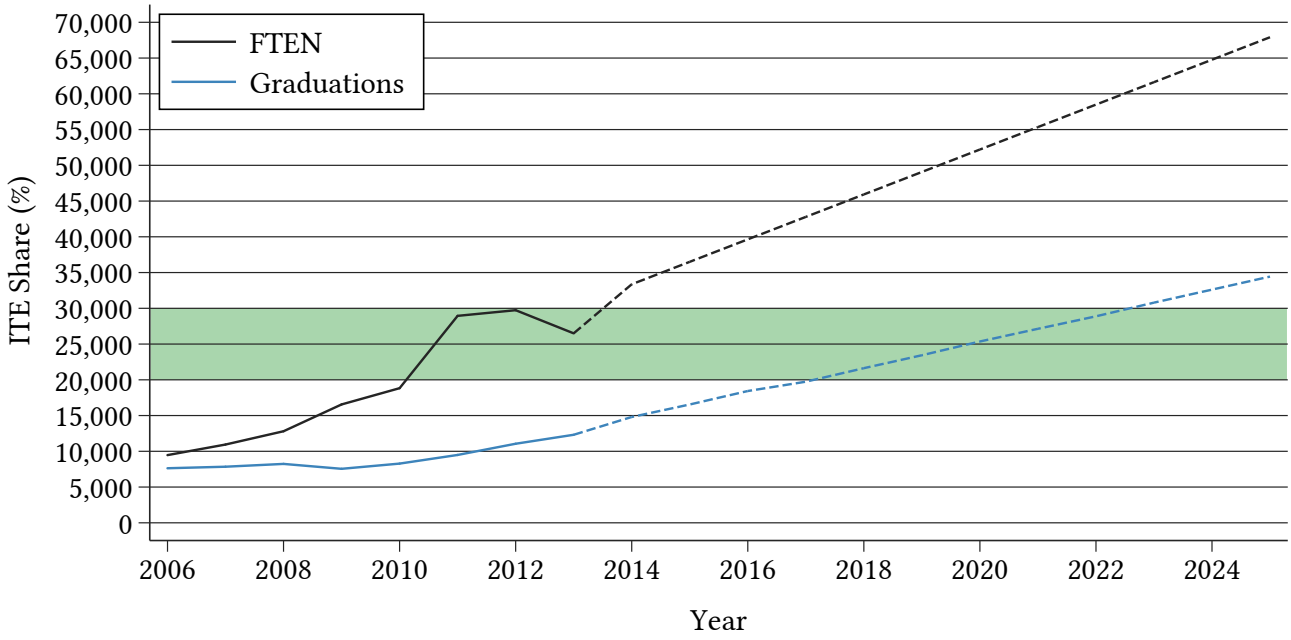
[44] The details underlying the CDE (2015) report are set out in Simkins (2015).

[45] A discussion on the differences between graduation and completion rates is presented in Section 4.5 which deals with throughput in ITE programmes between 2004 and 2013.

will continue to persist linearly along the trends they have respectively been on since 2006. Second, it assumes that the completion rate schedules that have characterised throughput in undergraduate and postgraduate ITE programmes at UNISA and contact HEIs in recent years will continue to do so for the foreseeable future. The number of ITE graduates produced every year is subsequently modelled as a simple function of the predicted FTEN for each ITE programme and HEI type and their respective estimated completion rate schedules (Table F.11). A formal description of this methodology is presented in Section G.3.

Figure 4.12 shows the projected ITE FTEN and graduation numbers for the period 2014 to 2025 alongside estimates of actual FTEN and graduations in ITE programmes between 2006 and 2013.[46] From visual inspection, these projections would appear to suggest that the HE system may start to produce sufficient numbers of ITE graduates to satisfy current levels of annual teacher demand at some stage between 2017 and 2022.

Figure 4.12: Actual and projected FTEN and graduations in ITE programmes (2006 - 2025)



NOTES: Figures represent (a) estimated FTEN and graduations in undergraduate and postgraduate ITE programmes for the period 2006 and 2013 and (b) projected numbers of FTEN and graduations in undergraduate and postgraduate ITE programmes based on the completion rate schedules in Table F.11 and the methodology described in Sections 4.3.4.3 and G.3 for the period 2014 - 2025.

It is worth noting that the predictions of this model are remarkably similar to those of the CDE (2015) model in terms of the projected number of new ITE graduations per year.[47] This is surprising, since the two models not only use different approaches to project ITE graduations, but are also based on different underlying assumptions and data. There are some differences, though. For example, the present model projects that postgraduate ITE students will account for a far smaller percentage of total ITE graduations than the CDE (2015:4) model suggests.[48] Notwithstanding, the two models' predictions of total annual ITE programme graduation numbers are substantively the same.

[46] The projected estimates on which the graph is based are presented in Table F.12.

[47] The projected total number of ITE graduations between 2014 and 2025 amounts to 293 810 graduates, approximately 97.8% of the number of graduates projected by the CDE (2015:4) model (300 466).

[48] This is partly explained by the fact that the CDE (2015) model explicitly uses a growth rate for total enrolments in PGCE programmes that is higher than the growth rate for enrolments in BEd programmes, based on the notion that there will be an increased demand for secondary school teachers relative to primary school teachers over the next decade (Simkins, 2015:12). By contrast, the model in this chapter allows for the fact that FTEN in undergraduate ITE programmes has been growing faster, on average, than FTEN in postgraduate ITE programmes (Table F.4) since 2004 to persist into the future.

While models such as the one presented here may be useful for understanding the potential future supply of ITE graduates and qualified new teachers, they are at best indicative tools, rather than definitive ones, and should therefore be viewed as such. It is important to understand not only that all of the caveats regarding the differences between annual ITE graduations and the number of potentially new qualified teachers also applies to projected ITE graduation numbers, but also that several additional caveats apply.

The present model is a severely simplified abstraction. It does not and cannot account for all of the complexity underlying FTEN and graduations in ITE programmes. For example, it does not allow for differential FTEN growth trends or completion rate schedules between males and females or between different population groups. As shown in Sections 4.4 and 4.5 below, there are good reasons to believe that such differences do exist and that the ways in which they are changing over time are likely to have a significant impact on ITE graduations.

Ultimately, the projections made here are only as accurate as the underlying assumptions and data on which they are based. It is therefore important to understand the likelihood that these assumptions might be violated and what the implications of violations may be. First, the model assumes that the current trend in FTEN in ITE programmes can be sustained. That is, it assumes that the public HE system has the capacity to keep enrolling ever-increasing numbers of students in ITE programmes. Moreover, it assumes that the extent to which institutions are able to do so is the same accross all universities. Second, the model assumes that, despite rapidly rising numbers of ITE students at public HEIs, ITE programme completion rates will not change over time, either in magnitude, or in timing. Though these assumptions are necessary in order to project ITE graduation numbers, neither are particularly realistic. Therefore, if the the level of growth in FTEN in ITE programmes cannot be sustained, or if completion rates among ITE programme students decline, on average, for whatever reason, the predictions of the model will not be accurate.

In light of these concerns, it would be prudent to interpret the estimates in this section with caution. Nonetheless, one may conclude that, conditional on the aforementioned assumptions and in the absence of unforeseen changes in the underlying parameters of the model, it is likely that the public HE system will start to produce sufficient numbers of ITE graduates to satisfy the annual demand for qualified new teachers in the schooling system within the next decade.

4.4 The demographic composition and geographical distribution of FTEN and graduations in ITE programmes

Having identified and discussed the major trends in FTEN and graduations in ITE programmes between 2004 and 2013, the focus now turns to the demographic composition and geographic distribution of FTEN and graduations in ITE programmes in the public HE system, how this has changed between 2004 and 2013, how it is likely to continue to change, and what the implications are for qualified teacher supply in South Africa.

Given the nature of the aggregate HEMIS data and the shortcomings of the methodology outlined in Section 4.2, there is an inherent trade-off between the depth of disaggregation and the accuracy of estimations that can simultaneously be achieved in the analysis. The deeper the level of disaggregation, the more the estimates are likely to be biased by the effects of classification and categorisation errors. The analysis that follows therefore tries to strike a compromise between these trade-offs by focussing on, at most, two dimensions of disaggregation at a time.

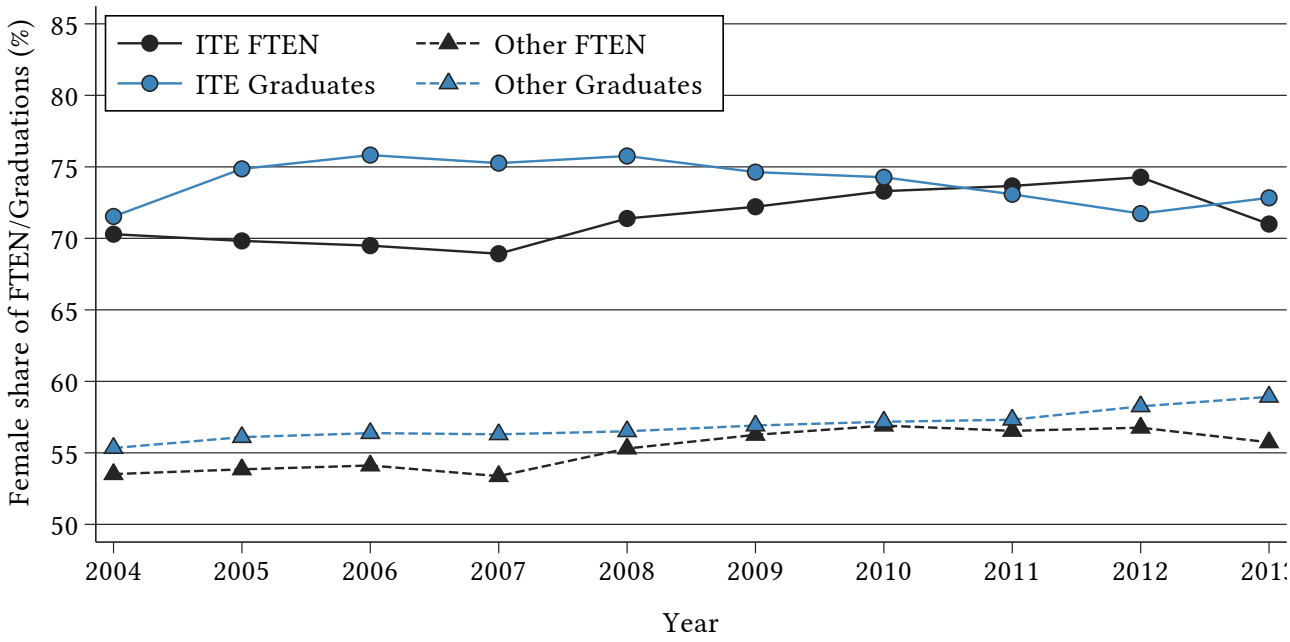
4.4.1 Gender, race, and language

4.4.1.1 Gender

In South Africa, as in many other countries, teaching is primarily a female-dominated profession. At present, females account for around 61% of educators in South African public schools and 66% of educators in public primary schools.[49] Moreover, the data indicates that the female share of practising teachers is increasing steadily over time. It is therefore perhaps not surprising that females accounted for 72% of all FTEN and more than 73% of all graduations in ITE programmes between 2004 and 2013 (Table F.13). Similar to the trend for FTEN in overall ITE programmes, the female share of FTEN in ITE programmes grew by an estimated 0.6% per annum over the period, rising from a low of 68.9% in 2007 to a high of 74.3% in 2012 (Table F.14 and F.13).

Between 2004 and 2013, the male share of graduations in non-ITE undergraduate degree and postgraduate diploma/certificate programmes gradually declined from 45% to just 41%. By contrast, Figure 4.13 shows that the trend for ITE programmes was non-monotonic. The number of individuals graduating from ITE programmes declined between 2004 and 2008 and then rose between 2008 and 2013. While this trend is evident for both genders, the rate of decline and rise over the respective periods was greater for males than it was for females. For this reason, the male share of graduations in ITE programmes declined sharply between 2004 and 2008 before rising again thereafter. Over the period as a whole, however, the change in the male/female share of ITE graduates was statistically negligible. For all intents and purposes, the HE system produced just over 7 female ITE graduates for every 3 male ITE graduates in 2013, much the same as it had in 2004.

Figure 4.13: Female share of FTEN and graduations in ITE and other programmes (2004 - 2013)



NOTES: Figures represent the estimated female shares of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes and non-ITE undergraduate degree and postgraduate diploma/certificate programmes. Figures are based on the estimates in Table F.13.

[49] These estimates are derived from Annual Survey of Schools (ASS) data for the 2000 - 2013 period. Interestingly, (CDE, 2011:10) assert that 67% of teachers in South African public schools are female. However, this claim is not substantiated by the ASS data.

The educator gender distribution has traditionally differed markedly across the various school phases in South Africa. It remains the case, for example, that males are, on average, far less likely to specialise in foundation or intermediate phase teaching than females (Mashiya, 2014:25). It is therefore plausible that the skewed gender distribution among newly qualified potential teachers may also imply a skewed distribution in terms of the number of individuals who are qualified to teach in different schooling phases. Unfortunately, in the same way that aggregate HEMIS does not allow for direct identification of BEd or PGCE qualifications, it does not allow for identification of teaching speciality areas. It is therefore not possible to asses the extent to which this is the case. However, insofar as phase specialisation choices in ITE programmes have remained delineated along gender lines, the fact that females continue to dominate FTEN in and graduations from ITE programmes may have actually served to mitigate the extent of the current imbalance between the demand for, and supply of, qualified foundation phase teachers in South Africa.

4.4.1.2 Race

Black participation in HE has grown rapidly over the past 25 years and Blacks now account for the vast majority of HE enrolments in South Africa. The HEMIS data shows that the Black share of total enrolments at public HEIs rose from 59% to over 70% between 2000 and 2013. In the context of widening teacher shortages, it is thus particularly worrying that most studies on teacher production in South Africa have reported dwindling numbers of Black enrolments in ITE programmes throughout the early 2000s.

While it is true that FTEN in ITE programmes among Blacks declined by about 50% between 2000 and 2006, Figure 4.14 shows that FTEN in ITE programmes for the group increased by more than 400% between 2006 and 2012. This, despite the fact that Black FTEN in other undergraduate degree and postgraduate diploma/certificate programmes grew by a more modest 70% over the same period. In fact, despite the declines in FTEN between 2004 and 2006 and again between 2012 and 2013, FTEN in ITE programmes among Blacks grew by 14.6%, on average, per annum between 2004 and 2013 (Table F.16). In other words, Black enrolments in ITE programmes have not simply been increasing over the intermediate term, but have done so much faster than Black enrolments in other programmes.[50]

Between 2004 and 2013, the Black share of FTEN in ITE programmes was at least as high as, if not higher than, the Black share of FTEN in other undergraduate degree and postgraduate diploma/certificate programmes (Figure 4.15). It is therefore not surprising that the trends in FTEN in ITE programmes are driven primarily by the trends for Black FTEN in ITE programmes. This also holds true for the trends in ITE graduations, albeit to a somewhat more moderate extent (Figure 4.14 and Figure 4.15).

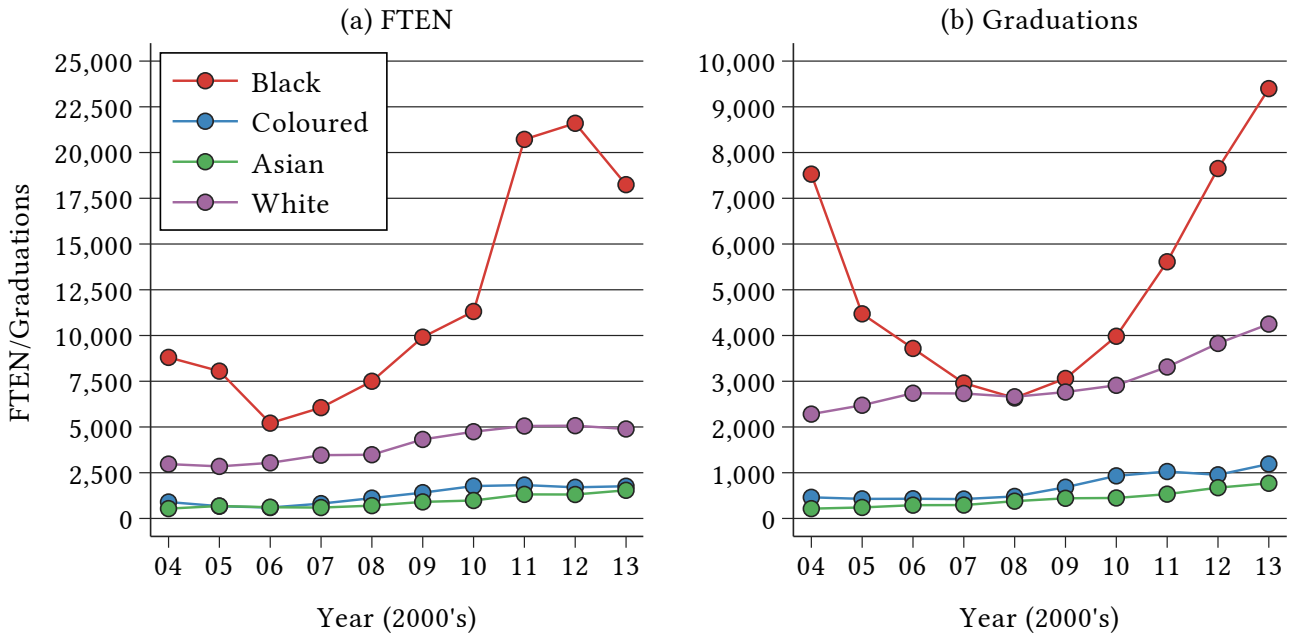
As mentioned above, the trends in graduations from HE programmes tend to reflect the trends in FTEN with some lag. In the wake of declining Black FTEN in ITE programmes before 2006, it is therefore to be expected that the number of Black ITE graduates produced by the public HE would have fallen, as indeed they did between 2000 and 2008.[51] However, Figure 4.14 makes it clear that the scenario regarding ITE graduate production has changed considerably since 2009.

In 2013, the public HE system produced an estimated 15 610 ITE graduates of whom roughly 9 400 were Black (60%), 1 190 were Coloured (8%), 7 70 were Asian (5%), and 4 250 were White (27%). Figure 4.15 shows how

[50] Crucially, it is the non-monotonic nature of the changes in Black FTEN in ITE programmes over the period that is responsible for the statistical insignificance of the average rate of growth between 2004 and 2013 (Table F.16).

[51] An exception to this is the year 2004 when there was a sudden spike in the number of Black ITE graduates produced at public HEIs.

Figure 4.14: FTEN and graduations in ITE programmes by race (2004 - 2013)



NOTES: Figures represent the estimated number of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes for the Black, Coloured, Asian, and White population groups respectively. Figures are based on the estimates in Table F.15.

the respective shares of FTEN and graduations in ITE and other programmes changed for each race group between 2004 and 2013. The fact that the trends for Whites are more-or-less the inverse of the equivalent trends for Blacks follows logically from the fact that the two groups collectively account for the vast majority (89% between 2004 and 2013) of all ITE FTEN and graduations from public HEIs. Thus, when the number of ITE graduations among Black students fell between 2004 and 2008 while it continued to grow among White students, the White share of ITE graduates more than doubled (Table F.15).

Contrary to the trend for Blacks, the number of White ITE graduations rose consistently between 2004 and 2013. However, because the number of Black ITE graduations has grown so rapidly since 2008, the White share of graduations has again declined (Figure 4.15). In fact, despite the rapid growth in the number of Coloured and Asian ITE graduations between 2004 and 2008[52], the relatively more rapid growth in the number of Black ITE graduations since 2008 means that the collective share for the two former race groups remained just over 12% in 2013.

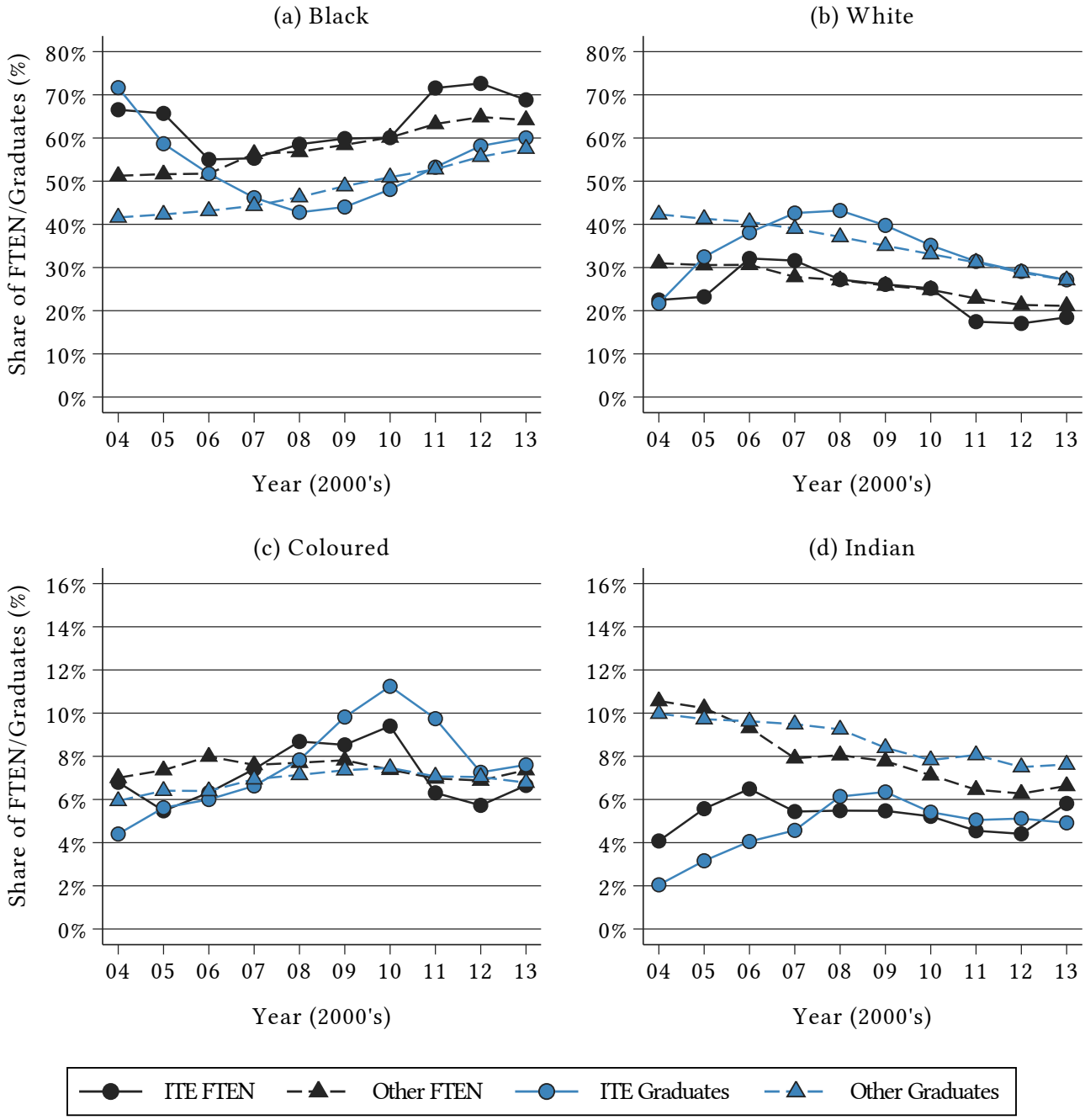
4.4.1.3 Gender and Race group

Having established that females and Blacks dominate FTEN and graduations in ITE programmes, it is useful to consider the interaction of race and gender and evaluate the potential differences in gender distribution levels and trends within each race group.

Figure 4.16 reveals that the extent to which females dominate ITE FTEN and graduations varies between race groups. Despite changes in the respective intra-race gender distributions between 2004 and 2013, it is evident that males represent a significantly greater share of ITE FTEN and graduations within the Black race group

[52] Coloured and Indian individuals collectively represented 14.6% of FTEN and 16.7% of ITE graduations in 2010.

Figure 4.15: Shares of FTEN and graduations in ITE and non-ITE programmes by race (2004 - 2013)



NOTES: Figures represent the estimated racial shares of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes as well as in other non-ITE undergraduate degree and postgraduate diploma/certificate programmes. Figures are based on the estimates in Table F.15.

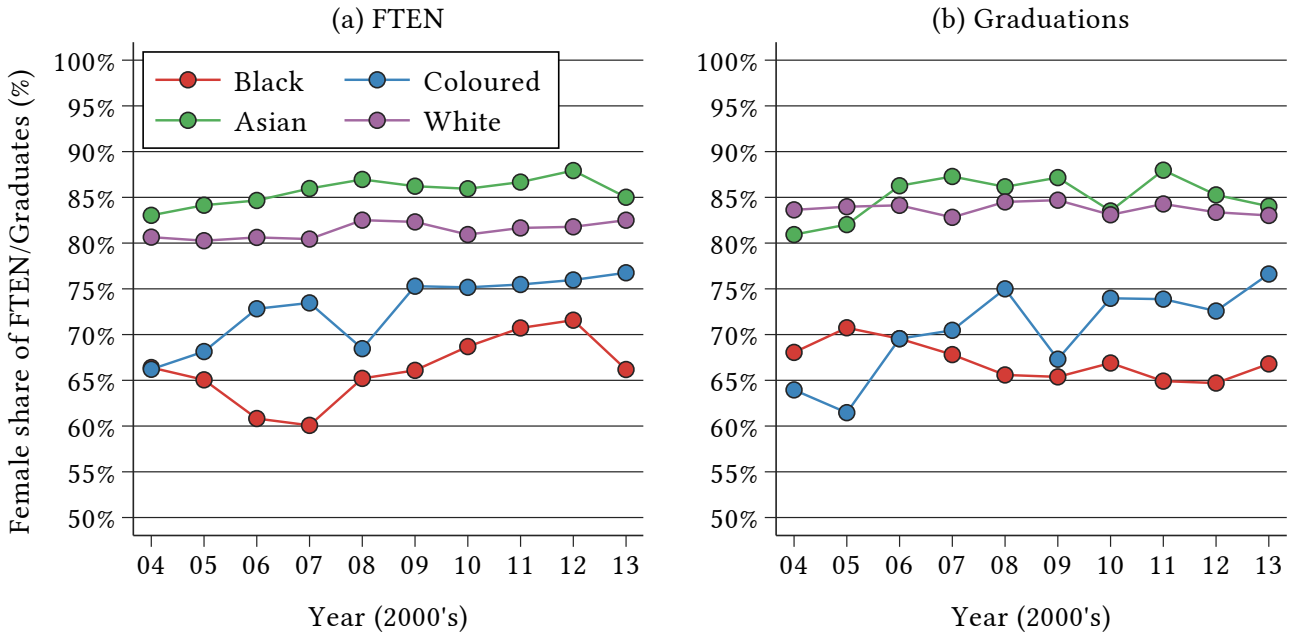
than within other race groups. Moreover, the data indicates that the male share of Black ITE graduations may be increasing over time. In 2013, more than 33% of Black ITE graduates were male, compared to 23% for Coloureds, 15% for Asians/Indians, and 17.5% for Whites (Table F.17 and Figure 4.16).

These results suggest that males' propensities to enrol in ITE programmes, although low in general, may be highest within the Black population.[53] One potential reason why this might be the case is if weak secondary school performance limits the field of study choices that are available to Black males more so than it does for

[53] Even so, the number of Black males entering ITE programmes for the first time in 2013 was only around 5% higher than the number of Black females that entered such programmes in 2004.

males in other race groups, effectively pushing more Black males to enrol in ITE programmes. Alternatively, it may be that Black males who choose to enrol in ITE programmes have comparatively greater access to funding via NSFAS loans or Funza Lushaka bursaries than their peer groups. However, without more detailed and reliable data with which such hypotheses could be tested, this remains largely conjecture. Moreover, it should be noted that the estimated average annual rate of growth in FTEN in ITE programmes for Black males between 2004 and 2013 was not statistically significantly higher than the estimated growth rates for Coloured or Indian/Asian males (Figure 4.17).

Figure 4.16: Female share of FTEN and graduations in ITE programmes within race (2004 - 2013)



NOTES: Figures represent the estimated female shares of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes for the Black, Coloured, Asian, and White population groups respectively. Figures are based on the estimates in Table F.17.

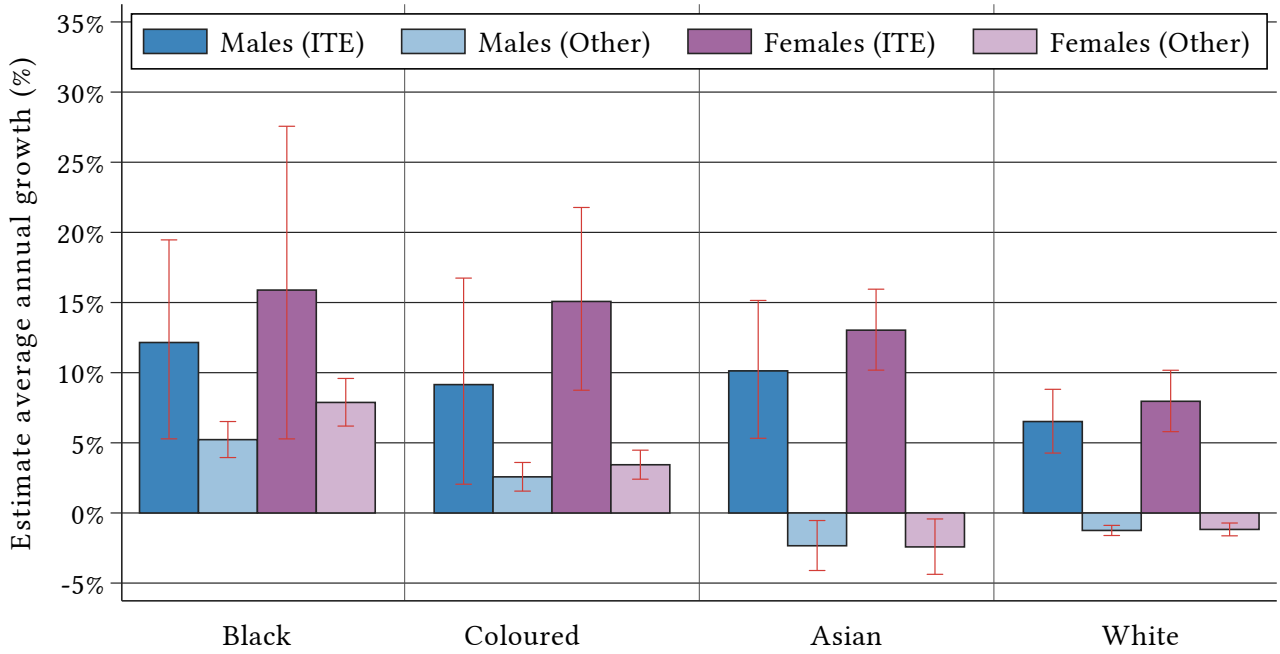
As noted above, one of the primary reasons why the trends in intra-race gender distributions are of importance is that male and female ITE students have traditionally been found to specialise in very different teaching areas and school phases in general (Mashiya, 2014:25 - 26). The aforementioned differences in underlying intra-racial gender distributions are thus likely to have important bearing on the types of newly qualified potential teachers that are produced by the HE system.[54] However, such a hypothesis cannot be tested with the available HEMIS data. What is clear is that three groups effectively dominate new ITE graduates. For every 10 ITE graduates produced in 2013, approximately 4 were Black females, 2 were Black males, and just over 2 were White females. In fact, these three groups constituted more than 80% of all ITE graduates produced by public HEIs between 2004 and 2013.

4.4.1.4 Home Language

A number of studies have pointed to the need to vastly increase the number of African language mother-tongue teachers in South Africa, particularly in the foundation phase (FP) (CHEC, 2009:xxxviii). DBE and

[54] The gender composition may, for example, have implications for the supply of maths and science teachers in the FET phase, given that different genders and race groups tend to have different likelihoods of specialising in such fields.

Figure 4.17: Estimated average annual growth rates in FTEN in ITE and non-ITE programmes by gender and race (2004 - 2013)



NOTES: Bars represent the estimated average annual growth rates (%) in FTEN in undergraduate and postgraduate ITE programmes and non-ITE undergraduate degree and postgraduate diploma/certificate programmes for males and females by population group over the period and were estimated using the least-squares methodology described in Appendix G. Capped lines represent the 95% confidence intervals surrounding the each point estimate. Figures are based on the estimates in Table F.19.

DHET (2011:12) estimates that the public HE system should be producing at least 4 300 African mother-tongue teachers, 750 Afrikaans mother-tongue teachers and 450 English mother-tongue teacher per annum just to replace the number of FP teachers leaving the profession.

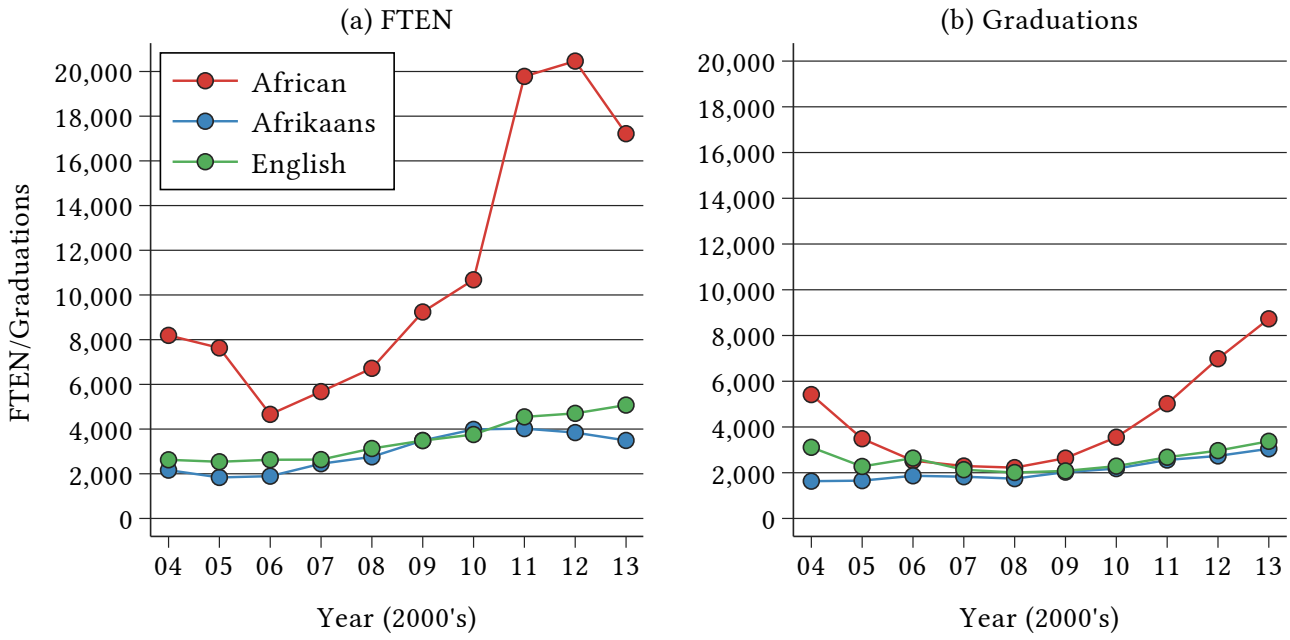
These estimates are far in excess of what the system has been producing thus far. DoE (2006:12) projected that out of the roughly 6 000 ITE graduates that were expected to graduate in 2006, only 500 would have been African language mother-tongue speakers specialising in FP education. However, even this low projection may have been overly optimistic as DHET (2010:2) shows that only 168 African mother-tongue speakers qualified to teach in the FP in 2009.

The HEMIS data indicates that approximately 95% of Black individuals who enrol in ITE programmes at South African public HEIs are African language mother-tongue speakers. The trends in African mother-tongue ITE FTEN and graduations between 2004 and 2013 are therefore virtually identical to the trends for Blacks, as discussed above (Figure 4.18 and Figure 4.14). It is evident that there was a significant rise in the number of African mother-tongue speakers enrolling in and graduating from ITE programmes since 2006/2007 (Figure 4.18). The public HEI system produced an estimated 8 730 African language mother-tongue ITE graduates in 2013, accounting for roughly 66% of all ITE graduations for the year (Table F.15).

It is important to evaluate the estimated number of African mother-tongue ITE graduates produced by the HE system relative to the demand for African language FP teachers. Only a small portion of all ITE graduates specialise in areas that would make them qualified to teach in the FP. For example, Adendorff *et al.* (2014:6) find that only 17.1% of all ITE graduates produced by the public HE system between 2008 and 2012 specialised in FP teaching.[55] There are indications that these percentages may be much lower still for Black ITE students

[55] Similarly, DHET (2011*b*:8 - 9), shows that only 25% (1 121) of all BEd and less than 9% (220) of all PGCE students who graduated in

Figure 4.18: FTEN and graduations in ITE programmes by home language (2004 - 2013)



NOTES: Figures represent the estimated numbers of first-time enrolments (FTEN) and graduates in undergraduate and postgraduate ITE programmes by home language. "African" languages include Setswana, Tshivenda, Xitsonga, isiXhosa, isiNdebele, isiZulu, seSotho, seSotho sa Lebowa, and siSwati. Figures are based on the estimates in Table F.20.

(DHET, 2010:2).[56]

Unfortunately, aggregate HEMIS does not allow for the identification of the specialisation areas of ITE students. However, even if one were to abstract from likely distributional differences and assume that about 18% of all ITE graduates specialise in FP education, regardless of their home language, the HEMIS data indicates that the public HE system would still only have produced about 1 300 African language mother-tongue FP ITE graduates in 2013.[57] This figure is likely to be a significantly inflated estimate of the actual number of African language mother-tongue FP ITE graduates produced in 2013 given that Adendorff *et al.* (2014:18) find that only 701 of the FP ITE graduates produced by contact HEIs in 2012 were African language mother-tongue speakers.[58] However, even if it was accurate, it would still amount to less than a third of the estimated 4 300 African mother-tongue FP teachers that are supposedly leaving the teaching profession in South Africa every year (DBE and DHET, 2011:12). This suggests that the HE system is still not producing anywhere near enough African-language FP teachers and, moreover, that it is highly unlikely to start doing so any time in the near future. In fact, DHET's own projections suggest that the public HE system can be expected to produce no more than 3 880 effective new FP ITE graduates in total in 2019 (Adendorff *et al.*, 2014:14).

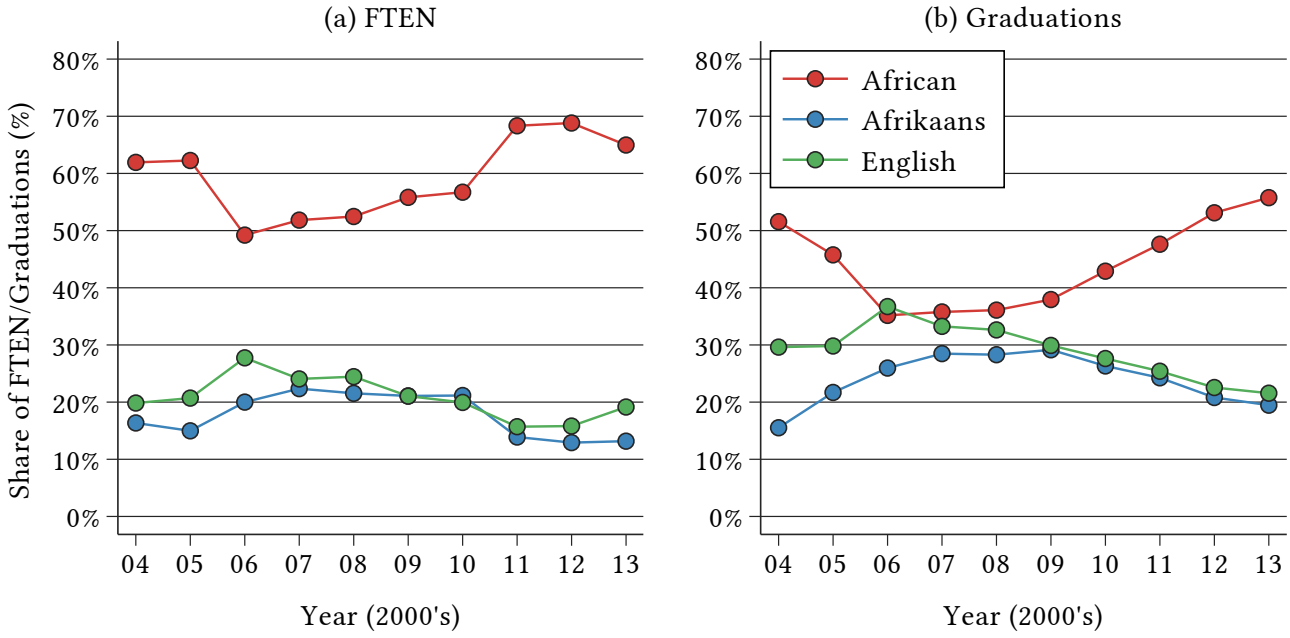
2009 were qualified to teach in the FP.

[56] The aggregate HEMIS data indicates, for example, that only 2 638 of the estimated 6 953 ITE graduates produced in 2009 were African language mother-tongue speakers (Table F.20). If it is true that only 168 African mother-tongue speakers qualified to teach in the FP in 2009 (DHET, 2010:2), this would mean that only about 6.4% of the African mother-tongue speaking ITE graduates produced that year specialised in FP education.

[57] This figure is estimated as 18% of all undergraduate and all postgraduate ITE graduates produced by the 15 HEIs that offer FP ITE programmes in South Africa in 2013, based on aggregate HEMIS data (DBE, 2009:8 - 11).

[58] Information on phase specialisation and home language was not available for UNISA in 2012. Yet, even if one were to assume that all of UNISA's FP ITE graduates for 2012 were African language mother-tongue speakers, this would still imply that only 1219 FP ITE graduates produced in 2012 were African language mother-tongue speakers.

Figure 4.19: Shares of FTEN and graduations in ITE programmes by home language (2004 - 2013)



NOTES: Figures represent the estimated shares (%) of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes by home language. "African" languages include Setswana, Tshivenda, Xitsonga, isiXhosa, isiNdebele, isiZulu, seSotho, seSotho sa Lebowa, and siSwati. Figures are based on the estimates in Table F.20.

4.4.2 Geography

The South African schooling system is spatially heterogeneous along a range of dimensions that affect both the demand for, and the supply of, teachers. Differences in population density (DOE, 2005*b*:33), socio-economic status (HSRC, 2013:115), urbanisation (DoE, 2006:10), teacher attrition rates (HSRC, 2005:41), pupil-teacher ratios (OECD, 2013:80), average class sizes (DBE and DHET, 2011:31), educator age-profiles (DOE, 2005*b*:10), and numerous other factors imply that the numbers and types of teachers that are required in schools vary between provinces and districts. It is widely accepted, for example, that the shortage of teachers is greatest in rural areas and poor communities and, therefore, that the demand for qualified teachers who are either willing to teach in such areas or can be incentivised to do so is comparatively high (CDE, 2011:10).

Geographical location also plays an important role in HE in South Africa, given that public universities are spread unequally between provinces. While Gauteng, the largest and most urbanised province, is home to five separate contact HEIs, Mpumalanga, North West, and the Northern Cape each have just one university, two of which only opened in 2014.[59] The size, function, and quality of HEIs also vary between provinces. The University of Zululand in Kwazulu-Natal, for example, is a relatively small HEI in terms of total enrolments, accounting for just 1.52% of all enrolments in public HEIs between 2004 and 2013 (Table F.21). However, in terms of its share of enrolments and graduations in ITE programmes, it is the largest contact HEI in the country and produced more ITE graduates than all of the HEIs in the Free State and Limpopo combined between 2004 and 2013 (Table F.21).

The spatial distribution of South Africa's HEIs invariably influences if, where, and what individuals ultimately

[59] Though the University of Mpumalanga (Mpumalanga) and Sol Plaatje University (Northern Cape) respectively offer the *Bachelor of Education degree in Foundation Phase Teaching* and the *Bachelor of Education in Senior Phase & FET Teaching* programmes, these institutions only started enrolling students in February 2014. As a result, neither HEI will have produced any ITE graduates yet.

study at university. Because of this, CHEC (2013:18) points to the existence of significant *"spatial inequalities in the distribution of higher education opportunities"* in the country. This is particularly relevant in the context of teacher training. CHE (2010*b*:14) and others have argued that the decline in FTEN in ITE programmes between 1995 and the early 2000s can partly be ascribed to the fact that, in contrast to former teacher colleges which were both relatively numerous and spread across urban as well as rural areas, South Africa's 23 public HEIs[60] are mostly concentrated in the urban centres of the richest provinces (DBE and DHET, 2011:22). This geographical "narrowing" in access, in conjunction with the substantially larger financial cost involved in attending university, is believed to have precluded many who may otherwise have sought to become teachers from enrolling in ITE programmes (CEPD, 2009*a*:17).[61]

In addition to affecting access to ITE programmes, the spatial distribution of HEIs may also be important for understanding the spatial distribution of newly qualified teacher supply. Qualitative research suggests that, given the significant financial investments required to attend university, new ITE graduates often face strong incentives to first search for teaching jobs near the HEIs where they studied before they consider looking for teaching positions in more rural areas (SACE, 2011:15). However, Boyd *et al.* (2003:10) finds that new ITE graduates are most likely to search for teaching jobs in areas that are near to or at least similar to the areas where they originally come from. Which of these theories best characterises South Africa is unclear, although there appears to be at least some evidence in favour of the notion that new ITE graduates prefer to search for employment in the provinces where they studied (Cosser, 2009; DOE, 2005*b*).

Just as it is important to know where the demand for teachers is highest, it is important to know where ITE students are studying and where they come from. To shed light on the regional trends and differences in access to ITE programmes and the production of newly qualified potential teachers between 2004 and 2013, this section therefore considers provincial patterns of FTEN and graduations in ITE programmes firstly in terms of the province of enrolment/graduation (i.e. the province in which the HEI attended is located) and, secondly, in terms of the provinces where ITE students/graduates come from.

4.4.2.1 HEI location and province of enrolment for ITE students

Table F.21 shows the provincial distribution of South Africa's 23 public HEIs and the relative contribution of each HEI/province to total enrolments and graduations in the country between 2004 and 2013.[62] It is clear that HEIs have different programme structures and that some make larger/smaller contributions to the production of ITE enrolments/graduations than they do to overall enrolments/graduations. Gauteng, Limpopo, and the Western Cape are the only provinces to have made smaller contributions to the production of ITE graduates than they did to the production of total graduates between 2004 and 2013. However, this is partly due to the fact that, as discussed in Section 4.3.3.1, UNISA's share of ITE graduations is significantly greater than its share of overall graduations.

If one excludes UNISA, the majority of FTEN and graduations in ITE programmes come from HEIs in KwaZulu-Natal and Gauteng. Between 2004 and 2013, more than 48% of all FTEN in ITE programmes and 45% of all

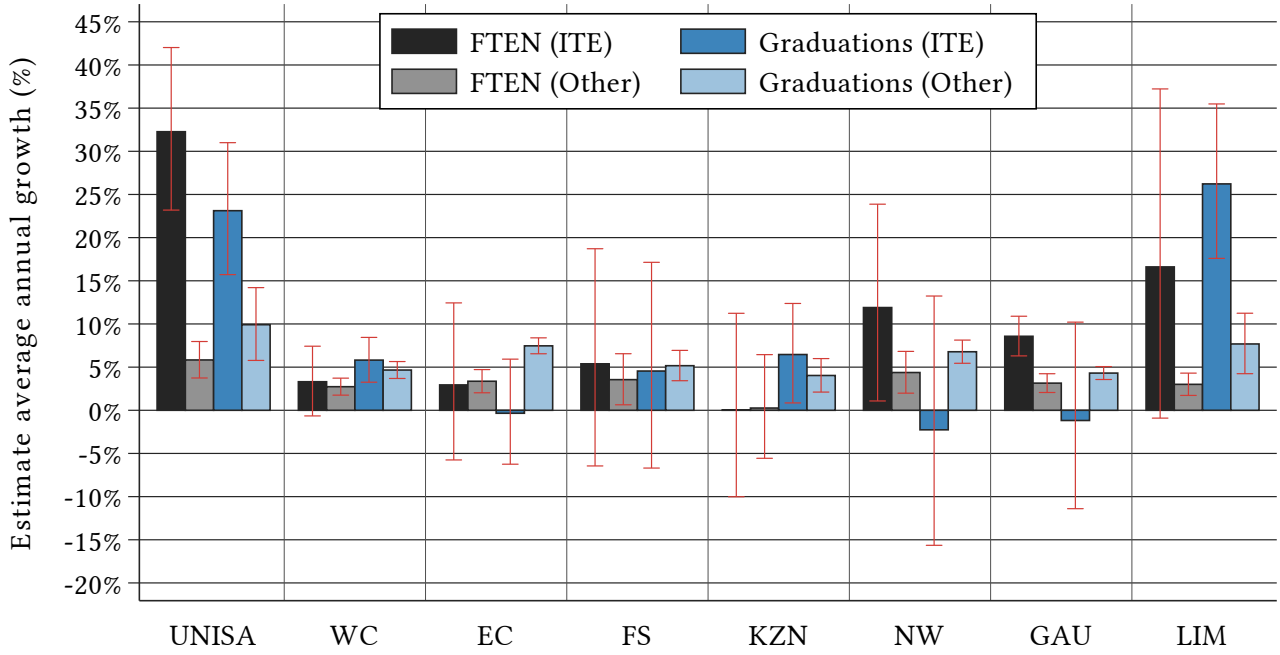
[60] It should be noted that Mangosuthu University of Technology does not offer ITE programmes.

[61] The incorporation of colleges of education into the HE system is believed to have had a particularly negative impact on the training of Grade R and Foundation Phase teachers (Chisholm, 2009:24).

[62] As noted above, the University of Mpumalanga (Mpumalanga) and Sol Plaatje University (Northern Cape) only opened in 2014 and is thus not included in the HEMIS data before 2014.

ITE graduates produced by contact institutions came from universities in these two provinces (Table F.22).[63] However, the respective provincial shares of ITE FTEN and graduations for most provinces fluctuated substantially over the period and, with the exception of Limpopo, all provinces experienced a general decline in share relative to UNISA where FTEN and graduations in ITE programmes continued to grow far more rapidly than it did at contact institutions.

Figure 4.20: Estimated average annual growth rates in FTEN and graduations in ITE and non-ITE programmes by province of HEI (2004 - 2013)



NOTES: Bars represent the estimated average annual growth rates (%) in FTEN and graduations in undergraduate and postgraduate ITE programmes and other non-ITE undergraduate degree and postgraduate diploma/certificate programmes over the period by province of enrolment (i.e. the province in which the HEI attended is located) and were estimated using the least-squares methodology described in Appendix G. Capped lines represent the 95% confidence intervals surrounding the each point estimate. UNISA is included as a separate category as it is not physically confined to a specific province. Figures are based on the estimates in Table F.23.

Because of the fluctuations in enrolments and graduations over time, inferences regarding trends in FTEN from comparisons of the yearly estimates in Table F.22 can be misleading. Figure 4.20 shows that North West, Gauteng, and Limpopo were the only provinces in which there were significant positive average annual growth in ITE FTEN between 2004 and 2013. These were also the only provinces in which FTEN in ITE programmes grew statistically significantly faster, on average, than FTEN in other undergraduate degree and postgraduate diploma/certificate programmes. In all of the other (Southern) provinces, average growth in ITE FTEN was either statistically negligible, or not statistically different from the growth in FTEN for other programmes. Over the period as a whole, these latter provinces represented approximately 62% of all FTEN in ITE programmes at contact HEIs. This reiterates the point that, as shown in Section 4.3.3.1, average annual growth in ITE FTEN at contact HEIs since 2004 has been very limited in general.

Only three provinces had statistically significant positive average annual growth in ITE graduations, namely the Western Cape, Kwazulu-Natal, and Limpopo (Figure 4.20) . Of these, Limpopo was the only province

[63] The HEIs located in KwaZulu-Natal are the Durban University of Technology (DUT), the University of Kwazulu-Natal (UKZN), and the University of Zululand. In Gauteng, the HEIs are the Tshwane University of Technology (TUT), the University of Johannesburg (UJ), the University of Pretoria (UP), and the University of the Witwatersrand (WITS)

in which ITE graduations grew statistically significantly faster on average than graduations in other undergraduate degree and postgraduate diploma/certificate programmes. While this comparatively rapid relative growth should be viewed in a positive light, it needs to be borne in mind that Limpopo has the smallest share of ITE graduations among the provinces, contributing less than 4% of all ITE graduates in the country between 2004 and 2013 (Table F.22).

Figure 4.21 shows the shares of ITE FTEN and graduations at contact institutions by province of enrolment/graduation for three periods between 2004 and 2013. This graph highlights three important aspects regarding the spatial distribution of entering ITE students and newly qualified potential teachers at contact institutions.

First, the relative provincial shares of ITE FTEN and graduations are not constant. This is evident from the number of significant changes that occurred over the relatively short period of time. For example, between 2004/2005 and 2008/2009, the contribution of KwaZulu-Natal's HEIs to the production of ITE graduates among contact HEIs dropped from a dominant 30.7% to just 21.7% (the 3rd largest share). Similarly, Limpopo's share of FTEN in ITE programmes increased more than four-fold between 2008/2009 and 2013/2014. From this it should be clear that it would be imprudent to base any evaluation of the relative contributions of HEIs and provinces to teacher production on a single point in time. Sadly, because of restrictions on available data, this is generally what is done (CEPD, 2009*c*:23 -26).

Second, despite general fluctuations in provincial shares, Gauteng and Kwazulu-Natal's collective shares of FTEN and graduations has remained fairly stable over time. While Kwazulu-Natal's share of FTEN has declined because of stagnant growth, this has been offset by Gauteng's rising share. The converse is true for the provinces' respective shares of graduations. As a result, the two provinces accounted for around 49% of FTEN and 46% of graduations at contact institutions by the end of 2013, more or less as they had done in 2004.

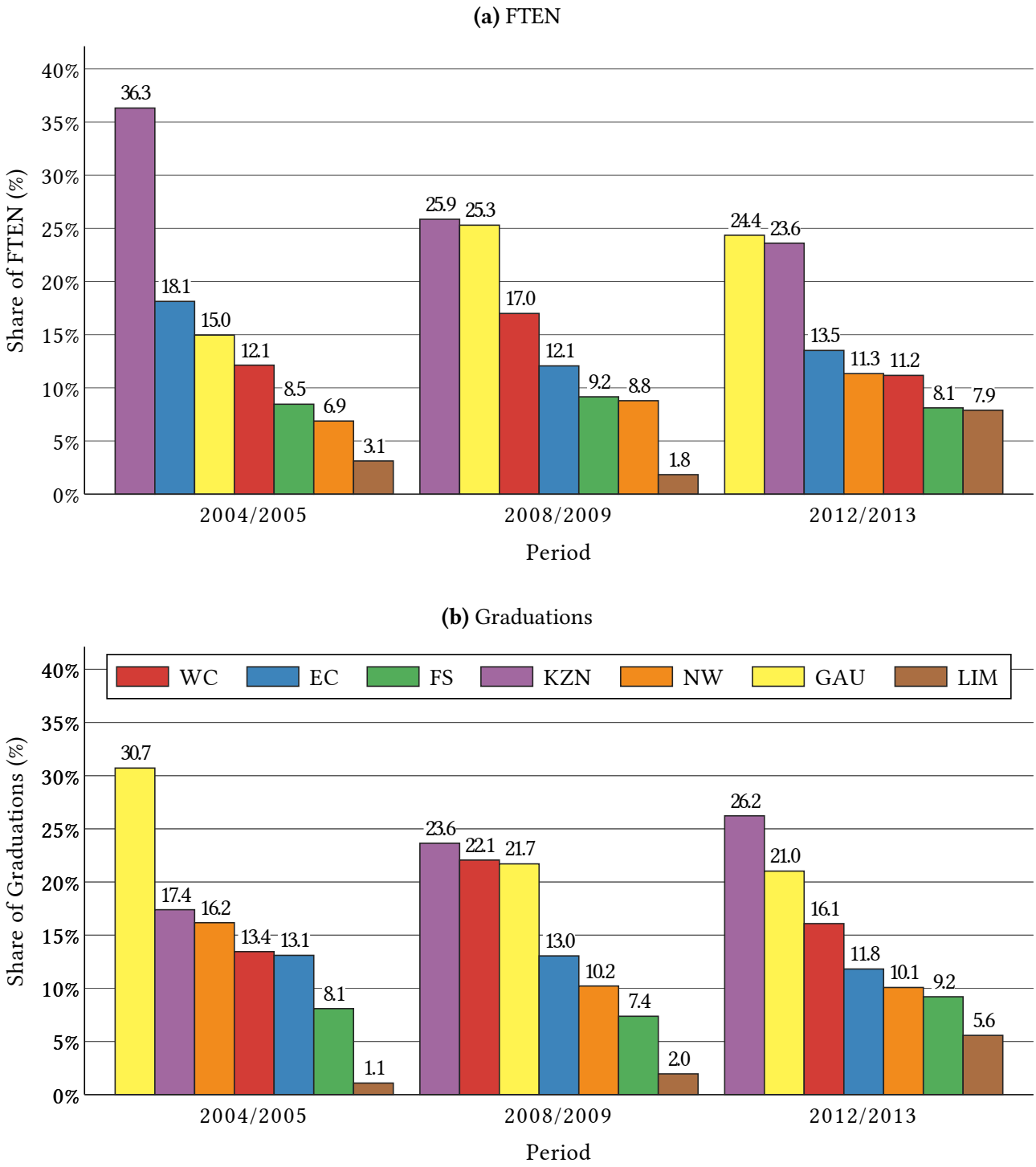
Third, and perhaps most importantly, for any particular period under consideration there may be significant differences between a province's share of the number of individuals entering ITE programmes and its share of the number of individuals successfully completing ITE programmes. However, these differences do not necessarily convey any meaningful information about institutional efficiency or ITE student throughput. Rather, it is worth noting again that graduations tend to lag behind FTEN. In many ways, the shares of FTEN in ITE programmes thus provide an indication of how the shares of ITE graduations are likely to change in the short run.

4.4.2.2 Sending regions

The province of enrolment/graduation provides a useful way of gauging how the physical location of HEIs in South Africa influences access to ITE programmes and the production of ITE graduates in different provinces. It could also conceivably be used to draw inferences about the spatial distribution of newly qualified potential teachers in the country. However, there are at least two reasons why it should not be used as a definitive measure for this purpose.

First, since UNISA is a distance education provider and thus not physically confined to a single province, the province of enrolment/graduation does not give any information regarding the provincial domiciles of individuals who enrol in, or graduate with, ITE qualifications at UNISA. Even if it were the case that individuals

Figure 4.21: Shares of FTEN and graduations in ITE programmes at contact HEIs by province of enrolment/graduation (2004 - 2013)



NOTES: Bars represent the estimated shares (%) of FTEN and graduations in undergraduate and postgraduate ITE programmes at contact HEIs by province of enrolment/graduation.Provinces are Western Cape (WC), Eastern Cape (EC), Free State (FS), KwaZulu-Natal (KZN), North West (NW) , Gauteng (GAU), and Limpopo (LIM). Years are grouped together to mitigate effects of year-on-year fluctuations in FTEN and graduation numbers. Figures are based on the estimates in Table F.22.

who graduate with ITE qualifications are more likely to seek employment near the HEIs they attended than near the areas they originally come form, it thus remains unclear where UNISA's ITE graduates are likely to seek employment. Given that UNISA accounts for by far the largest share of FTEN and graduations in ITE

programmes in the country, this is clearly problematic.

Second, while it may seem reasonable to assume that individuals generally choose to study at HEIs located in the provinces where they are resident, there are bound to be exceptions to this rule. For various reasons, some students may elect to study at specific institutions that are located outside of their own provinces. Others may have no other alternative but to enrol at a university in another province. Prior to 2014, for example, it was not possible for individuals from Mpumalanga or the Northern Cape to enrol at contact HEIs in those provinces. Insofar as the spatial distribution of ITE graduates conveys information about the areas where those graduates may seek employment as teachers, it is therefore not just of interest to know where individuals study, but also where they come from.

The extent to which the province of enrolment/graduation differs from the province from which students hail is rarely investigated, primarily because the data required to do so is generally not available. However, the availability of residential postal code information in HEMIS makes it possible to identify the provinces where students originally come from (hereafter referred to as sending regions).[64] This not only means that one can determine where UNISA ITE students/graduates reside, but also where ITE students who graduate from contact institutions may return to after graduation.

CHE (2010*b*:79 - 80) states that *"there is sufficient unverified evidence to indicate a reasonably close correlation between province of study and home province"*. However, the HEMIS data indicates that the extent to which this is true varies considerably between provinces. Tables F.24 and F.25 show the shares of FTEN and graduations in ITE programmes between 2004 and 2013, disaggregated by province of enrolment/graduation and sending region.

The highest correlation between province of enrolment/graduation and sending region is in KwaZulu-Natal. More than 95% of individuals entering ITE programmes and 92% of individuals graduating with ITE qualifications at HEIs in KwaZulu-Natal indicated that they were KwaZulu-Natal residents. In other provinces, non-residents represented far greater shares of total FTEN and graduations. For example, less than 60% of all students entering ITE programmes and only 50% of ITE graduates at HEIs in Gauteng over the period were residential in Gauteng. Moreover, the number of Gauteng residents entering ITE programmes and graduating with ITE qualifications in the North West province over the period exceeded the number of North West residents who did so. Overall, more than a quarter of all FTEN in ITE programmes and nearly 31% of ITE graduates produced at contact institutions between 2004 and 2013 were non-residents in the province of enrolment/graduation.

In terms of the provincial origins of UNISA's ITE students, Table F.29 reveals that an estimated 55.5% and 20.9% of all FTEN in ITE programmes respectively came from KwaZulu-Natal and Gauteng. Collectively, these two provinces thus accounted for more than three in every four FTEN in ITE programmes at UNISA over the period. Similarly, 64.6% of the ITE graduates produced by UNISA during this time came from KwaZulu-Natal (35.3%) and Gauteng (29.3%).

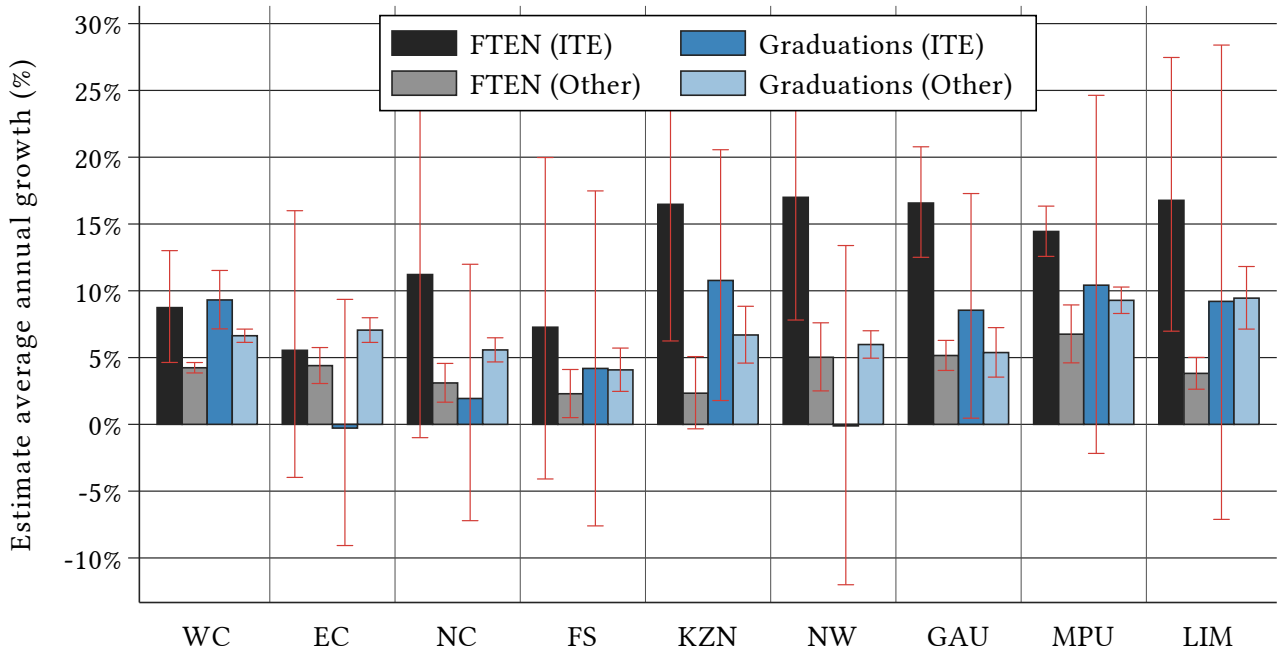
Given that UNISA is a distance-education provider, it theoretically affords individuals who are unable to access contact HEIs because of barriers to physical access the opportunity to enrol in HE programmes, regardless of where they live. Consequently, one may have expected UNISA to contribute to a more equal distribution

[64] HEIs capture students' home addresses when they formally register for academic programmes. To ensure that these addresses reflect where students originally come from, HEMIS requires that the permanent residential address submitted by HEIs may not be the same as the student's semester or term address. (DOE, 2014:DATA ELEMENTS 011 TO 020)

of graduates across provinces. However, because of the highly unequal spatial pattern of enrolments in ITE programmes at UNISA, this has not been the case. In fact, Table F.25 shows that, in terms of sending regions, the spatial distribution of South Africa's ITE graduates is actually more unequal between provinces when one includes UNISA than when one only considers contact HEIs. Specifically, the pattern of ITE graduate production at UNISA reinforces the extent to which Gauteng and KwaZulu-Natal dominate the overall production of ITE graduates in South Africa.

As in the case of the province of enrolment/graduation, the respective provincial shares of ITE FTEN and graduations in terms of sending regions fluctuated between 2004 and 2013 (Table F.26). However, Figure 4.22 shows that there was positive and statistically significant average annual growth in ITE FTEN for virtually all of the sending regions over the period. In fact, with the exception of the Eastern Cape, FTEN in ITE programmes grew significantly faster, on average, than FTEN in other undergraduate degree and postgraduate diploma/certificate programmes in all sending regions. As expected, the average rate of growth in ITE graduations was lower than the growth in FTEN for all sending regions other than the Western Cape. The Western Cape, KwaZulu-Natal, and Gauteng were also the only provinces in which ITE graduations grew faster, on average, than graduations in other undergraduate degree and postgraduate diploma/certificate programmes.

Figure 4.22: Estimated average annual growth rates in FTEN and graduations in ITE and non-ITE programmes by sending province (2004 - 2013)

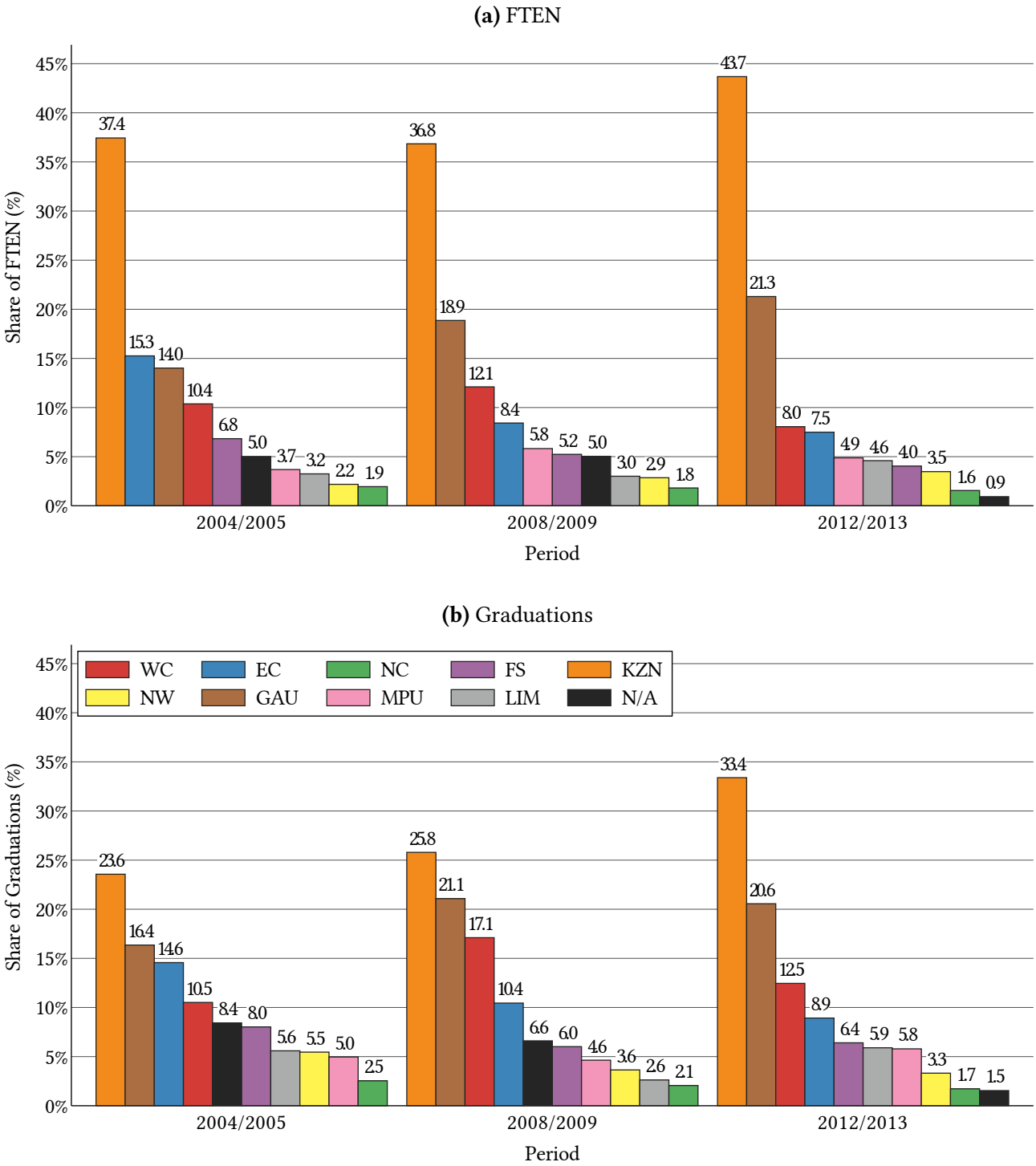


NOTES: Bars represent the estimated average annual growth rates (%) in FTEN and graduations in undergraduate and postgraduate ITE programmes and other non-ITE undergraduate degree and postgraduate diploma/certificate programmes over the period by sending region (province of permanent residence) and were estimated using the least-squares methodology described in Appendix G. Capped lines represent the 95% confidence intervals surrounding the each point estimate. Figures are based on the estimates in Table F.27.

A comparison between Figure 4.23, which shows the shares of ITE FTEN and graduations by sending region between 2004 and 2013, and Figure 4.21 reveals some interesting findings. First, for virtually every period under consideration, KwaZulu-Natal's share of FTEN and graduations in ITE programmes was substantially larger in terms of sending region than it was in terms of the province of enrolment. Second, while KwaZulu-Natal's share of ITE FTEN as province of enrolment fell between 2004 and 2013, its share has not fallen in terms of sending region and may actually have increased slightly between 2008/2009 and 2012/2013. Third, because

of the extent to which individuals from Gauteng and KwaZulu-Natal dominate FTEN in ITE programmes at UNISA - a dominance which has only grown over time - the two provinces' collective share of ITE FTEN and graduations grew substantially between 2004 and 2013.

Figure 4.23: Shares of FTEN and graduations in ITE programmes by sending region (province of permanent residence) (2004 - 2013)



NOTES: Bars represent the estimated shares (%) of FTEN and graduations in undergraduate and postgraduate ITE programmes by sending region (province of student's permanent residence). Provinces are the Western Cape (WC), Eastern Cape (EC), Free State (FS), KwaZulu-Natal (KZN), North West (NW) , Gauteng (GAU), Limpopo (LIM), Northern Cape (NC), and Mpumalanga (MPU). N/A include all individuals who are either not South African residents (majority) or failed to provide residential information (minority).Years are grouped together to mitigate effects of year-on-year fluctuations in FTEN and graduations. Figures are based on the estimates in Table F.26.

4.4.2.3 Spatial distribution of ITE graduates and teacher supply

By 2013, nearly 72% of all students entering ITE programmes and 68% of all ITE graduates in South Africa's public HE system came from just three provinces: KwaZulu-Natal, Gauteng, and the Western Cape. These provinces were also the province of graduation for 63% of all graduations in ITE programmes at contact HEIs in 2013. Regardless of whether or not sending regions are a better proxy for the provincial distribution of newly qualified potential teachers than the province of graduation, it is thus clear that teacher production in South Africa is highly unequal across provinces. This begs the question of how this unequal distribution is likely to affect teacher supply in the various provinces.

To truly understand where ITE graduates from different sending regions and HEIs supply their labour, it would be necessary to track them to the areas where they search for and ultimately find employment as teachers. However, this would require the ability to link student records from the HEMIS data to teacher employment records in PERSAL. Sadly, even if one were to ignore the fact that public use of either of these data sources is severely restricted, to the author's knowledge, there is currently no way of linking records between HEMIS and PERSAL.

In the absence of a way of explicitly matching newly qualified potential teachers with newly employed teachers in the public school system, it is nevertheless useful to juxtapose the provincial distribution of ITE graduates, based on province of graduation and sending region, and the provincial distribution of employed teachers over the period as is done in Table 4.5. The table shows that, in some instances, the provincial shares of employed teachers in 2004 and 2014 differ substantially from the provincial shares of ITE graduate production between 2004 and 2013. However, the provinces with the largest net increases in the number of employed teachers between 2004 and 2014, namely Gauteng, KwaZulu-Natal, and the Western Cape, also tended to be the provinces where the greatest number of ITE graduates were from.

Table 4.5: Provincial distribution of practising teachers and ITE graduations (2004 - 2013)

	Practicing/Employed Teachers				ITE Graduations (2004 - 2013)			
	2004[1]		*2014*[2]		*HEI Province*		*Sending Province*	
Province	**Number**	**(%)**	**Number**	**(%)**	**Number**	**(%)**	**Number**	**(%)**
Western Cape	25 180	8.0	35 931	8.5	13 056	14.1	13 032	14.1
Eastern Cape	63 498	20.2	64 258	15.1	9 122	9.9	10 009	10.8
Northern Cape	6 067	1.9	9 182	2.2			1 914	2.1
Free State	22 451	7.1	24 552	5.8	6 031	6.5	6 261	6.8
KwaZulu-natal	73 637	23.4	95 560	22.5	15 879	17.2	25 730	27.8
North West	29 752	9.5	26 086	6.1	8 266	8.9	3 665	4.0
Gauteng	40 916	13.0	77 265	18.2	16 768	18.1	17 785	19.2
Mpumalanga	25 631	8.1	35 000	8.2			4 782	5.2
Limpopo	52 571	16.7	57 256	13.5	2 555	2.8	4 575	4.9
Total	314 523	100	425 090	100.0	92 477	77.5[3]	92 477	94.9[4]

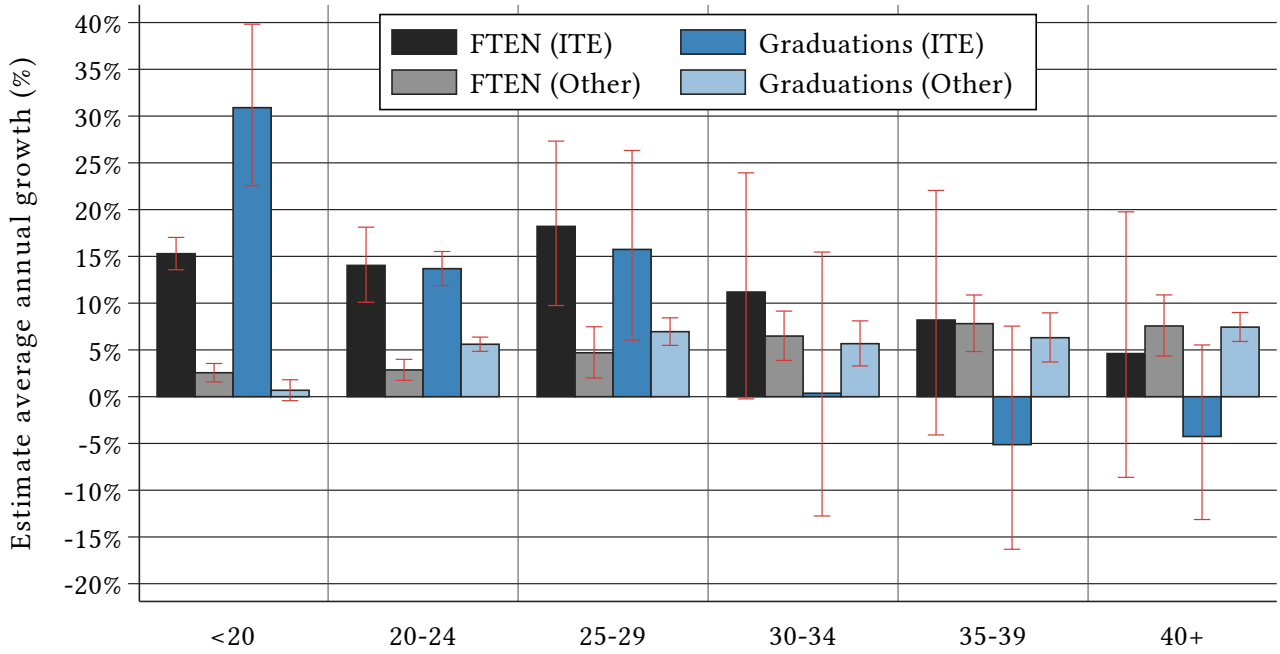
NOTES: [1] Figures from DOE (2005*a*:4). [2] Figures from DBE (2014*b*:1). [3] Shares do not add to 100% because of the exclusion of UNISA, which produced 22.5% of ITE graduates over the period. [4] Shares do not add to 100% because of the 5.1% of ITE graduations who were either not South Africa residents or who failed to provide any information on their permanent residential addresses.

4.4.3 Age

The extent of South Africa's current and likely future teacher shortages is closely linked to the age profile of practising teachers in the country. The teaching workforce is not only older, on average, than the non-teaching workforce, but is also ageing rapidly over time (HSRC, 2005:5). Of particular concern is the small and declining percentage of young teachers. Between 1994 and 2005, the percentage of teachers below the age of 30 fell from 54% to just 5.4% (DBE and DHET, 2011:31). While more recent data indicates that this figure may have risen marginally since 2005, the present situation clearly remains untenable.[65] An ever-rising age profile only increases the proportion of teachers who retire each year, further raising the demand for new teachers.

Given South Africa's present teacher age-profile, it is clear that more young individuals need to be attracted to the teaching profession. This not only means that more young ITE graduates need to be produced, but also that more of those graduates have to enter and remain in the teaching profession for extended periods of time. It is therefore disconcerting that many studies have noted declining enrolments in ITE programmes among younger cohorts between 1995 and 2004 (Paterson and Arends, 2009; CHE, 2010*b*; Onwu and Sehoole, 2011). However, the HEMIS data indicates that the number of young individuals enrolling in and subsequently graduating from ITE programmes has risen significantly since 2004 (Table F.30).

Figure 4.24: Estimated average annual growth rates (%) in FTEN and graduations in ITE and non-ITE programmes by age cohort (2004 - 2013)



NOTES: Bars represent the estimated average annual growth rates (%) in FTEN for the respective dependent variables over the period and were estimated using the least-squares methodology described in Appendix G. Capped lines represent the 95% confidence intervals surrounding the each point estimate. "Other" programmes represent all non-ITE undergraduate degree and postgraduate diploma/certificate programmes. Figures are based on the estimates in Table F.31.

Figure 4.24 shows that FTEN in ITE programmes between 2004 and 2013 grew significantly faster, on average, among younger cohorts than it did among older cohorts. In fact, the number of individuals below the age of 25

[65] PERSAL 2012 indicates that around 6.5% of employed teachers were below the age of 30 in 2012.

who enrolled in ITE programmes for the first time increased more than threefold over the period, rising from approximately 5 400 in 2004 to 16 250 in 2013. Because of this rapid increase, the rate of average annual growth in subsequent ITE graduations among individuals below the age of 30 was not only statistically significantly higher than it was for older cohorts, but also statistically significantly higher than the average annual rate of growth in graduations for individuals under the age of 30 who enrolled in non-ITE undergraduate degree and postgraduate diploma/certificate programmes.

The relatively rapid rate of growth in FTEN and graduations in ITE programmes among younger cohorts over the period means that ITE students and graduates have, on average, become younger since 2004. The drop in the average age of ITE students and graduates has also been relatively large and has occurred fairly rapidly in comparison to the changes for students and graduates in non-ITE undergraduate degree and postgraduate diploma/certificate programmes. This can clearly be seen in Figure 4.25, which shows the cumulative percentage of ITE FTEN and graduations over the student age distribution for three periods between 2004 and 2013.

The median age at first-time enrolment in ITE programmes in 2004 was 25. By 2013, it had fallen to below 23. This seemingly minor change has had a significant impact in terms of altering the age distribution of new ITE graduates. Only 40% of all ITE graduates produced in 2004 and 2005 were below the age of 30. By 2012/2013, this percentage had grown to nearly 75%. In other words, what is encouraging is not just that the overall number of ITE graduates being produced by the HE system has been increasing over time, but, critically, that the number of ITE graduates below the age of 30 has been increasing faster than among other age cohorts. This is also evident from the fact that, while more than two in every three ITE graduates produced in 2004 were above the age of 30, the opposite was true in 2013.

It appears to unambiguously be the case that new ITE graduates in South Africa are, on average, becoming younger over time. Nonetheless, the average age at which individuals enter into ITE programmes remains significantly higher that the age at which students tend to enter other undergraduate degree and postgraduate diploma/certificate programmes. Consequently individuals who graduate with ITE qualifications are still older, on average, than individuals who graduate with non-ITE qualifications.

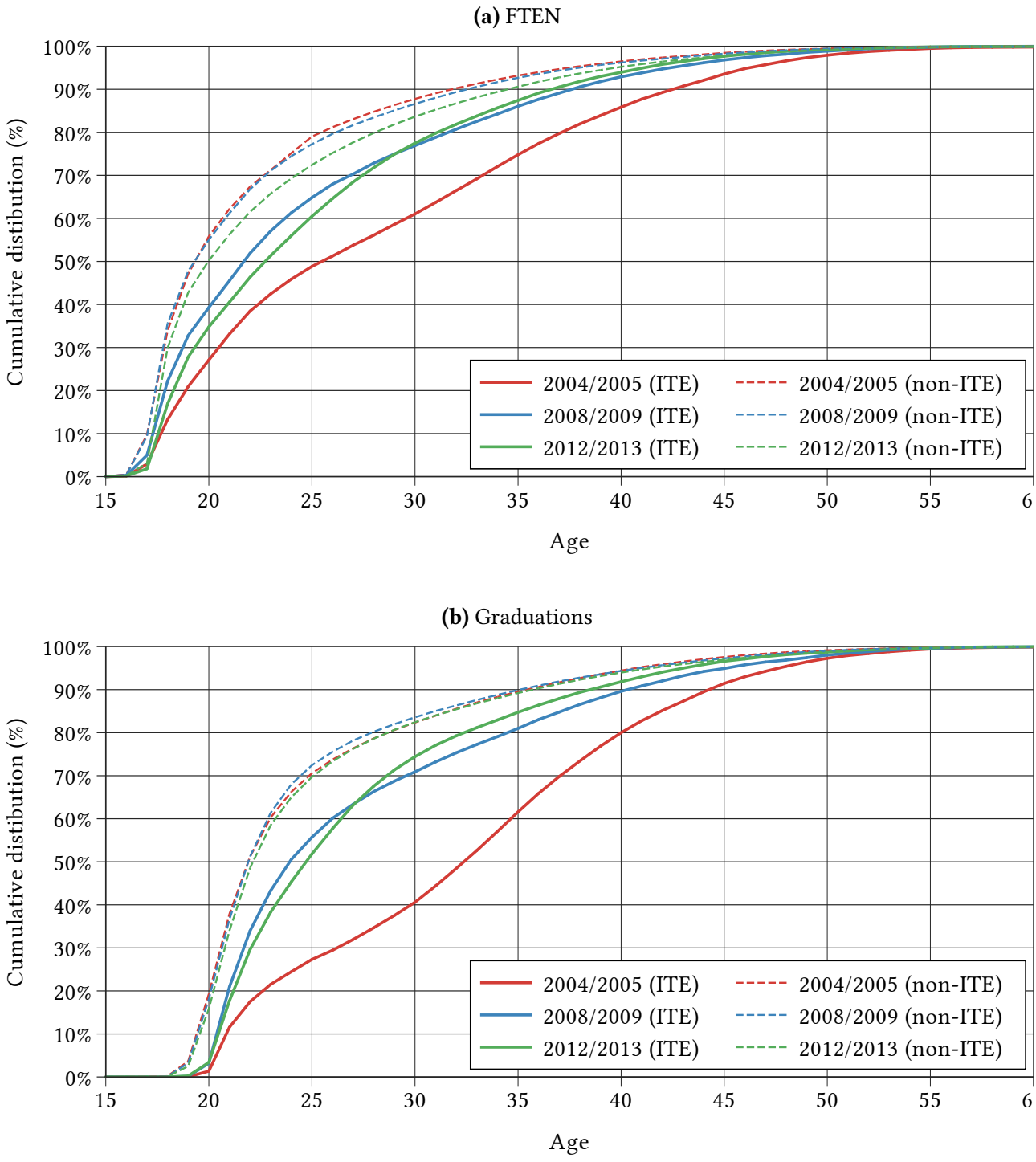
To better understand why these age differences obtain, Figure 4.26 shows the cumulative share of ITE FTEN and graduations over the student age distribution for undergraduate degrees[66] and postgraduate diploma/certificate qualifications, respectively. The graphs provide evidence that the age distribution of ITE FTEN shifted to the left between 2004 and 2008, moderately shifting to the right again thereafter. As a result, the median age of entry into non-ITE undergraduate degrees in 2012/2013 (between 19 and 20) was still roughly two years less than the median age of entry into undergraduate ITE programmes (between 21 and 22).

It is not immediately clear why there is such a big difference in age distribution between ITE and non-ITE undergraduate FTEN. One possible reason might be that practising under-qualified teachers who enrol in Bachelor of Education programmes are raising the overall age profile of ITE FTEN. It could also be the case that a substantial number of BEd students initially enrolled in other programmes before switching to ITE programmes. However, these hypotheses cannot be tested with aggregate HEMIS.

Panel (a) of Figure 4.26 reveals that the shift in the age distribution of undergraduate ITE graduates was primarily restricted to the 2004 - 2008/2009 period, with very little further changes taking place thereafter.

[66] In the case of ITE programmes, only 4-year Bachelor's degrees are considered.

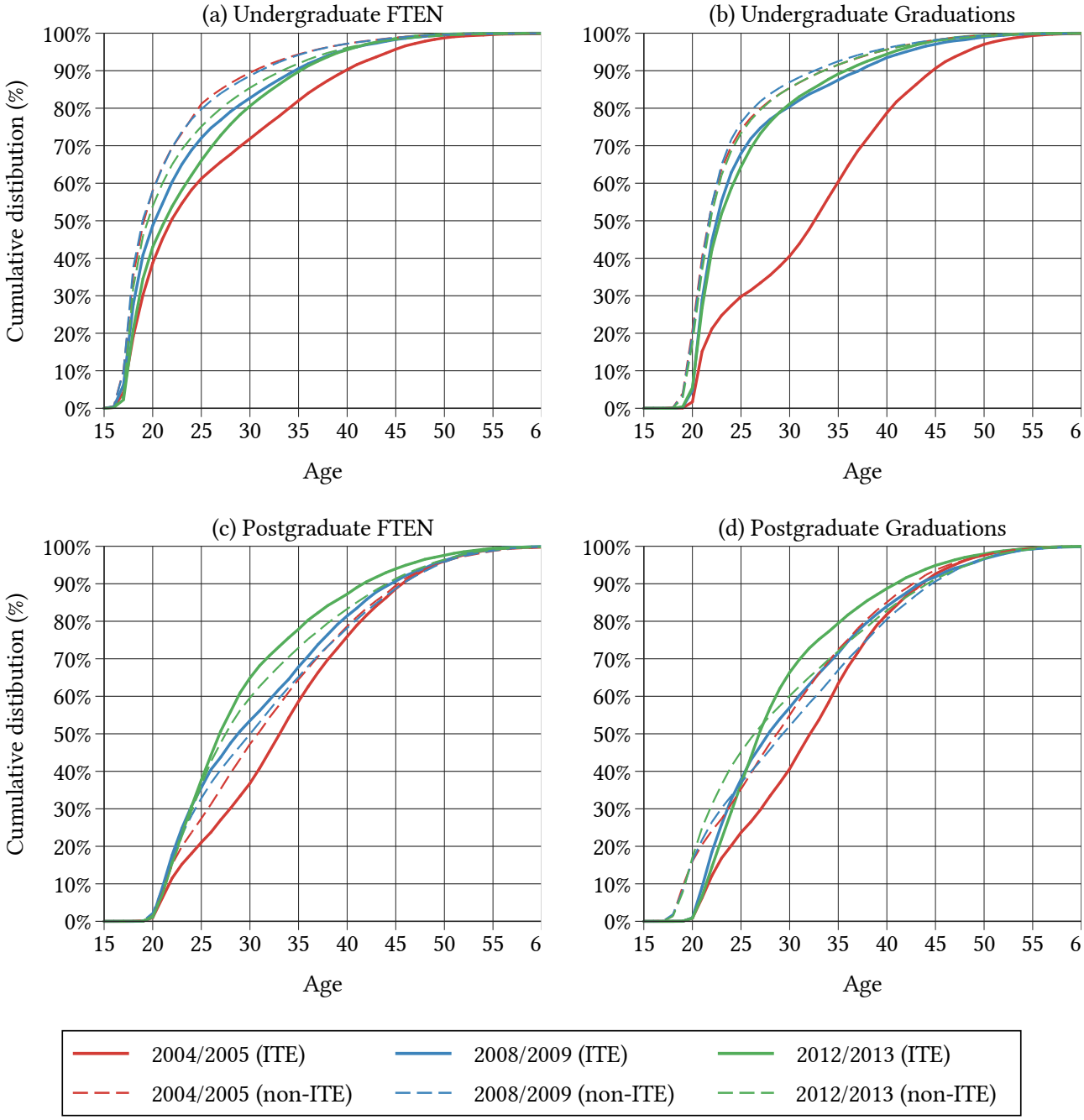
Figure 4.25: Cumulative distribution of FTEN and graduations in ITE and non-ITE programmes by age (2004 - 2013)



NOTES: Lines represent the cumulative percentage of FTEN/graduations that are below a certain age for undergraduate and postgraduate ITE programmes and other non-ITE undergraduate degree and postgraduate diploma/certificate programmes. Years are grouped together to mitigate effects of year-on-year fluctuations in FTEN and graduations.

Given that most non-ITE undergraduate Bachelor's degrees are 3-year programmes whilst the Bachelor of Education degree is a 4-year programme, it is partly to be expected that the age at graduation for ITE students would be higher, on average, than the age at graduation for non-ITE students, even if individuals first enrolled in their programmes at the same age. In light of the aforementioned median age difference at FTEN, it is thus

Figure 4.26: Cumulative distribution of FTEN and graduations in undergraduate and postgraduate ITE and non-ITE programmes by age (2004 - 2013)



NOTES: Lines represent the cumulative percentage of FTEN/graduations that are below a certain age for (a) undergraduates ITE and non-ITE undergraduate degree programmes and (b) postgraduate ITE and non-ITE postgraduate dimploma/certificate programmes. Years are grouped together to mitigate effects of year-on-year fluctuations in FTEN and graduations. *In the case of ITE programmes, only 4-year Bachelor's degrees are considered.

encouraging that more than 80% of ITE graduates produced in 2013 were below the age of 30.

In line with expectations, the age profile for individuals enrolling in postgraduate diploma/certificate programmes is older than it is for undergraduate degree programmes. In contrast to undergraduate degree programmes, postgraduate ITE students in the 2012/2013 period tended to be younger, on average, over certain age ranges than their non-ITE counterparts. For example, a greater percentage of 2012/2013 postgraduate ITE graduates were below the age of 30 (approx 62%) than was the case for graduates from non-ITE postgraduate diploma/certificate programmes (approx 57%). Admittedly, as is evidenced by the differences in the slopes of

the lines in the respective graphs, a far smaller percentage of postgraduate ITE graduates were below the age of 25 (roughly 29%) than was the case for undergraduate degree ITE students (59%).

4.4.3.1 Young ITE graduates and young entering teachers

One of the Department of Basic Education's strategic goals is to increase the number of qualified individuals aged 30 and below who enter the teaching profession for the first time (DBE, 2014*a*:25). In light of this, it is important to understand what the capacity for such an increase is, given current levels of, and trends in, young ITE graduate production and young teacher employment in South Africa ("young" is hereafter used to refer to individuals aged 30 or below). The age at which young students graduate from HEIs places an absolute lower bound on the age at which they can enter the teaching profession for the first time. It is therefore important to consider the age distribution among young graduates.

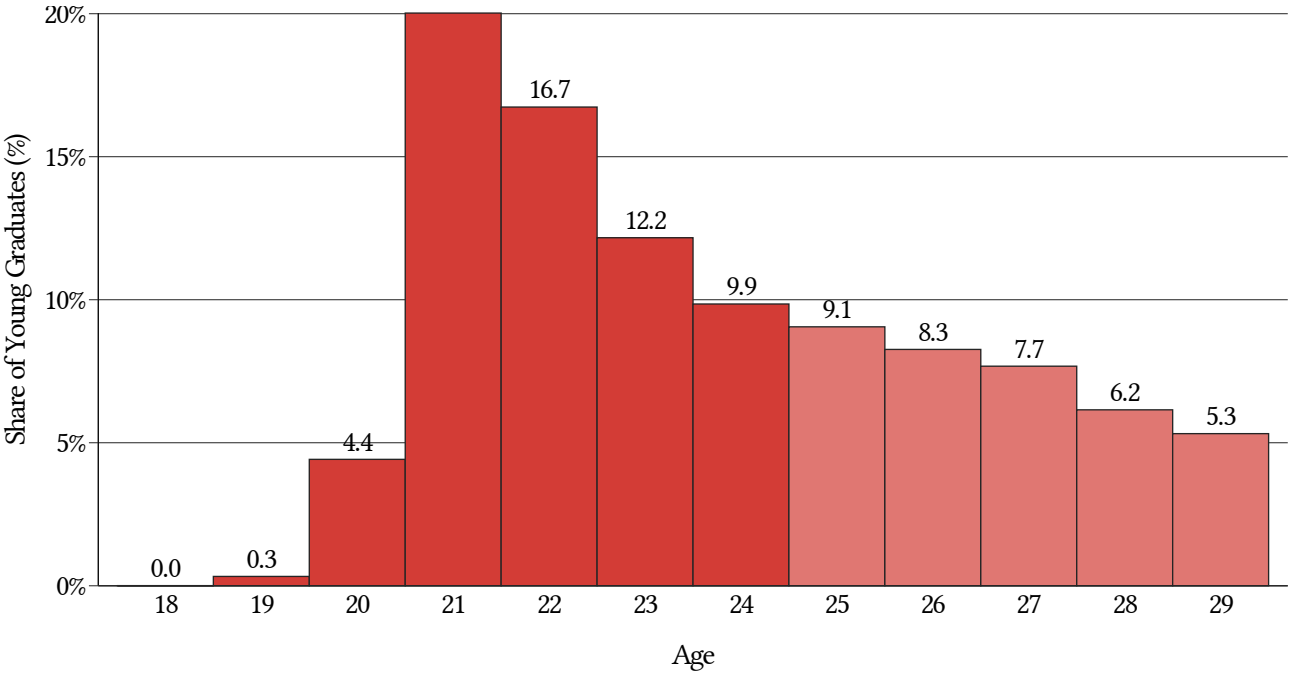
Figure 4.27 shows the age distribution of young ITE graduates for the years 2012 - 2013. The graph indicates that roughly 36.5% of young ITE graduates produced over the period were between the ages of 25 and 29. It follows that these individuals would have been in the 26 - 30 age group in the year subsequent to graduation. For those ITE graduates who plan on entering the teaching profession in South Africa, most are likely to begin searching for positions only in the year after graduation. Of course, as noted above, some young ITE graduates may choose to first teach abroad or seek non-teaching employment opportunities immediately after graduating, such that there is a delay between graduation and employment as teachers in South African schools. This potentially has important implications for the DBE's aforementioned strategic goal as it implies that the time window in which young ITE graduates can be employed as young teachers may be small in certain instances. In fact, holding all else constant, any delays in absorbing new ITE graduates into the teaching profession effectively reduces the available pool of young qualified potential teachers in the country.

To conclude this section, it is useful to compare the production of young ITE graduates with the employment of young, qualified potential teachers as done in Table 4.6. The table presents three sets of figures. Column one simply reports the estimated number of new ITE graduates, aged 29 and younger, produced by public HEIs for each year between 2007 and 2013. Column two reports the cumulative number of ITE graduates produced by the public HE system since 2000 who are 30 years of age or younger. This group represents the total population of young, qualified, potential teachers, regardless of whether or not they are practising teachers. The implicit assumption is that all new, young ITE graduates join this pool the year after they graduate and remain part of the pool until such time as they turn 31. In any year, the pool of young, qualified, potential teachers thus increases by the number of ITE graduates who graduated at age 29 or younger in the preceding year and decreases by the number of ITE graduates produced in previous years who are no longer below the age of 31.[67] The implication is that, within some margin of error, the total number of qualified young individuals employed as teachers in South Africa cannot exceed this number.[68]

[67] Since HEMIS data is not available before 2000, the estimated pool of young, qualified, potential teachers in 2007 reported in Table 4.6 will exclude all individuals who graduated from ITE programmes in 1999 aged 22 or younger, all 1998 ITE graduates aged 21 and younger, all 1997 ITE graduates aged 20 and younger, and so on. The HEMIS data for 2000 indicates that roughly 24% of young ITE graduates produced that year were 22 or younger, 15% were 21 or younger, 3% were 20 or younger, and less than 1% were younger than 20. The implication is that, while the estimate for 2007 will be a downward-biased estimated of the true total number of young, qualified, potential teachers in the country, the bias should not be significant. Moreover, the number of young, qualified, potential teachers in 2011 and later years cannot include anyone who graduated before 2000 since all such individuals would already have been above the age of 30 by 2011.

[68] The PERSAL data for 2012, for example, show that there were an estimated 21 665 young, qualified (REQV 13 or higher) teachers employed in South Africa. Based on the estimates presented here, this amounted to roughly 76% of the estimated total number of young, qualified, potential teachers in the country at the time (28 404).

Figure 4.27: Age distribution among young ITE graduates (2012 - 2013)



NOTES: Bars represent the percentage of "young" 2012/2013 undergraduate and postgraduate ITE programme graduates by the age at graduation. Years are grouped together to mitigate effects of year-on-year fluctuations in FTEN and graduations.

Table 4.6: Young ITE graduate production, the pool of young qualified individuals, and new young practising teachers (2007 - 2014)

Year	New young ITE graduates Produced [a]	Pool of young, qualified (REQV 14), potential teachers [b]	New young, qualified (REQV 13+), entering teachers [c]
2007	3 873	13 356*	4 882
2008	4 141	15 931*	4 954
2009	4 556	18 361*	4 369
2010	5 575	20 819*	5 582
2011	7 202	24 043	5 790
2012	9 081	28 404	5 213
2013	10 384	33 879	4 669
2014		39 699	

NOTES: [1] Estimated number of new ITE graduates aged 29 or below produced by the public HE system per year based on HEMIS. [2] Cumulative number of ITE graduates produced by the public HE system since 2000 who are 30 years of age or younger. In any year, this group represents the population of young, qualified, potential teachers, regardless of whether or not they are practising teachers. [*] Figures are likely to exclude individuals who graduated with ITE qualifications at very young ages before 2000. [3] Figures for 2007 - 2012 taken from Gustafsson (2014) and for 2013 from DBE (2013). Figures reflect the number of qualified (REQV 13 or higher) f teachers aged 30 or below entering the public school system for the first time in respective years based on PERSAL data.

Column three of Table 4.6 shows the number of young, qualified individuals entering the public school system as teachers for the first time for the years 2007 - 2013 based on estimates reported in Gustafsson (2014) and DBE (2013). The data shows that an average of 5 065 young, qualified individuals entered the teaching profession every year over the period. In total, it is estimated that 35 459 young, qualified individuals entered the public school system as first-time teachers over the period.[69] This number appears perplexing at first, as it exceeds

[69] The PERSAL data suggests that many of these young new teachers left the teaching system shortly after entering it. This is partly evidenced by the fact that total number of young, qualified teachers employed in South Africa in 2012 according to PERSAL (21

the estimated 33 879 individuals in the pool of young, qualified, individuals from which new teachers could be drawn according to the HEMIS data. However, this is likely to be explained by the fact that, while the estimates of the numbers of qualified new teacher entrants presented in Gustafsson (2014) and DBE (2013) include individuals with REQV 13 or higher qualifications, the estimated pool of young, qualified potential teachers, as estimated in this chapter, only includes individuals with REQV 14 qualifications.

Until 2011, the number of young teachers entering the system exceeded the number of young ITE graduates produced in the preceding year. This means that at least some of the newly employed teachers must have graduated in earlier years. However, in both 2012 and 2013, the number of young, qualified individuals entering the teaching profession was less than the number of young ITE graduates produced in the preceding year. In fact, at least 1 989 (Est.) young 2011 ITE graduates and 4 412 young 2012 ITE graduates could not have entered the teaching profession for the first time the year after they graduated. While it may be expected that some of these individuals would already have been employed as teachers or that some may not immediately have sought to become employed as teachers, it is nevertheless disconcerting that there is such a large difference.

In conclusion, the data suggests that until recent years, the schooling system's ability to employ young teachers may partly have been constrained by the fact that the HE system was producing too few young ITE graduates. However, insofar as this is the case, it is not clear why more young teachers weren't employed in 2012 and 2013. For example, the employment of 5 213 young new teachers in 2012 was well below the DBE's baseline goal of 8 227 new young teachers as stated in DBE (2014*a*:25). Whatever the reasons for these shortfalls may be, the present example poignantly illustrates the fact that increased production of ITE graduates does not necessarily translate into increased effective teacher supply (in terms of teacher uptake, deployment, and utilization) and that other measures are necessary to ensure that new ITE graduates can be absorbed into the teaching profession in South Africa. As noted by DOE (2005*b*:83): *"if an increased number of younger candidates do not enter the teaching profession, and remain in it for an extended period, there will be inadequate numbers to replace those who leave the profession due to age. To avert an imminent shortage, government must embark on an intense drive to interest younger people into the profession."*

4.5 Converting inputs into outputs: ITE student throughput in HE

The number of individuals who enter ITE programmes for the first time each year is of critical importance as it imposes an upper bound on the number of new, qualified potential teachers that can be produced by the public HE system. However, the number of ITE graduates that are actually produced is not just a function of FTEN, but also of the extent to which HEIs are able to convert those enrolments into graduations.

Positive growth in ITE programme FTEN over time can only translate into increased qualified teacher supply if it firstly leads to growth in the number of individuals who graduate with ITE qualifications. Moreover, the rate at which new, qualified potential teachers become available is dependent on the time it takes, on average, for ITE students to complete their qualifications. An evaluation of university throughput in ITE programmes is thus essential in order to understand the trends and patterns in qualified teacher supply. In many ways, throughput is also a measure of institutional efficiency and provides what is a potentially useful indicator for identifying areas where policy intervention may be required.

665) was significantly lower than the total number of young qualified individuals who supposedly entered the teaching system for the first time between 2007 and 2012 (30 790).

4.5.1 Measuring throughput

The bulk of studies on South African HE focus on graduation rates as sole measures of university throughput.[70] This is partly due to the fact that graduation rates are simple to calculate, but also partly because the type of data that is required for calculating more nuanced and accurate measures of throughput is generally not publicly accessible.

Graduation rates express the number of graduations in a particular programme as a percentage of the total number of enrolments for that programme in the same year. Thus, they are only crude measures of throughput, being highly sensitive to changes in the number of FTEN, student repetition, drop-out, and retention rates. This sensitivity makes graduation rates inherently volatile and means that they can yield very misleading impressions of throughput and performance.

From the perspective of evaluating student performance and HEI efficiency, knowing what percentage of all enrolled individuals graduate in a given year is of less importance than knowing what proportion of a cohort of students who enrol for a qualification ultimately complete that qualification (such individuals are hereafter referred to as "completers") and how long it takes for them to do so. As measures of throughput, graduation rates are thus inferior to completion rates.

Completion rates express the number of graduations for a given cohort in a particular year as a percentage of the total initial enrolment for that cohort in its commencement year. This has two major implications. First, it means that completion rates are cohort-specific. Unlike graduation rates, they are thus insensitive to the number of FTEN, and the repetition rates, drop-out rates, and retention rates for other cohorts. Second, the completion rate for a particular cohort depends on the year for which it is estimated. For example, the 1-year marginal completion rate (MCR) for a cohort will reflect the percentage of that cohort that graduated within the first year of enrolment. Similarly, the 5-year MCR for a cohort will reflect the percentage of that cohort that graduated in the 5th year of enrolment.

While marginal completion rates (MCR) are useful for comparing throughput between different enrolment years for a particular cohort[71], what is generally of greater interest is the cumulative completion rate (CCR), i.e. the total percentage of a cohort that has graduated after a certain number of years. Unless explicitly stated otherwise, "completion rates" are thus hereafter used to refer to cumulative completion rates.

4.5.1.1 Calculating completion rates in aggregate HEMIS

The calculation of completion rates requires the ability to track cohorts of students over time as they progress through the HE system. The fact that the type of information required to identify cohorts of students (such as identifiable student unit-records) is generally not available to researchers is therefore one of the main reasons why completion rates are seldom reported in South African research studies. However, the availability of information regarding the year in which students commenced their qualifications in aggregate HEMIS allows partial identification of such cohorts.

[70] See, for example, CHE (2010*b*), DBE and DHET (2011), Petersen and Petker (2011:S50), and CDE (2015). The Department of Higher Education and Training (DHET) itself exclusively uses graduation rates when reporting on student throughput in its annual *"Statistics on Post-School Education and Training in South Africa"* publications.

[71] They can, for example, be used to determine the year in which the bulk of all completers in a cohort actually graduated.

The *qualification commencement year* (QCY) variable in HEMIS reflects the year in which students first commenced with their current academic programmes at their current HEIs. Since the commencement year is time-invariant within any given HEI and academic programme, it enables identification of the same cohorts of individuals in successive years of aggregate data. In other words, cohorts in aggregate HEMIS are effectively defined based on the year in which they commenced their current academic programmes at the HEI where they are currently enrolled. For example, all students who commenced with ITE programmes at NMMU in 2003 would be part of NMMU's 2003 ITE cohort and remain part of that cohort as long as they remain enrolled in the same ITE programmes at NMMU. The presence of these identifiable cohorts of students in aggregate HEMIS enables estimation of various marginal and cumulative completion rates which are the primary metrics considered in the analysis that follows.

A detailed discussion of the *qualification commencement year* variable in aggregate HEMIS, the calculation of graduation rates and completion rates, and the potential problems that may arise from the methodology employed in this section is presented in Section G.2. However, it is worth noting here that the same methodological issues that are likely to bias aggregate HEMIS-based estimates of FTEN and graduations in ITE programmes (as discussed in Section 4.2), are also likely to bias estimates of completion rates. These are issues that are inherent when using HEMIS variable fields to estimate enrolments, graduations, and throughput by field of study. The only way in which they can be avoided is by tracking individuals through the HE system via their unit records in the original HEMIS data. As before, all estimates presented in the analysis that follows are thus, at best, indicative rather than definitive.

4.5.2 Simple completion rates

4.5.2.1 Cohort progression and time to completion

To contextualise the analysis on completion rates presented below, it is important to consider how long individuals generally take to complete ITE qualifications at public HEIs in South Africa. All approved HE academic programmes in South Africa have associated minimum time requirements that determine the minimum total amount of study time (generally in terms of a number of years) required for their completion (DOE, 2014:DATA ELEMENTS 051 TO 060). For example, the BEd degree, an undergraduate ITE qualification, commonly requires a minimum of 4 years of study to complete. Similarly, the PGCE (and former advanced diploma in teaching), in turn, is a postgraduate ITE qualification that generally requires a minimum of 1 year of study to complete.

It is well-known that many HE graduates in South Africa do not complete their studies within the predetermined minimum required times, but often take considerably longer (CHE, 2013). This has important implications for the analysis of completion rates, as it means that, in order to get an accurate sense of the number of individuals from a cohort who ultimately graduate, one needs to allow for a fairly long time-horizon when tracking progression through HE. In practice, however, the length of the time-horizon available is constrained by the length of the data series that is available.[72]

Since aggregate HEMIS is only available for the period 2000 - 2013, the longest duration over which any single cohort of students can be tracked is 14 years. Table 4.7 summarizes enrolment and completion data for the

[72] *"Enrolment horizon"* is used throughout this section to refer to the amount of time (number of years) that has elapsed since a particular cohort or group of cohorts initially commenced with the academic programme(s) in question.

2000 ITE cohort between 2000 and 2013. The figures reveal a number of important findings regarding the progression of the cohort, many of which extend to the progression of cohorts in South African HE more generally.

Of the estimated 19 784 individuals constituting the 2000 ITE cohort, only 13 160 were still enrolled in the same academic programmes at the same HEIs in the year subsequent to commencement (i.e. the second year). However, this does not imply that 33.5% of the cohort dropped out of HE after just one year. Because of the structure of the aggregate HEMIS data and the way in which cohorts are defined, individuals are considered to be enrolled as part of the 2000 ITE cohort only if they are (a) recorded as having commenced with an ITE programme at a HEI in 2000, (b) enrolled in the programme for which they were registered in the commencement year, and (c) enrolled at the HEI where they were registered in the commencement year. Thus, it would be more accurate to say that nearly 33.5% of the 2000 ITE cohort were no longer enrolled as part of the cohort (hereafter *enrolled*) after just one year.

Given the definition of enrolment in the current context, there are four distinct groups of individuals who will effectively *exit the cohort* over time: (1) those who successfully complete their commencement programmes at the commencement HEI, (2) those who de-register from their commencement programmes and re-register for different programmes, (3) those who transfer from the commencement HEI to different HEIs, and (4) those who completely drop out of the public HE system. The fact that it is not possible to distinguish between the last three of these groups without detailed unit-record data provides the rationale for focussing only on the estimates of cohort-based completion rates, rather than drop-out rates, using aggregate HEMIS.

Table 4.7 shows that, though enrolment among the 2000 ITE cohort declined rapidly over time, there were still some individuals who were enrolled more than 10 years after commencement. In fact, the data indicates that 2 individuals from the cohort were still enrolled in 2013, 14 years after commencing with their programmes. It should be noted that few of these individuals would have been continuously enrolled for 10 or more consecutive years. Instead, many would have been enrolled in HE intermittently, effectively taking a leave of absence from their studies at some point in time, only to return again at a later stage in order to complete their programmes. This intermittent attendance means that enrolment among a cohort can change non-monotonically over time. For example, the HEMIS data indicates a noticeable jump in enrolments for the 2000 ITE cohort between 2007 and 2008 and, to a lesser extent, also between 2009 and 2010. These increases can be attributed to individuals who "stopped out" of the cohort at some stage after 2000, only to "drop in" again in 2008 or 2009.

As explained in Section G.2, any given commencement cohort in aggregate HEMIS is likely to include some students for whom the course credits acquired while previously registered for other academic programmes (or at other HEIs) have effectively been transferred/credited to their new academic programmes. In many instances, these credit-transfer students may already have satisfied part of the official requirements for the completion of their new academic programmes. This is one of the reasons why estimates of completion rates that are based on the QCY can make it seem as though reasonably large numbers of students are completing their qualifications in less than the minimum required time.[73] Whenever there are large numbers of credit-transfer students in a cohort, the estimated CRs for the years immediately following commencement are likely to be biased upwards. More importantly, as explained in Sections 4.2 and G, ITE programmes in this chapter include Baccalaureus Technologiae and postgraduate Bachelor's degrees as well as postgraduate diplomas

[73] For example, holding all else constant, it would be possible for a BEd student who has already completed three years of study and subsequently transfers to another HEI to graduate within only 1 year after commencement at the new HEI.

Table 4.7: Enrolment and completion for the 2000 ITE cohort (2000 - 2013)

Year	Time[a]	Enrolled[b]	Not Enrolled[b]	Enrolled (%)[c]	Graduations	MCR (%)	CCR (%)	% of all Completers[d]
2000	1	19 784	0	100.0	1 683	8.5	8.5	25.6
2001	2	13 160	6 624	66.5	2 212	11.2	19.7	59.2
2002	3	9 868	9 916	49.9	1 371	6.9	26.6	80.0
2003	4	7 595	12 189	38.4	634	3.2	29.8	89.6
2004	5	6 129	13 655	31.0	344	1.7	31.6	94.9
2005	6	3 981	15 803	20.1	195	1.0	32.5	97.8
2006	7	2 756	17 029	13.9	108	0.6	33.1	99.5
2007	8	243	19 541	1.2	15	0.1	33.2	99.7
2008	9	649	19 135	3.3	9	0.0	33.2	99.8
2009	10	16	19 768	0.1	6	0.0	33.2	99.9
2010	11	18	19 766	0.1	2	0.0	33.2	99.9
2011	12	12	19 772	0.1	3	0.0	33.3	100.0
2012	13	5	19 779	0.0	1	0.0	33.3	100.0
2013	14	2	19 782	0.0	0	0.0	33.3	100.0

NOTES: [a]Number of years following cohort's commencement. [b]Individuals are considered to be enrolled as part of the 2000 ITE cohort as long as they (a) commenced with ITE programmes in 2000, (b) are registered for the same ITE programme as they were in the commencement year, and (c) are registered at the same HEI as they were in the commencement year. [c]Expresses the number of individuals who are enrolled (as defined in note [*b*]) as a percentage of the original cohort. [d]Expresses the cumulative number of graduations from the cohort as a percentage of all individuals who ultimately graduate (i.e. all completers). is HEI and programme specific.

and certificates - qualifications for which the official minimum time requirements tend to be between 1 and 2 years of study. Combined, these factors are likely to explain why 5 266 individuals (26.6%) from the 2000 ITE cohort already graduated within the first three years of enrolment.[74]

Table 4.7 makes it clear that some individuals take much longer than 4-years to complete ITE programmes. For example, there were some students in the 2000 ITE cohort who only completed their programmes after more than 10 years. In order to know exactly how many individuals from a cohort ultimately graduate, it would thus be necessary to track the cohort over a fairly long period. However, doing so implies that one can only ever consider cohorts who commenced with their studies a long time ago and who may, therefore, no longer be representative of more recent cohorts of students. Thus, there is effectively a trade-off between the accuracy/comprehensiveness with which total completion rates (see Section G.2) can be estimated and the recency/relevance of the cohorts for whom they are estimated.

While it is true that some students in the 2000 ITE cohort only graduated after a considerable amount of time, these individuals represented only a small percentage of all completers in the cohort. Of the estimated 33.3% of individuals in the cohort who ultimately graduated, approximately 95% graduated within 5 years of commencing their studies. In fact, it is a general feature of progression in HE that MCRs begin to decline sharply after a certain number of years as ever-fewer numbers of individuals remain enrolled as part of their original commencement cohorts. This has a useful practical implication for the analysis of completion rates for different cohorts as it means that one can infer much about the extent of completion among a cohort, even if one only considers the first few years of data following commencement. This, in turn, means that one can

[74] The qualification type breakdown in the commencement year for the 2000 ITE cohort (Table 4.7) is as follows: Baccalaureus Technologiae degrees (21.8%), 4-year Bachelor's degrees (14,9%), 1- or 2-year postgraduate diplomas (23.3%), and postgraduate Bachelor's degrees (40.0%). The data also indicates that only 48% of the 2000 ITE cohort were *first-time entering undergraduate* students in 2000.

draw at least some inferences regarding the trends in completion for different cohorts over time.

Figure 4.28 shows the completion rates for the 2004, 2006, 2008, 2010, and 2012 ITE cohorts by qualification type. The graph reveals several important findings.

First, the completion rates for postgraduate diploma/certificate ITE programmes are consistently higher than the completion rates for 4-year Bachelor's degree ITE programmes, regardless of the time period under consideration. Second, the completion rates for postgraduate diploma/certificate ITE programmes also initially rise much faster over time than the completion rates for undergraduate ITE degree programmes.[75] Third, there appears to have been a significant change in the overall completion rate-schedule for both undergraduate and postgraduate ITE programmes. The near consistent rise in the 2-year and 3-year completion rates for postgraduate ITE cohorts between 2004 and 2011/2012, in particular, is striking. Similarly, if one excludes the 2005 cohort, there seems to have been a consistent rise in the 5-year completion rate for individuals enrolled in undergraduate ITE programmes between 2004 and 2009 (Table F.32). Fourth, the percentage of undergraduate ITE students who complete their qualifications within fewer than 4 years seems to have declined slightly over time (Table F.32), such that there is a far more noticeable jump between the 3-year and 4-year completion rates for the group in recent years. This can largely be explained by the fact that enrolments in 4-year Bachelor's degree programmes (rather than in BTech or postgraduate Bachelor's degree programmes) represent an increasing share of enrolments in undergraduate ITE programmes.[76]

The estimates presented in Table F.32 make it clear that, despite what appears to be a rising trend over time, the extent of completion among undergraduate ITE programmes is still very low. Even for more recent cohorts of undergraduate ITE students, only around 50% - 55% of students are expected to ultimately graduate and, with the exception of the 2005 cohort, less than a third of the initial cohorts are estimated to complete their qualifications within 4 years. By contrast, the data indicates that more than 75% of current postgraduate ITE programme students can be expected to complete their programmes within 3 years and that the ultimate total CCR for some cohorts could be as high as 90%.

Figure 4.28 and Table F.32 clearly show that, the more recent the cohorts under consideration, the shorter the available period of time over which their progression can be tracked. For the purposes of conducting comparative analysis, it is thus necessary to reach a compromise between the recency of the cohorts being analysed and the duration over which their progression can be tracked. As stated above, such a compromise may be possible because of the fact that MCRs diminish over time for all ITE cohorts.

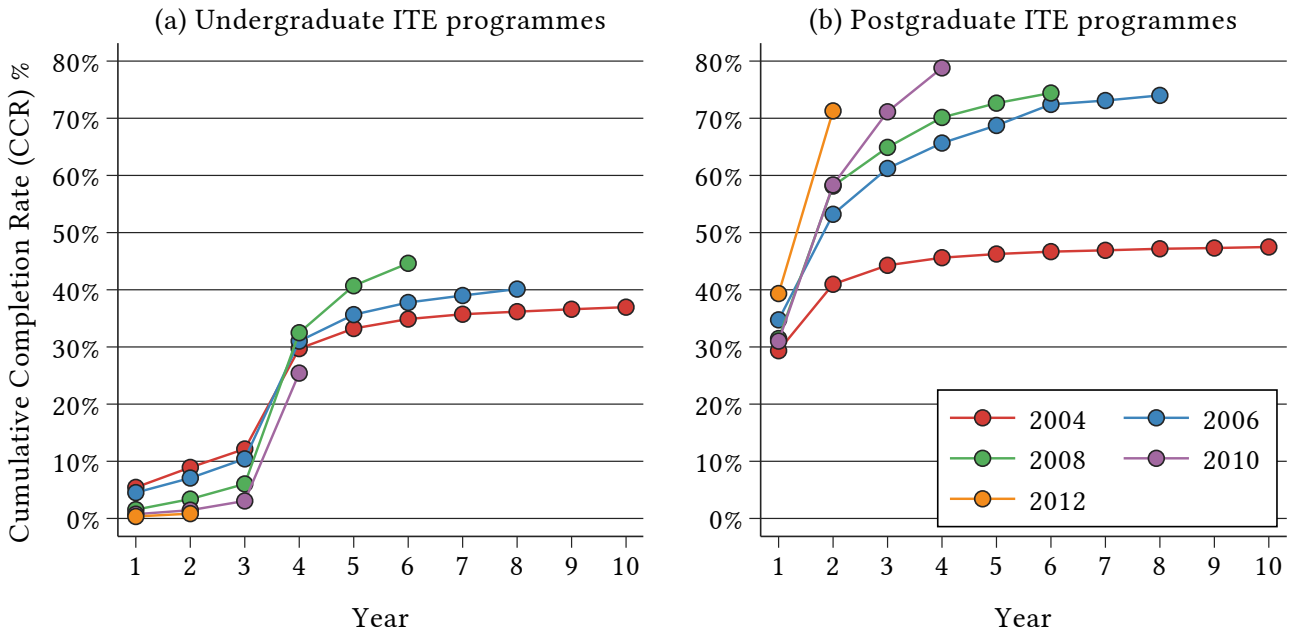
If one were to assume that virtually all individuals who ultimately complete either an undergraduate or postgraduate ITE programme do so within 14 years after commencement[77], one can use the available data on programme completion in aggregate HEMIS to produce crude estimates of the percentage of completers who can be expected to complete their programmes within a given number of years. Using simple repeated log-linear regressions, it is estimated that, for all completers from the 2004 - 2013 undergraduate ITE cohorts, roughly 63% graduate(d) within 4 years, 79% graduate(d) within 5 years, and 85% graduate(d) within 6 years

[75] Given the different minimum time requirements for the respective qualification types, this is hardly surprising.

[76] 4-year Bachelor's degrees accounted for 60% of all initial enrolments among the 2004 undergraduate ITE cohort. The same figure for the 2009 undergraduate ITE cohort was 96%.

[77] It should be clear that this hypothesis is not directly testable without a data series that extends beyond 14 years. However, the HEMIS data suggests that the MCRs for ITE programmes strongly tend to zero after 10 years. In fact, for the 2000, 2001, and 2002 cohorts, the number of additional individuals completing ITE programmes after 9 years amounted to no more 0.20% of the original cohort. It follows that, while some individuals may indeed graduate only after 13 years or more, they are likely to represent a negligible percentage of all completers.

Figure 4.28: Cumulative completion rates (CCR) for ITE cohorts (2004 - 2013)



NOTES: Figures represent the estimated cumulative completion rates per year of enrolment for different commencement cohorts (each series represents a specific cohort) in undergraduate and postgraduate ITE programmes (See Table F.32 in Appendix F for the full set of estimates. Figures are based on the estimates in Table F.32.

(Table F.33). Similarly, for all individuals who completed postgraduate ITE programmes over the period, it is estimated that roughly 73% graduate(d) within 2 years, 85% graduate(d) within 3 years, and 91% graduate(d) within 4 years. While these estimates provide some indication of the time individuals take, on average, to complete ITE programmes, it is important to reiterate that they are based on imputations and, as such, are likely to be subject to error. It would therefore be imprudent to view them as definitive or to use them explicitly for the purpose of statistical inference.[78]

Direct comparisons of finite time-horizon completion rates between cohorts are subject to several caveats. The most significant of these is the fact that the extent of programme completion between cohorts as well as the structure/timing of completion within cohorts may be changing over time and in different ways. This implies that the extent to which total completion rates can be inferred from short-run or even medium-run completion rates is likely to vary over time in unknown ways, making such inferences imprudent. For example, the fact that the 4-year completion rates for the 2010 undergraduate ITE cohort is lower than it was for the 2009 cohort (Table F.32) could either imply that fewer individuals from the 2010 cohort will ultimately complete their programmes than was the case for the 2009 cohort, that individuals from the 2010 cohort will, on average, take longer to complete their programmes than individuals from the 2009 cohort, or both. It may even be possible that a greater percentage of the 2010 cohort than the 2009 cohort will ultimately graduate, but simply that they take longer on average to do so. The critical point is that is it not possible to use the data to determine which of these hypotheses is true. This is a limitation that is inherent when analysing academic programme completion.

[78] The approach used to impute CRs in this chapter produces estimates that compare well with those presented in CHE (2013:45). Using unit-record HEMIS data, the CHE study estimates that, of all *first-time entering* 4-year undergraduate degree students at public HEIs in South Africa in 2006, 37% graduated within 5 years. They further estimate that 50% of this cohort would never graduate, implying that of the 50% who do, roughly 74% graduated within 5 years. Using log-linear regressions on the aggregate HEMIS data, it is estimated that 55.5% of the 2006 4-year undergraduate degree ITE cohort will never graduate and, of those who do, roughly 80% (i.e. 5-year CCR = 35.6%) graduated within 5 years.

4.5.3 Disaggregated completion rates

Having considered the overall trends in completion rates for ITE cohorts between 2004 and 2013, the focus now turns to the description of completion rate differentials between groups of ITE students. Specifically, this section presents and compares estimates of completion rates at a disaggregated level in order to cast light on the dimensions along which ITE programme completion rates in South Africa are found to vary.

Since the estimation of completion rates in this chapter is based on identifiable cohorts in aggregate HEMIS data rather than identifiable unit-records in original HEMIS, the level of disaggregation that can be achieved is limited. In essence, student cohorts in aggregate HEMIS can only be defined based on time-invariant factors such as race or gender. Therefore, it is only possible to estimated disaggregated completion rates over time-invariant dimensions.[79]

4.5.3.1 Disaggregated fixed-horizon completion rates by ITE cohort

Table F.34 presents estimated 5-year completion rates for the 2004 - 2009 undergraduate ITE programme cohorts, disaggregated by contact vs distance institutions, gender, race, home language, province of enrolment, and age cohort at commencement.

The extent of the differences between the estimated completion rates for UNISA and contact HEIs is immediately striking. Over the period under consideration, the percentage of undergraduate ITE students completing their programmes within 5 years at contact HEIs was, on average, 3 times as high as it was at UNISA. In other words, even if the number of individuals entering ITE programmes at UNISA was three times greater than the number entering such programmes at contact institutions, the estimates suggest that UNISA would produce no more ITE graduates than contact HEIs would within the first five years. Though it appears as though completion rates at UNISA improved somewhat between 2006 and 2009, even among UNISA's 2009 undergraduate ITE cohort, fewer than 22% of students completed their programmes within the first five years, compared to almost 60% of undergraduate ITE students at contact HEIs.

Though it is reasonable to expect that distance education students will take longer, on average, to complete their undergraduate programmes than students at contact HEIs, UNISA's low 5-year completion rates is clearly problematic, particularly considering the fact that the university currently accounts for around half of all FTEN in undergraduate ITE programmes in the public HE system. Moreover, as discussed in Section 4.3.3.1, UNISA's share of enrolments in undergraduate ITE programmes has increased substantially since 2004 and the available evidence suggests that it is likely to continue to do so for the foreseeable future.

In accordance with what appears to be a general feature in the South African education system, females consistently outperform males in terms of completion rates with the female 5-year completion rates for undergraduate ITE programmes over the period being 8.4 percentage points (25%) higher, on average, than it was for Males. Table F.34 also shows that there is a distinct racial dimension to undergraduate ITE programme completion rate differentials. Despite movements over time, Whites consistently have the highest 5-year completion rates, followed by Indians, and thereafter by Coloureds and Blacks. Among the 6 cohorts under consideration, the 5-year completion rate for White undergraduate ITE students was, on average, 43% higher

[79] It is not, for example, possible to calculate completion rates by NSFAS status since students who receive NSFAS funding in one year may or may not receive NSFAS funding in another year.

than it was for Black students. This figure is similar to the 45% differential found by CHE (2013:49) when comparing the 5-year completion rates for all Black and White students from the 2006 first-time entering undergraduate student cohort in South Africa.

Undergraduate ITE programme completion rates by home language are broadly reflective of the disaggregated completion rates for the respective race groups. Since virtually all African language students are Black, it is not surprising that the 5-year completion rates for African language and Black undergraduate ITE students are, with the notable exception of the 2004 cohort, very similar.[80] Afrikaans-speaking students have the highest 5-year completion rates, with the completion rates for English-speaking students lying somewhere between that for Afrikaans and African language students.

5-year completion rates by province of enrolment varied considerably between the 2004 - 2009 undergraduate ITE cohorts. In some provinces, like Limpopo and KwaZulu-Natal, completion rates seem to have increased on average, while the opposite is observed for the North West. However, there do not appear to be any clearly discernible trends in the patterns of changes for the other provinces.

The 5-year completion rates for the 2009 undergraduate ITE cohorts from the Western Cape, Eastern Cape, Free State, and North West provinces were all between 61.9% and 63.8% while those from Limpopo had the highest completion rate (67.0%) . However, it should be noted that Limpopo accounted for only 2.5% of all individuals who commenced with undergraduate ITE programmes at contact HEIs between 2004 and 2009. By contrast, KwaZulu-Natal had the second highest 5-year completion rate in 2009 and accounted for a far more meaningful 29% of individuals commencing with undergraduate ITE programmes at contact HEIs over the period. The primary reason why the overall 5-year completion rate for the 2009 undergraduate ITE cohort from contact HEIs is lower than what might be expected given the respective provincial completion rates, is that Gauteng, the province with the lowest 5-year completion rate for the 2009 cohort, accounted for a relatively large share (28%) of all undergraduate ITE programme commencements in 2009.

Lastly, Table F.34 shows that the 5-year completion rate for undergraduate ITE programmes over the period was highest among cohorts who commenced with their programmes at a young age. On average, the completion rate for individuals who commenced with ITE programmes before the age of 20 was 35% higher than it was for those who entered such programmes between the ages of 20 and 24, which in itself was 13% higher than the average completion rate for older cohorts. Thus, while the completion rates for individuals who were 25 years old or older when they commenced with their ITE programmes fluctuated somewhat over time, it seems clear that, with all else being equal, the extent of ITE programme completion is highest among young cohorts.

When considering completion rate differentials between different age cohorts, it is important to bear in mind that senior students tend to differ from younger students (who generally enter university shortly after completing secondary school) in a number of ways that may affect the extent of programme completion over the medium term for the respective groups. For example, the percentage of older undergraduate ITE students (aged 25 and above) who commenced with programmes at UNISA between 2004 and 2009, rather than at contact HEIs, was more than twice as high as the percentage of younger undergraduate ITE students who did so. Many of these older students may thus have been studying towards their ITE programmes on a part-time

[80] The HEMIS data shows that, while about 86% of all Black students from the 2004 - 2009 undergraduate ITE cohorts were African-language speakers, the 2004 cohort had a disproportionately large number of Black English home language students (32%).

basis only and, moreover, at an institution with a relatively low rate of student throughput in general. This is likely to at least partly explain why the 5-year completion rates differ so markedly across age cohorts.

Table F.34 presents estimated 3-year completion rates for the 2004 - 2011 postgraduate ITE programme cohorts, disaggregated along the same time-invariant factors as discussed above. While there are many similarities regarding the dimensions over which completion rates differ for both undergraduate and postgraduate ITE programmes, the table shows that the extent of programme completion is much higher for postgraduate students. Given that individuals who qualify for entry into postgraduate HE programmes must already have successfully completed some form of undergraduate HE qualification, this is to be expected. Postgraduate students generally constitute a more select group of individuals and it is not uncommon for them to have higher completion rates, on average, than undergraduate students. This is particularly true in the case of individuals who enrol for postgraduate diploma or certificate programmes.

While it is true that postgraduate ITE completion rates are higher at contact HEIs than at UNISA, the extent of the difference is far less than in the case for undergraduate ITE programmes. For the 2004 - 2011 postgraduate ITE cohorts, the 3-year completion rate at contact institutions was, on average, only 20.4% higher than at UNISA. Given that students generally take longer to complete their qualifications via distance education, it is therefore not unlikely that the 4-year or 5-year completion rates for postgraduate ITE students at UNISA may be just as high as, if not higher than, they are for students at contact HEIs.

The differences in the 3-year completion rates for postgraduate ITE students by gender, race, and home language are similar to those for the 5-year undergraduate ITE completion rates. On average, the 3-year completion rate for female postgraduate ITE cohorts between 2004 and 2011 was 18.5% higher than it is for males. Similarly, as in the case for undergraduate ITE programmes, Whites have the highest 3-year completion rates in terms of postgraduate ITE programmes. It must be said, however, that the extent of the difference between White and Black 3-year completion rates declined significantly, on average between the 2004 - 2011 cohorts such that, for the 2011 postgraduate ITE cohort, the 3-year completion rate for Whites was only 19% higher than it was for Blacks. The estimates thus show that the gap between the 3-year completion rates for postgraduate Black/African-language students and other cohorts of postgraduate ITE students is closing rapidly over time. In fact, if one were to assume that the rate at which completion rates changed for the respective race groups between 2004 and 2011 persisted for subsequent cohorts, the data suggests that the 3-year completion rates for postgraduate ITE programmes should more-or-less be the same among all race groups from the 2014 cohort onwards.

As in the case for undergraduate ITE programmes, it is difficult to discern a clear relationship between the province of enrolment and the 3-year completion rates for postgraduate ITE programmes. However, it does seem to be the case that the completion rates in question rose in all provinces, on average, between 2004 and 2011. While the provincial rank-ordering in terms of the 3-year completion rates varied between cohorts over the period, the Eastern Cape had the highest 3-year completion rates on average, whilst the Free State had the lowest.

Finally, the trends and differences in the 3-year completion rates for postgraduate ITE programmes by age cohort are effectively the same as for 5-year undergraduate ITE completion rates. One notable difference is that, in the context of postgraduate programmes, the better performing “younger” cohorts appear to also include individuals who commence with their programmes between the ages of 25 and 29. Again, this is in line with expectations given that individuals who commence with postgraduate studies must have already

completed undergraduate study and, as such, will be older on average than undergraduate students at the point of commencement. In fact, individuals who commenced with postgraduate ITE programmes before the age of 20 accounted for less than 0.5% of all students in the 2004 - 2011 cohorts.

4.5.3.2 Disaggregated weighted-average completion rates by ITE cohort

The preceding section highlighted the extent to which the 5-year completion rates for undergraduate ITE students and 3-year completion rates for postgraduate ITE students differed between groups and cohorts between 2004 and 2011. However, as mentioned before, it is not just the ultimate extent of program completion that differs between groups of students, but also the average time taken to complete (hereafter *time to completion*) among those who manage to graduate. Consequently, it is important to investigate if and how the completion rate differentials reported in Tables F.34 and F.35 change over the duration of a cohort's studies in order to cast light on the extent to which certain differentials persist, shrink, or grow over time.

Table F.36 shows estimated weighted average 4-year, 5-year, and 6-year completion rates for undergraduate ITE students in the 2004 - 2008 cohorts alongside the weighted average 1-year, 2-year, 3-year, and 4-year completion rates for postgraduate ITE students in the 2004 - 2010 cohorts. These estimates provide an indication of the degree to which completion rates and completion rate differentials change, on average, over time within ITE cohorts.

The estimates for undergraduate ITE students in Table F.36 make it apparent that most of the completion rate differentials identified in the preceding section are persistent over time. The estimated completion rate for female undergraduate ITE students, for example, remains around 8.6 to 9 percentage points higher than the figure for males, regardless of whether or not one looks at the 4-year, 5-year, or 6-year period. This translates into a marginal reduction in the female undergraduate ITE student completion rate premium relative to males over time, from 32.7% after 4 years to 26.1% after 6 years.

The "relative narrowing" of completion rate differentials over the study-horizon appears to hold in general for undergraduate ITE programmes over all of the time-invariant dimensions under consideration. In general, the extent of this narrowing is fairly modest, owing to diminishing marginal completion rates over the enrolment-horizon. A notable exception is the estimated undergraduate ITE programme completion rate differentials between UNISA and contact HEIs which is shown to decline substantially between 4 and 6 years of study. This attenuation is again a reflection of the fact that undergraduate ITE students at UNISA generally take much longer to complete their programmes than students at contact HEIs. Despite this narrowing, however, it remains clear that the total completion rate for undergraduate ITE students at UNISA will ultimately still be much lower than it is at contact HEIs. This can partly be deduced from the fact that, 6 years after commencement, the completion rate among undergraduate ITE students at contact HEIs is estimated to still be more than twice as high as the equivalent figure for students studying via UNISA.

In terms of the persistence and relative narrowing of completion rate differentials between groups, what holds for undergraduate ITE students broadly appears to hold for postgraduate ITE students as well. For the most part, the differentials in ITE completion rates between groups appear to decline only marginally in relative terms over the 2-4-year enrolment-horizon. Again, the differential between UNISA and contact HEIs is the notable exception, declining much faster over time than any of the other differentials considered. In fact, Table F.36 reveals that the average 4-year completion rate for postgraduate ITE students at UNISA among the

2004 - 2010 cohorts was actually higher than it was at contact HEIs. This reiterates the point made above that it is not necessarily the case that fewer postgraduate ITE students at UNISA complete their programmes, but rather that those who do take longer to do so, on average, than students from contact HEIs.

4.5.4 Multivariate analysis

Unbiased univariate comparisons of disaggregated completion rates between groups of ITE cohorts are confounded whenever there are significant differences in the underlying composition of the groups under consideration. For example, it seems fair to deduce from the estimates in Table F.36 that females outperform males in terms of ITE programme completion. However, if it were the case that far greater proportions of male ITE students study via UNISA than is the case for females, the differentials shown in Table F.36 may not necessarily mean that females outperform males in terms of completing ITE programmes. Instead, they may simply be capturing the fact that contact students generally have higher completion rates than distance-education students.

The associations between demographic characteristics and institutional factors in South African HE mean that the completion rate differentials that are observed to manifest along any particular single dimension may, in truth, derive from several underlying interrelated dimensions. Failure to explicitly account for this fact can easily lead to misleading inferences. To get a better sense of the correlation between completion rates and race, for example, it is necessary to explicitly control for any underlying compositional differences in terms of gender, qualification type, age, HEI type, and other factors that are likely not only to differ between race groups, but also to influence completion rates. One of the ways in which this can be done is by using multiple regression to estimate completion rates as a function of several dimensions simultaneously, thereby allowing more accurate identification of the true partial associations between cohort characteristics and completion rates. The results of these estimations, while not necessarily accurately reflecting the true completion rates for the group in question, provide a more accurate sense of the extent to which completion rates between groups would differ if other observable factors that can be controlled for were being held constant.

Tables F.37 and F.38 present the results from various estimations modelling completion rates as functions of selected time-invariant factors available in aggregate HEMIS.[81] As before, the focus falls on the 4-year, 5-year, and 6-year completion rates for undergraduate ITE programmes and the 2-year, 3-year, and 4-year completion rates for postgraduate ITE programmes.

Broadly speaking, the regression results support the descriptive findings discussed above. Even after controlling for differences in gender, race, home language, age, and other factors, undergraduate ITE students at UNISA are found to have far lower completion rates than undergraduate ITE students at contact institutions. While the extent of the undergraduate ITE completion rate differential between UNISA and contact HEIs appears to decrease over the enrolment horizon, the results still indicate that, on average and with other factors held constant, completion rates among UNISA's undergraduate ITE students are expected to be around 72% (or 47.4 percentage points) lower than they are at contact HEIs six years after commencement. By contrast,

[81] A series of regressions was also estimated to determine if and how the partial correlations between the various demographic and institutional dimensions and 5-year undergraduate ITE completion rates and 3-year postgraduate ITE completion rates, respectively, changed over time between cohorts. The results from these regression (not shown) indicated that the estimated coefficients either remained relatively stable over cohorts or that they fluctuated marginally without any clearly discernible pattern or trend to those fluctuations.

the estimation results indicate that, while there may also be large differences in the postgraduate ITE completion rates at UNISA and at contact HEIs initially, these differences decline substantially after two years of study. In fact, the rate at which these differentials are found to decline over the enrolment horizon in the estimation results suggest that whatever differences between the postgraduate ITE completion rate at UNISA and the postgraduate ITE completion rate at contact HEIs remain after five or six years of study are unlikely to be statistically significant.

Again, these results suggest that it is not necessarily the extent of completion that differs between postgraduate ITE students at UNISA and contact HEIs, but rather the average time required to complete qualifications. Specifically, while the total completion rate among postgraduate ITE students at UNISA and contact HEIs may ultimately be broadly similar, UNISA's completers take longer, on average, to complete their qualifications. The situation is markedly different for undergraduate ITE students. The results seem to imply not only that UNISA's undergraduate ITE students take longer to complete their qualifications than students at contact HEIs, but also that a far smaller percentage of UNISA's undergraduate ITE students ultimately graduate.

The regression estimates provide little new information on the nature of gender and racial completion rate differentials among ITE student cohorts, save to reaffirm the findings from the descriptive summaries in Table F.36. None of the other factors controlled for in the estimations can account for the fact that females have higher completion rates for both undergraduate and postgraduate ITE programmes. Interestingly, while the magnitude of the gender differential for undergraduate ITE programmes decreases over the enrolment horizon, the opposite holds true for postgraduate ITE programmes. In other words, females not only appear to be more likely to complete ITE qualifications than male ITE students, but also to require less time, on average, to do so.

Significant racial ITE programme completion rate differentials remain even after other observable characteristics have been taken into account. In fact, the regression results suggest that White-Black and Indian-Black completion rate differentials for undergraduate ITE programmes may be even larger than what is implied by the simple univariate estimates in Table F.36. For example, the estimates in Table F.36 suggest that the 6-year undergraduate ITE completion rate is, on average, 16.8 percentage points (47.1%) higher for Whites than it is for Blacks. However, the coefficients in Tables F.37 and F.38 show that this estimated completion rate differential may be closer to 17.9% (75.6%) once other underlying compositional differences have been controlled for. By contrast, the multivariate estimates suggest that racial completion rate differentials may be smaller in magnitude than those found in Table F.36. Notwithstanding, it seems clear that the magnitude of the differences that exist on average between the completion rates for White, Indian, and Black ITE students increase over the enrolment horizon for both undergraduate and postgraduate programmes.

As expected, the coefficients on the home language variables in Tables F.37 and F.38 reveal that the observed univariate associations between home language and ITE program completion rates are closely related to race. Thus, while the results confirm that Afrikaans and English undergraduate ITE students may be expected to have higher completion rates than African language speakers, the extent to which these differences can be explained by language is not nearly as great as the estimates in Table F.36 would suggest. Moreover, the results show that the association between undergraduate ITE completion rates and being either an English or an Afrikaans home language speaker (as opposed to an African language speaker), is only statistically significant and positive over the 4-year and 6-year enrolment horizons, and not over the 5-year horizon. This provides some insights into the timing of undergraduate programme completion among Black African language ITE graduates. Specifically, it suggests that while they are no less likely, on average, to graduate

after 5 years than their English or Afrikaans counterparts, Black African language ITE students who have not yet graduated after 5 years are far less likely to ever do so than English or Afrikaans Black ITE students.

The association between home language and program completion at the postgraduate level is also interesting. The results show that what is initially a positive and statistically significant average association between English or Afrikaans and programme completion over the 2-year enrolment horizon, becomes statistically insignificant over the 3-year horizon, before becoming negative and statistically significant thereafter. Again, this change over the enrolment horizon reflects something about the differences in the extent and timing of postgraduate ITE completion among Black students. Specifically, it shows that Black African language ITE students on average perform better than other Black ITE students in terms of the extent of postgraduate programme completion, but worse in terms of the time taken to complete. In other words, a greater percentage of Black African language students ultimately complete their postgraduate ITE programmes than Black English or Afrikaans students. However, those who do complete take longer, on average, to graduate than their Afrikaans and English counterparts.

The regression results provide mixed evidence regarding the associations between age at programme commencement and programme completion among undergraduate ITE students. It would seem as though older cohorts have higher completion rates over the short-run enrolment horizon (four years) than individuals who commence with their programmes below the age of 25. However, the results over the 5-year and 6-year horizons are inconclusive, save to suggest that a greater percentage of individuals who started their programmes while below the age of 20 ultimately graduate than those who were older at the time of commencement. The evidence regarding the association between age at programme commencement and completion rates for postgraduate ITE programmes is more robust. Individuals who commence with their postgraduate ITE programmes between the ages of 20 and 24 are predicted to have higher completion rates than other age cohorts, regardless of the enrolment horizon under consideration. This result is hardly surprising. Individuals who commence with postgraduate ITE studies before the age of 25 are not only likely to have successfully completed their undergraduate studies in a relatively short period of time but may also be expected to benefit from a greater degree of continuity between undergraduate and postgraduate study than older cohorts.

Owing to the limitations of the data, the regressions underlying the estimates in Tables F.37 and F.38 only control for a limited selection of time-invariant factors. It is important to recognize that there are many other, potentially critical factors which are likely to differ between gender, language, race, and age groups and also relate to the extent and timing of HEI programme completion. The estimations do not, for example, account for differences in socio-economic background, income, or levels of secondary school performance between cohorts of students. It may well be that the unexplained gap in completion rates between race groups, for example, becomes insignificant if one were to control for these and other factors. Unfortunately, the present estimations cannot shed light on the extent to which this may or may not be the case. What is clear though, is that the demographic distribution of newly qualified, potential teachers, is not simply a function of the demographic composition of FTEN in ITE programmes, but is also driven by the differences in programme completion rates between various ITE student cohorts, as identified above.

4.6 Conclusion: Implications for teacher supply in South Africa

Increasing the supply of qualified teachers in South Africa is essential for ensuring a functional schooling system. However, teacher supply is not only a pressing issue, but also one which is inherently complex and

difficult to unpack. Understanding it well requires an approach that is simultaneously comprehensive, yet nuanced.

This chapter has taken an admittedly narrow view on the issue of qualified teacher supply in South Africa by focussing predominantly on quantitative aspects pertaining to the production of new ITE graduates by the public HE system between 2004 and 2013. Nevertheless, by focussing on the trends in first-time enrolments and graduations in ITE programmes, the throughput of ITE programme students, and the foremost demographic and geographic correlates underlying these measures, the findings from the empirical analysis presented above provide several insights into the nature and extent of qualified teacher supply in the country.

In order to synthesise the chapter's main findings, it is useful to contextualise them within a simple conceptual framework of qualified new teacher supply, such as the one presented in Figure 4.29. At a basic level, one can think of qualified new teacher supply as a continuous cycle involving four phases, each of which comprises a range of objectives. In the *recruitment* phase, individuals are attracted into initial teacher programmes with a view to becoming qualified teachers. In the *conversion* phase, ITE programme students are converted into qualified and competent potential teachers through the training they receive. This is followed by an *absorption* phase in which newly qualified ITE graduates are absorbed into the teaching profession as qualified new teachers in the schooling system. Lastly, there is a *retention and utilisation* phase in which new teachers are retained within the schooling system for an extended period of time, further developed as educators, and utilised appropriately.

Critically, the qualified teacher supply chain is only as strong as its weakest link. Weaknesses in a particular phase not only serve to constrain teacher supply, but also compound the adverse consequences of any weaknesses in the other phases. Ensuring that the supply of qualified and competent teachers in South Africa is sufficient to meet demand therefore necessitates interventions that speak to each of the four aforementioned phases of the qualified teacher supply process. In light of this, this section relates the implications of the findings presented throughout this chapter to the various objectives underlying the teacher supply process and also highlights which critical questions pertaining to teacher supply in South Africa remain unanswered.

4.6.1 Recruitment into initial teacher training

The numbers of individuals entering ITE programmes for the first time at public HEIs rose significantly over the past decade, effectively doubling between 2004 and 2013 largely due to the substantial rise in the numbers of individuals entering undergraduate ITE programmes. Moreover, FTEN in ITE programmes not only grew fast in absolute terms, but also when compared to the growth in FTEN in other non-ITE undergraduate degree and postgraduate diploma/certificate programmes.

Some have argued that the growth in FTEN in ITE programmes since 2004 can largely be attributed to the expansion of funding opportunities for ITE students. It is certainly true that the introduction and subsequent expansion of the FLBP coincided with the rapid rise in ITE programme FTEN since 2006. In addition, the relative availability of NSFAS awards to undergraduate ITE programme students also appears to have increased over this period. It would thus seem as though the availability of financial support to ITE programme students has increased in relative, if not also in absolute, terms since 2004. However, while it may be plausible to believe that this increased availability of financial support may have influenced enrolments in ITE programmes,

Figure 4.29: Basic conceptual framework of qualified new teacher supply

Phase	Basic Objective	Nuanced Objectives
1. Recruitment	Ensure that sufficient numbers of individuals enrol in ITE progammes	Ensure that sufficient numbers and the right types of individuals • want to become teachers • are able to enrol in ITE programmes • enrol in high quality ITE programmes • choose to specialize in subjects and phases for which demand is greatest
2. Conversion	Ensure that sufficient numbers of ITE students (a) complete their programmes and (b) do so within the shortest possible amount of time	Ensure that sufficient numbers of ITE students • acquire the necessary competencies and relevant experiences to be effective and motivated teachers • are able to succesfully complete their initial teacher training with minimal repetition or delay • are adequately prepared for the realities of teaching in South Africa schools
3. Absorption	Ensure that sufficient numbers of new ITE graduates are absorbed into teaching posts with minimal delay	Ensure that sufficient numbers of new ITE graduates • Want to become teachers • Apply for teaching positions • Are placed in the right schools with minimal delay
4. Retention and utilisation	Ensure that sufficient numbers of new teachers stay in the schooling system for an extended period of time	• Minimize the extent of teacher turnover, voluntary attrition, and early retirement • Ensure that teachers are utilised appropriately • Provide adequate development and further training for teachers

one cannot draw definitive causal inferences regarding the relationship between the FLBP, NSFAS, and enrolments in ITE programmes from the findings presented here or those presented in other existing studies. More evidence is needed on the extent to which these factors have truly served to incentivise new enrolments in ITE programmes, rather than merely providing funding opportunities for an already expanding group of ITE

students in the public HE system.

While present trends in FTEN in ITE programmes are arguably encouraging from the perspective of new teacher recruitment, present levels of enrolment are not. Even with a 100% completion rate, the numbers of individuals currently entering ITE programmes would in all likelihood still only just be enough to ensure that the numbers of ITE graduates produced within the next three to five years would satisfy lower-bound estimates of current annual qualified teacher demand. In reality, low programme throughput in general implies that the numbers of ITE graduates being produced will fall far short of this already low benchmark.

If the public HE system is to start consistently producing sufficient numbers of ITE graduates within the next decade, it is essential that current trends in ITE programme FTEN persist. Yet, it is difficult to see how these trends can be sustained unless HEIs have access to significant additional resources and the public HE system experiences an unprecedented expansion of its infrastructural and instructive capacity to accommodate additional ITE students every year (CDE, 2015:12). Unfortunately, the potential for such changes is questionable. Qualitative evidence already suggests that the decline in ITE FTEN at UNISA between 2011 and 2013 was the direct consequence of new policies that were implemented to curtail the excessively rapid rise in individuals entering such programmes at the university (McKay, 2015). Given that UNISA has been the major driver of growth in ITE FTEN since 2004 and that, in many ways, it faces fewer physical constraints to expansion than most contact HEIs, the need for such policies at the institution does not bode well for the system's ability to accommodate ever increasing numbers of ITE programme students.

Of course, recruitment is not just about getting sufficient numbers of individuals to enrol in ITE programmes, but also about getting the right types of individuals to specialise in the right subjects and schooling phases at the right HEIs. It is well-known, for example, that the demand for qualified teachers in South Africa is unequally distributed across lines of race and language with the need for greater numbers of qualified African-language teachers being particularly acute. In light of this, it is encouraging that the growth in ITE programme FTEN has been particularly strong among Black, African language mother-tongue speakers. Despite these trends, however, levels of enrolment in ITE programmes among African language students still remain far too low to ensure that sufficient numbers of qualified African language teachers are being produced, particularly given the fact that African language students appear to have far lower programme completion rates, on average, than English or Afrikaans ITE students.[82]

The data also shows that there has been a substantial increase in the number of young individuals entering ITE programmes between 2004 and 2013. Again, this trend is encouraging and has had the effect of lowering the overall age profile of first-time ITE programme students. Nonetheless, individuals entering ITE programmes remain older, on average, than those who enrol in non-ITE undergraduate degree and postgraduate diploma/certificate programmes. In fact, the median age of entry into undergraduate ITE programmes remains roughly two years more than the median age of entry into non-ITE undergraduate degree programmes. It is not immediately clear why such a difference in the age-at-entry exists, yet this clearly has implications for the age at which individuals can graduate from ITE programmes and enter the labour market for the first time.

As far as the recruitment of individuals into ITE programmes in South Africa is concerned, the findings presented in this chapter point to a sobering reality. First, it remains the case that too few individuals are enrolling in ITE programmes at public universities, despite significant growth in FTEN in ITE programmes

[82] Also, it is important to note that the substantial growth in ITE programme FTEN among African language students has chiefly been limited to isiZulu, and to a lesser extent, isiNdebele and SeSotho speakers (Table F.20).

since 2004. Second, it is doubtful whether the public HE system can sustain the level of growth in ITE programme FTEN that has been seen in recent years without significant additional support from government and access to substantial additional resources. Third, and perhaps most disconcertingly, even if FTEN in ITE programmes continue to grow as it has since 2006, the underlying composition of ITE programme students is unlikely to be conducive to producing the kinds of ITE graduates that the schooling system needs the most.

4.6.2 Conversion of ITE programme students into qualified potential teachers

Recruitment into ITE programmes is critical as the number of individuals entering such programmes effectively sets the limit on the numbers of individuals who can qualify to teach in South African schools. However, it is not just the numbers of individuals entering ITE programmes, but also the types of individuals and the institutions where they study that ultimately determine how many and the types of ITE graduates are produced. In other words, it is not recruitment into ITE programmes itself that is important for qualified teacher supply, but rather what the nature of that recruitment means for the conversion of ITE students into qualified potential teachers. In the end, the trends in ITE programme graduations not only lag behind movements in ITE programme FTEN, but are also invariably influenced by the composition of those enrolments.

Graduations in ITE programmes grew rapidly between 2008 and 2013, increasing almost threefold in just 6 years. Yet, this growth occurred from a very low base. The public HE system produced only about 15 650 ITE graduates in 2013, just 50% more than it did in 2004. The message regarding ITE graduations is thus similar to the message regarding ITE programme FTEN: while current trends are encouraging, current numbers are still not sufficient to satisfy demand. Moreover, while the projections presented in this chapter suggest that the HE system could potentially start to produce sufficient numbers of ITE graduates each year to satisfy demand within the next decade, these projections are conditional on sustained growth in ITE programme FTEN and sustained levels of ITE programme throughput. Various changes in the nature of enrolments in ITE programmes since 2004 mean that these prospects are dubious at best.

Perhaps the most important change to occur in the ITE landscape since 2004 is the fact that UNISA has begun to account for ever-increasing shares of FTEN in ITE programmes in the public HE system. UNISA experienced unprecedented growth in FTEN in ITE programmes between 2006 to 2013 and accounted for half of all individuals entering ITE programmes for the first time in the public HE system between 2008 and 2013. This not only has implications for the numbers and types of ITE graduates that the HE system is likely to produce, but also for the time it will take to produce them. Only a small percentage of individuals who commence with undergraduate ITE programmes at UNISA ever complete those programmes. Moreover, those who do graduate take a much longer time to do so than students who graduate from contact HEIs. Similarly, while the ultimate extent of postgraduate ITE programme completion at UNISA may be similar to, if not higher than, it is at contact HEIs, UNISA students still tend to take longer, on average, to complete their programmes.

It is problematic that much of the expansion of FTEN in ITE programmes since 2004 has been limited to what has historically proved to be one of the least efficient parts of an already generally inefficient public HE system. Increased enrolments in ITE programmes will count for little if they do not lead to commensurate increases in ITE graduations. Indeed, the compositional shift in ITE programme enrolments between UNISA and contact HEIs most likely means that there will be a continued divergence between the rate of growth in ITE programme FTEN and the growth in graduations from such programmes. This inefficiency is clearly

costly both in terms of the supply of qualified teachers in South Africa and the funding of ITE students at South African HEIs. If interventions aimed at improving the production of qualified new teachers in South Africa are to be effective, it is clear that they will need to speak directly to the low levels of throughput at UNISA and the implications that this is likely to have for the production of ITE graduates in the public HE system as a whole.

Finally, it is worth highlighting that qualifying to teach in a South African school by virtue of completing an ITE qualification at a public HEI by no means guarantees that one will be a good or a competent teacher. Several studies have expressed serious concerns about the quality of ITE programmes at some South African HEIs and the quality of the ITE graduates they consequently produce.[83] It is therefore important that the focus on improving ITE programme throughput is not misplaced. Instead, it is imperative that quality of training issues are addressed and that ITE students are not merely *pushed through* the HE system. Converting ITE enrolments into ITE graduates is little more than a rubber-stamping exercise if those graduates have not acquired the necessary competencies and relevant experiences required to be effective and motivated teachers in South African schools by the time they leave university. Unfortunately, it is not only the case that very few ITE students ultimately graduate with ITE qualifications in South Africa, but also that many ITE graduates leave university without the kinds of competencies that would make them quality, rather than simply qualified, teachers.

4.6.3 Absorption into the teaching profession

Getting increasing numbers of individuals to enter ITE programmes and graduate with qualifications that allow them to teach in South African schools may be a necessary precondition for increasing the supply of qualified teachers in South Africa. Yet, it is critical to understand that it cannot be a sufficient condition. For ITE graduate production to truly influence qualified teacher supply, it is essential that sufficient numbers of newly qualified potential teachers are absorbed into the schooling system as qualified new teachers.

The absorption of ITE graduates is a supply as well as a demand side issue. On the supply side, absorption requires that new ITE graduates must firstly want to become teachers and, moreover, take active steps towards applying for teaching positions. On the demand side, absorption requires that new teaching vacancies are well-advertised and that individuals who apply for positions for which they are adequately qualified are appointed to posts by the relevant schools and/or provincial education departments. Unfortunately, there is evidence to suggest that both supply and demand-side inefficiencies are driving a wedge between the numbers of ITE graduates produced by the HE system and the numbers of newly qualified individuals joining the schooling system each year.

As discussed above, it is clear that not all individuals who qualify to teach in South African schools endeavour to do so. Because of this, large numbers of ITE graduates are effectively lost to the South African schooling system. There remains a need to better understand why individuals enrol in ITE programmes and the extent to which their decision to do so implies that they are likely to seek employment as teachers in the South African schooling system subsequent to graduation. These motivations also have important implications for the nature of the interventions that have thus far been used to increase the production of new ITE graduates in South Africa. While the findings in this chapter suggest that ITE programmes have become relatively more

[83] See CHE (2010*b*), for example, for a review of the quality of ITE programmes at various HEIs in South Africa.

attractive as fields of study since 2004, it is important to understand that this does not mean that the teaching profession in South Africa has become more attractive as a field of employment. Ultimately, qualified teacher supply is not a function of the numbers of individuals who want to study ITE programmes, but rather of the numbers of individuals who want to become teachers and are able to do so. Interventions aimed at increasing the supply of qualified teachers in the country can therefore only be effective in the long run if they also address the deteriorating status of the teaching profession in South Africa.

Teacher supply is not only impacted by the extent of ITE graduate absorption, but also by the time it takes for ITE graduates to be absorbed into the schooling system. The younger overall age profile among new ITE graduates means little if there are significant delays in absorbing young ITE graduates into the teaching profession. The window of opportunity for the DBE to reach its strategic goal of increasing the number of qualified teachers below the age of 30 is very narrow. Nearly 40% of new ITE graduates below the age of 30 are between the ages of 25 and 29. Any significant delays in the absorption of new ITE graduates into the teaching profession will therefore substantially reduce the available pool of qualified young potential teachers in the country. In this regard, it is worrying that the number of qualified individuals aged 30 or younger who entered the schooling system as teachers for the first time between 2012 and 2013 amounted to only 51% of new ITE graduates below the age of 30 produced by the public HE system between 2011 and 2012.

More generally, given that only a proportion of new ITE graduates seek employment as teachers, it is disconcerting to hear of reports that many newly qualified potential teachers are either unaware of relevant teaching vacancies in their provinces or are unable to find employment after extended periods of searching for work. What is particularly worrisome is the prevalence of practices in some provinces whereby older, unqualified individuals are employed in teaching positions despite the fact that there are qualified younger ITE graduates who apply for those positions.

Lastly, even if greater numbers of ITE graduates applied for teaching positions and greater numbers of applicants were appointed to teaching posts, the fragmented nature of teacher demand and supply in South Africa means that it remains unlikely that sufficient numbers of teachers will be appointed to the schools where they are needed the most. The fact of the matter is that the incentive structures facing new ITE graduates are rarely aligned with the socio-demographic dimensions of teacher demand in South Africa. The part of the schooling system where the demand for qualified new teachers is probably also the part of the schooling system where new ITE graduates are least likely to seek employment. In effect, there remains a mismatch between the types of schools where new qualified teachers are needed the most and the types of schools where newly qualified potential teachers want to work. While service-linked funding programmes such as the FLBP aim to remedy this situation, there are limits to the extent to which they can do so.[84] Ultimately, the only way of ensuring that greater numbers of new ITE graduates apply for teaching positions in poor and rural schools is by ensuring that they have incentives to do so.

4.6.4 Retention and utilisation of newly employed teachers

The retention of qualified practising teachers in the schooling system and the production and subsequent absorption of newly qualified ITE graduates serve complementary roles in the supply of qualified teachers in South Africa. Even if increased levels of ITE graduate production lead to greater numbers of qualified new

[84] In fact, there is already evidence that some Funza Lushaka bursars have refused to be placed in certain schools.

teachers being employed in South African schools in the short run, its long-run impact on qualified teacher supply will depend on the extent to which newly employed teachers can be retained within the schooling system.

A number of studies have alluded to the fact that teacher retention and turnover rates in South African schools appear to be deteriorating over time with ever larger numbers of practising teachers leaving the system each year. What makes the situation particularly problematic is that teacher attrition appears to be highest amongst qualified teachers. This clearly has negative implications for qualified teacher supply.

In light of an ageing teachers corps, the DBE's drive to increase the number of qualified young individuals entering the teaching profession is commendable. However, getting younger individuals to enter teaching is only part of the solution. If the age profile of the teaching workforce is to change meaningfully, it is not only imperative that greater numbers of younger teachers enter the teaching profession, but also that greater numbers of those individuals are retained as teachers for a meaningful period of time. Moreover, if the increased supply of qualified new teachers in the country is to make a real difference to the education system, it is important that teachers are not just retained, but also developed and utilised appropriately. Unfortunately, while there is little systematic information on teacher utilisation in South African schools, qualitative evidence suggests that many teachers are employed to teach subjects for which they are not trained.

4.6.5 Understanding teacher supply: the need for better and more integrated information

While this chapter has viewed teacher supply through a particularly narrow quantitative lens and therefore cannot shed light on many of the issues that have important bearing on qualified teacher supply in South Africa, the analysis and discussion presented above nevertheless provides new insights into the scale and shape of the production of qualified potential new teachers by the public HE system. However, it is important to emphasise that the accuracy of these insights are only as good as the data on which they are based. While every step has been taken to ensure that the results presented here are representative of the underlying data, methodological rigour can never fully compensate for incomplete or inaccurate data.

Many of the critical unanswered questions pertaining to teacher supply in South Africa remain unanswered primarily because the type of data required to answer such questions cannot be accessed by researchers. In conjunction, the Annual Survey of Schools (ASS), PERSAL, and HEMIS databases contain incredibly rich information on the types of individuals who are studying to become teachers and the types of individuals who are ultimately employed as teachers in South African schools. Individually, these datasets could be used to provide far more fine-grained information on the types of individuals entering and subsequently graduating from teacher training programmes at South African universities, or the types of individuals entering or leaving the teaching profession each year than is currently available in the literature. Moreover, linking information across the various data would provide invaluable information regarding the dynamics of teacher demand and supply in South Africa. By linking HEMIS and PERSAL, for example, one could for the first time analyse the transition between the production of ITE graduates by the public HE system and the absorption of ITE graduates into the teaching profession. Unfortunately, for various reasons - none of which are compelling - access to ASS, PERSAL, and HEMIS is restricted to the point where few researchers are ever able to access even crude subsets of the data. Moreover, there is no evidence than any attempts have been made to integrate or link detailed information across these datasets.

The ability to ensure that South Africa has sufficient numbers of adequately qualified competent teachers necessitates a comprehensive understanding of current and future teacher supply and demand in the country. It is true that there are already numerous studies on teacher demand and supply in South Africa. Yet despite the extant body of evidence, our understanding of teacher demand and supply remains sorely lacking. Sadly, our understanding of this issue and the ways in which we choose to address it, will remain lacking as long as there is a systemic failure to fully exploit and integrate existing sources of information on teacher production in the HE system and teachers flows in the schooling system.

Chapter 5

Conclusions

This dissertation has investigated three distinct topics pertaining to HE access, HE success, and HE output in South Africa. Each of these topics has focussed on a particular dimension of the nexus between the secondary schooling system, HE, and the labour market and provides new insights into the degree to which the HE system is succeeding in fulfilling its various functions.

Chapter 2 evaluated the extent of graduate unemployment in South Africa and examined the associations between the types of HEIs that graduates are likely to have attended and the employment/unemployment outcomes that they are likely to face. By focussing on two of the most important labour market returns to HE, namely employment and unemployment premiums relative to other educational cohorts, the chapter provided the rationale for focussing on HE as a key role player in addressing South Africa's skills shortages and pervasive unemployment problems. In addition, the chapter illustrated that at least part of the heterogeneity in the observed employment and unemployment outcomes for graduates from different race groups may be explained by the associations between race, HEI type, and the probability of employment/unemployment.

Topic two (Chapter 3) investigated the extent of HE access and success among secondary school leavers in the Western Cape, with specific emphasis on the ways in which HE access, throughput, and dropout are predicated on various pre-entry and HE-level factors. In light of the *low participation, high attrition* nature of the public HE system and persistent racial differentials in HE access, throughput, and dropout rates in South Africa, the analysis in the chapter sought to provide clarity on the marginal contributions and relative importance of demographics, matric performance, and school-level factors for observed HE outcomes among learners in the Western Cape and illustrate the respective roles that HE access rate differentials and HE throughput rate differentials play in explaining differentials in HE graduations.

Lastly, chapter 4 focussed on initial teacher education (ITE) graduate production in the public HE system and teacher supply in South Africa. Given the degree to which the performance of the HE system is predicated on the outputs produced by the primary and secondary schooling systems and the central role that teachers play in fostering those outcomes, teacher graduate production and, more broadly, teacher supply is clearly a fundamental determinant of the quality of education in South Africa. Consequently, it remains imperative that the HE system produces sufficient numbers of new teacher graduates to satisfy the demand for teachers in the country.

Each of these three broad topics produced a number of interesting findings. These are summarised below.

5.1 Chapter 2: Graduate unemployment and Higher Education Institutions in South Africa

Chapter 2 focussed on the levels of graduate employment and unemployment in South Africa and on the underlying reasons for the persistent differentials in graduate unemployment rates between race groups.

The historically fragmented and racially stratified nature of South Africa's HE system means that some race groups remain significantly more likely to graduate from certain types of HEIs than others. In particular, it is evident that far larger shares of Black, Coloured, and Indian graduates in the population of working age graduated from historically disadvantaged institutions (HDIs) than is the case for White graduates.

In order to estimate the partial associations between the types of HEIs attended and graduate employment and unemployment outcomes for different race groups, the chapter employed a probabilistic linking approach which exploits the existence of common time-invariant graduate characteristics that are present in both the 2000 - 2015 LFS/QLFS data and the 2000 - 2013 aggregate HEMIS data to estimate the probability that graduates in the labour force data graduated from particular HEIs. The validity of this approach is premised on the fact that, firstly, the pool of HE graduates in South Africa remains small and, secondly, the distribution of graduates across HEIs is not only non-random, but also correlated with factors such as race, age, and field of study. Consequently, the unique combinations of the time-invariant graduate characteristics that are available in the LFS/QLFS and HEMIS data are able to satisfactorily discriminate between the types of HEIs that graduates are likely to have attended.

In contrast to the assertions of many other studies, the descriptive analysis in Chapter 2 shows that graduate unemployment in South Africa is neither particularly high, nor rising rapidly over time. Instead, it is clear that unemployment rates for degreed graduates remain significantly lower, on average, than those for other educational cohorts, regardless of race. However, racial differentials in graduate unemployment remain evident, with the incidence of unemployment still being much higher among Black graduates than it is among White graduates.

Despite the fact that the estimated HEI-type probability measures used in the multivariate analysis are likely to be imprecisely measured, the multivariate results show that there are statistically significant associations between the types of HEIs that graduates are likely to have attended and their probabilities of employment/unemployment. Specifically, the results indicate that at least part of the observed variation in graduate employment and unemployment rates between race groups may be explained by differences in the types of HEIs that different race groups have generally been likely to attend.

While the estimates presented in Chapter 2 cannot be interpreted as causal, they suggest that there is a need to be cognisant of the fact that graduates from different HEIs may face vastly different labour market outcomes in terms of their likelihoods of employment and unemployment. Moreover, the nature of the findings indicate that controlling for the type of HEI attended may be crucial for understanding the persistence of racial differentials in graduate employment and unemployment rates in South Africa.

5.2 Chapter 3: Higher Education access and success in the Western Cape

Chapter 3 examined HE access and success among secondary school learners in the Western Cape. The analysis presented aimed to answer four main questions. First, what is the level and pattern of HE access, throughput, and dropout among matric learners in the Western Cape? Second, what are the most important factors and learner attributes for explaining the observed HE outcomes in the province? Third, how much of the variation in HE outcomes in the Western Cape can respectively be attributed to variation in demographics, matric performance, school type and school-level performance, and HEI and programme-specific factors? And, fourth, to what extent are the racial differentials in graduate outputs in the province a consequence of differentials in HE access rates, as opposed to differentials in HE completion rates?

To answer these questions, the analysis retrospectively followed learners who wrote the 2005 SCE in WCED schools into and through the HE system over the period 2006 to 2009, by matching learner records from the 2005 WCED SC database with student records from the 2006 to 2009 HEMIS databases. This is the first South African study to track secondary school learners into and through HE at a provincially representative level by means of explicitly linking secondary school records for an entire cohort population to HE records at the individual level.

The findings show that HE access among secondary school learners in the Western Cape is low, even for those learners who satisfy the minimum academic requirements for HE entry. The results suggest that less than 30% of the learners from the 2005 WCED matric cohort ultimately enrolled in public HE. Moreover, the effects of low HE access rates are compounded by low throughput rates among learners who are able to access HE. For example, less than half of the learners from the 2005 WCED matric cohort who entered the HE system immediately after matriculating successfully completed undergraduate programmes within four years of study. As a result, it is estimated that only just over one in ten learners from the 2005 WCED matric cohort successfully completed some university qualification by the end of 2009.

In addition to low levels of HE access and throughput for the cohort as a whole, the chapter also revealed that there are significant racial differentials in the extent of HE access and success in the Western Cape. Black and Coloured learners not only remain significantly less likely than White learners to accede to HE after finishing secondary school, but those who do so are also far less likely to complete their academic programmes and more likely to drop out of HE. Crucially, however, the multivariate estimates indicate that the observed racial HE access rate differentials in the Western Cape may be explained by underlying differences in matric performance between learners from different race groups. In fact, once matric performance has been taken into account, White learners appear to be significantly less likely to access HE than Black or Coloured learners.

The estimates suggest that scholastic achievement in secondary school, as measured by performance on the SC, is highly predictive of HE access and, to a lesser extent, also of HE throughput and dropout. Moreover, the Shapley-Owen decompositions of the goodness of fit measures from the multivariate analysis show that the relative contribution of matric performance to the explained variation in HE access, completion, and dropout rates is far greater than the collective contributions of demographic and school-level factors. Yet, it is clear that matric performance is not a perfect predictor of either HE access or HE success and that there is still substantial variation in the observed HE outcomes at most points on the matric performance distribution.

In contrast to the findings for HE access and dropout rates, persistent racial differentials in HE completion rates remain evident, even after controlling for differences in matric performance. In particular, it is found that

White students are, on average, far more likely to complete their undergraduate studies within four years than students from other race groups. When viewed in conjunction with the chapter's other findings, this result provides evidence of differential selection into HE. Specifically, the fact that White learners are simultaneously significantly less likely to enrol in HE, yet significantly more likely to complete their undergraduate studies if they do enrol in HE than Black or Coloured learners, conditional on other factors, suggests that the HE selection process for White applicants may be comparatively more effective at screening out applications with low likelihoods of achieving HE success. If this is indeed the case, it is to be expected that White students will perform better in terms of completion rates than students from other race groups.

While the analysis in Chapter 3 focussed specifically on HE outcomes among secondary school learners in the Western Cape, many of the substantive findings are also broadly applicable to the rest of the country. In the context of South Africa's skills shortages, it should be clear that a situation in which only 10% of the learners that reach Grade 12 are able to complete undergraduate qualifications within four years of leaving school is untenable. Without meaningful alternative post-school training opportunities for the remainder of secondary school-leavers, the low rate of conversion of matriculants into HE graduates severely undermines the expansion of South Africa's scarce skills base. Moreover, because of the extent to which HE throughput and dropout remains stratified by race, the HE system is at risk of perpetuating existing inequalities in the labour market.

The findings in Chapter 3 suggest that the emphasis on the expansion of HE access in South Africa must be balanced with an emphasis on ensuring that learners who gain access to HEIs have meaningful chances for success. Ultimately, what matters is not how many individuals are able to enrol in HE, but rather how many individuals are able to increase their competencies and raise their employability by successfully completing their HE studies. The equitable expansion of HE access alone cannot ensure equitable outcomes in terms of HE graduations. Rather, without careful forethought, increasing access to HE access may well have perverse consequences.

Care should be taken to ensure that the HE system does not devolve into little more than a revolving door for many students. Instead, it is imperative that the low throughput rates at many HEIs are addressed. In this regard, both the pre-tertiary and higher education systems have critical roles to play. In the long run, the articulation gap between secondary school and HE can only decrease if the quality of education in the primary and secondary schooling systems improve significantly. At the same time, HEIs have a duty to ensure that learners who are able to access HE are given adequate support to ensure that they are able to complete their studies.

5.3 Chapter 4: Initial Teacher Education (ITE) graduate production and teacher supply in South Africa

In light of the pervasive teacher shortages in the South African schooling system, Chapter 4 used aggregate HEMIS data to analyse the trends in, and underlying correlates of, first-time enrolments and graduations in ITE programmes between 2004 and 2013. Due to the restrictions imposed by the nature of the data, the analysis presented focussed primarily on quantitative aspects pertaining to patterns of ITE graduate production in the public HE system. Nevertheless, the findings in the chapter provide a number of insights regarding the production of new teacher graduates and the supply of teachers in South Africa.

The HEMIS data shows that there has a been a significant increase in the number of individuals entering teacher training since 2004, with first-time enrolments in ITE programmes doubling between 2004 and 2013. This growth was also lagged by significant, albeit more moderate, growth in ITE programme graduations. However, the vast majority of the growth in ITE programme FTEN over this period occurred at Unisa, which has accounted for nearly half of all FTEN in ITE programmes in the public HE system since 2008. Crucially, completion rates at Unisa are generally far lower than completion rates at contact HEIs. In addition, students who complete their qualifications at Unisa generally take much longer to do so than students who complete their qualifications at contact HEIs. The implication is that the significant growth in ITE programme FTEN is unlikely to result in commensurate growth in ITE programme graduations.

In addition to the role of Unisa, Chapter 4 also looked at the potential role that the availability of financial support in the form of Funza Lushaka bursaries and/or NSFAS awards may have played in the growth in ITE programme enrolments between 2004 and 2013. While it is true that the rise in ITE programme FTEN coincided with an expansion of the Funza Lushaka Bursary Programme and a rise in the share of NSFAS awards that were allocated to ITE students, neither the analysis presented in Chapter 4, nor the evidence presented in other studies are sufficient to conclude that there were any causal linkages between the expansion of funding for ITE students and the growth in ITE programme enrolments. In addition, the discussion in Chapter 4 also made it clear that the extent of Funza Lushaka support for ITE students may be far less than what is often asserted.

One of the major contributions of Chapter 4 was to evaluate ITE graduate production in the context of current and future teacher demand and supply in South Africa. The analysis showed that the HE system is still not producing sufficient numbers of ITE graduates to meet current levels of teacher demand. Under the assumption that current trends in ITE programme FTEN and current ITE programme throughput rates can be maintained for the foreseeable future, estimations suggest that the HE system may begin to produce sufficient numbers of ITE graduates to satisfy projected teacher demand within the next decade. However, given the change in the distribution of ITE enrolments between Unisa and contact HEIs since 2004, it is highly unlikely that these assumptions will hold.

The analysis of disaggregated ITE programme FTEN and graduation trends and ITE student throughput in Chapter 4 casts further doubt on the HE system's ability to meet teacher demand in the near future. While the data did not allow for any evaluation of the subject- or phase specialisations of ITE students, the demographic composition of ITE programme FTEN and graduations suggest that, even if the HE system was able to produce sufficient numbers of ITE graduates, it is highly unlikely that the majority of those ITE graduates would have specialised in the subject areas and teaching phases that are most needed in the schooling system.

The findings in Chapter 4 suggest that addressing South Africa's teacher supply shortages will require interventions that not only focus on bolstering ITE student recruitment, but also seek to raise current levels of ITE programme throughput, increase the extent and speed with which new ITE graduates are absorbed into the teaching profession, and provide incentives that increase retention rates among existing teachers.

5.4 Final remarks

This dissertation has sought to reduce the *information gap* in South African HE by integrating information on secondary schooling, HE, and labour market outcomes across different data sources in order to investigate

the extent and the underlying correlates of graduate unemployment, HE access and success, and teacher production in the country.

Though the findings from the analyses presented here shed new light on the performance of the HE system with regards to each of these three issues, there is a pressing need for more nuanced and comprehensive quantitative research regarding the linkages between the schooling, HE, and labour market outcomes. Such analysis can only be conducted if researchers have access to detailed unit-level data on HE outcomes in the country. Sadly, while such data already exists, it is not being utilised for this purpose. As long as this remains the case, the HE *information gap* will continue to impede the understanding and subsequent improvement of the HE system.

List of references

Adendorff, M., Green, W. and Mathebula, B. (2014). 'Minding the gap?' A national foundation phase teacher supply and demand analysis: 2012-2020. *South African Journal of Childhood Education* **2**(4), pp. 1–23.

Aigner, D. J. (1973). Regression with a binary independent variable subject to errors of observation. *Journal of Econometrics* **1**(1), pp. 49 – 60.

Akoojee, S. and Nkomo, M. (2007). Access and quality in South African higher education: the twin challenges of transformation. *South African Journal of Higher Education* **3**(21), pp. 385 – 399.

Altman, M. (2007). *Youth Labour Market Challenges in South Africa*. Pretoria: Human Sciences Research Council.

ANC (2014). Radical Socio-Economic Transformation for Women: Women and Education. Discussion paper. African National Congress (ANC).

Angrist, J. D. and Krueger, A. B. (1999). Empirical Strategies in Labor Economics. In O. Ashenfelter and D. E. Card (Eds.) *Handbook of Labor Economics*. vol. 3. chap. 23, pp. 1277 – 1366. Elsevier BV. 1st edn.

Arends, F. (2010). Teacher Shortages?: The need for more reliable information at school level. *Review of Education, Skills Development and Innovation (RESDI)* **2010**.

Armstrong, P. (2009). Teacher pay in South Africa: How attractive is the teaching profession? Stellenbosch Economic Working Paper 04/09. Department of Economics and the Bureau for Economic Research at the University of Stellenbosch.

Badsha, N. and Cloete, N. (2011). Higher Education: Contribution for the NPC's National Development Plan. Cape Town: Centre for Higher Education Transformation (CHET).

Baldry, K. (2015). Graduate unemployment in South Africa: social inequality reproduced. *Journal of Education and Work* **2015**, pp. 1 – 25.

Beckmann, J. (2008). Aspects of student equity and higher education in South Africa. *South African Journal of Higher Education* **22**(4), pp. 773 – 788.

Bertram, C., Appleton, S., Muthukrishna, N. and Wedekind, V. (2006). The career plans of newly qualified South African teachers. *South African Journal of Education* **26**(1), pp. 1– 13.

Bertram, C., Wedekind, V. and Muthukrishna, N. (2007). Newly qualified South African teachers: Staying or leaving. *Perspectives in Education* **25**(2), pp. 77 – 89.

Bhorat, H. (2004). Labour market challenges in post-Apartheid South Africa. *South African Journal of Economics* **72**(5), pp. 940 – 977.

Bhorat, H. and Mayet, N. (2012). Labour Demand Trends and The Determinants of Unemployment in South Africa. Closing the Skills and Technology Gap in South Africa: Background Paper 4. World Bank Human Development Group, Africa Region.

Bhorat, H., Mayet, N. and Visser, M. (2010). Student graduation, labour market destinations and employment earnings. In M. Letseka, M. Cosser, M. Breier and M. Visser (Eds.) *Student Retention & Graduate Destination: Higher Education & Labour Market Access & Success*. chap. 7, pp. 97 – 124. Pretoria: HSRC Press.

——— (2012). Student graduation, Labour market destinations and employment earnings. DPRU Working Paper 12/153. Cape Town: Development Policy Research Unit, University of Cape Town.

Bitzer, E. and Troskie-De Bruin, C. (2004). The effect of factors related to prior schooling on student persistence in higher education. *South African Journal of Education* **24**(2), pp. 119 – 125.

Blom, R. (2011). The size and shape of private, post-school education and training provision in South Africa: A study for the Department of Higher Education and Training. Johannesburg: Centre for Education Policy Development (CEPD).

——— (2014). The Value of Designated Subjects in Terms of Likely Student Success in Higher Education. Pretoria: Higher Education South Africa (HESA).

Boyd, D., Lankford, H., Loeb, S. and Wyckoff, J. (2003). The Draw of Home: How Teachers' Preferences for Proximity Disadvantage Urban Schools. Working Paper 9953. National Bureau of Economic Research.

Bozick, R. and DeLuca, S. (2005). Better Late Than Never? Delayed Enrollment in the High School to College Transition. *Social Forces* **84**(1), pp. 531 – 554.

Branson, N., Leibbrandt, M. and Zuze, T. L. (2009*a*). The Demand for Tertiary Education in South Africa. Final report to the centre for higher education transformation (chet). Southern Africa Labour and Development Research Unit (SALDRU), University of Cape Town (UCT).

——— (2009*b*). What are the returns of tertiary education and who benefits? In N. Cloete (Ed.) *Responding to the Educational Needs of Post-School Youth: Determining the Scope of the Problem and Developing a Capacity-Building Model*. chap. 3, pp. 45 – 60. Centre for Higher Education Transformation (CHET) / African Minds. 1st edn.

Branson, N. and Zuze, T. L. (2012). Education, the great equaliser: Improving access to quality education. In K. Hall, I. Woolard, L. Lake and C. Smith (Eds.) *South African Child Gauge 2012*. pp. 69 – 74. Cape Town: Children's Institute, University of Cape Town.

Breier, M. (2010). Dropout of stop out at the University of the Western Cape? In M. Letseka, M. Cosser, M. Breier and M. Visser (Eds.) *Student Retention & Graduate Destination: Higher Education & Labour Market Access & Success*. chap. 4, pp. 53 – 66. Pretoria: HSRC Press.

Bunting, I. (2002). The higher education landscape under apartheid. In N. Cloete, R. fehnel, P. Maasen, T. Moja, H. Perold and T. Gibbon (Eds.) *Transformation in Higher Education: Global Pressures and Local Realities in South Africa*. pp. 35 – 52. Netherlands: Kluwer Academic Publishers. 2 edn.

Burger, R., Van der Berg, S. and Von Fintel, D. (2012). The unintended consequences of education policies on South African participation and unemployment. ERSA Working Paper 289. Economic Research Southern Africa.

Cameron, A. C. and Trivedi, P. K. (2005). *Microeconometrics: Methods and Applications*. Cambridge University Press.

——— (2009). *Microeconometrics Using Stata*. College Station: Stata Press.

Case, J., Marshall, D. and Grayson, D. (2013). Mind the gap: Science and engineering education at the secondary-tertiary interface. *The South African Journal of Science* **109**(7/8), pp. 1 – 5.

CDE (2011). Value in the classoom: The quantity and quality of South Africa's teachers. CDE In Depth September 2011. Johannesburg: Centre for Development and Enterprise (CDE).

CDE (2015). Teachers in South Africa: Supply and Demand 2013-2025. CDE In Depth March 2015. Johannes-

burg: Centre for Development and Enterprise (CDE).

CEPD (2009*a*). Access to Pre-Service Teacher Education. In *Joint Centre for Education Policy Development (CEPD) and UMALUSI seminar hosted by the CEPD*. WITS Education Campus, Johannesburg: CEPD.

——— (2009*b*). Choices in the design, delivery and management of initial professional teacher education in South Africa: Increasing diversity, quality and success. Synthesis report. Johannesburg: Centre for Education Policy Development.

——— (2009*c*). Choices in the design, delivery and management of initial professional teacher education in South Africa: Increasing diversity, quality and success. Research report. Johannesburg: Centre for Education Policy Development. Braamfontein.

CHE (2004). *South African Higher Education in the first decade after democracy*. Pretoria: Council on Higher Education.

——— (2007). Review of Higher Education in South Africa: Selected Themes. Pretoria: Council on Higher Education.

——— (2010*a*). Access and throughput in South African Higher Education: Three case studies. HE Monitor No. 9. Pretoria: Council on Higher Education.

——— (2010*b*). Report on the National Review of Academic and Professional Programmes in Education. HE Monitor No. 11. Pretoria: Council on Higher Education.

——— (2013). A proposal for undergraduate curriculum reform in South Africa: The case for a flexible curriculum structure. Report of the task team on undergraduate curriculum structure. Pretoria: Council on Higher Education.

——— (2014*a*). Advice to the Minister of Higher Education and Training on the Reform of the Undergraduate Curriculum in Higher Education. Report. Council on Higher Education CHE.

——— (2014*b*). VitalStats Public Higher Education 2012. Pretoria: Council on Higher Education (CHE).

CHEC (2009). Educator Supply and Demand in the Western Cape. Report prepared for the Western Cape Education Department by the Cape Higher Education Consortium (CHEC). Wynberg: Cape Higher Education Consortium CHEC.

——— (2013). *Pathways from University to Work: A Graduate Destination Survey of the 2010 Cohort of Graduates from the Western Cape Universities*. Wynberg: Cape Higher Education Consortium (CHEC).

CHET (2010). Clustering of South African universities into distinct groups based on input and output indicators. Unpublished report. Wynberg: Centre for Higher Education Transformation.

Chisholm, L. (2009). *An Overview of Research, Policy and Practice in Teacher Supply and Demand 1994-2008*. Teacher Education in South Africa Series. Cape Town: Cape Town: HSRC Press.

Coetzee, M. and Bester, S. (2010). The possible value of a gap year: A case study. *South African Journal of Higher Education* **23**(3), pp. 608 – 623.

Cosser, M. (2006). Pathways from matric. In V. Reddy (Ed.) *Marking Matric: Colloquim Proceedings*. chap. 18, pp. 253 – 262. Pretoria: Human Sciences Research Council.

——— (2008). Anyone for teaching? Students, Teachers and Choices in South Africa.

——— (2009). *Studying Ambitions. Pathways from Grade 12 and the Factors that Shape them*. Teach Education in South Africa Series. Cape Town: HSRC Press.

——— (2010). Uniformity and disjunction in the school-to-higher-education transition. In M. Letseka, M. Cosser, M. Breier and M. Visser (Eds.) *Student Retention & Graduate Destination: Higher Education & Labour Market Access & Success*. chap. 1, pp. 11 – 24. Pretoria: HSRC Press.

Cosser, M., du Toit, J. L. and Visser, M. (2004). *Settling for Less: Student aspirations and higher education realities*. Pretoria: HSRC Press.

Coughlan, F. (2006). Access for success. *South African Journal of Higher Education* **20**(2), pp. 209 – 218.

Cross, M. and Carpentier, C. (2009). 'New students' in South African higher education: institutional culture, student performance and the challenge of democratisation. *Perspectives in Education* **27**(1), pp. 6 – 18.

Crouch, L. and Perry, H. (2003). Educators. In A. Kraak and H. Perold (Eds.) *Human resources development review 2003: Education.* chap. 21, pp. 477 – 499. Cape Town: HSRC Press.

DBE (2006). Question 1046, 1 January 2006. National assembly internal question paper 27/2006. Department of Basic Education. [online] available from http://www.education.gov.za/LinkClick.aspx?fileticket=BYGBFqN0X9w%3D&tabid=168&mid=494 [Accessed January 14, 2015].

——— (2008). Question 217, 25 February 2008. National assembly internal question paper 04/2008. Department of Basic Education. [online] available from http://www.education.gov.za/LinkClick.aspx?fileticket=4%2BED9zr8LZg%3D&tabid=320&mid=952 [Accessed January 14, 2015].

——— (2009). Information Guide on Initial Teacher Education. Information guide. Pretoria: Department of Basic Education.

——— (2011). School Realities 2011. Report. Pretoria: Department of Basic Education.

——— (2012*a*). Report on Funza Lushaka Bursary Programme in 2012. Report. Department of Basic Education.

——— (2012*b*). WQ 1076 NA Funza Lushaka bursaries, 04 May 2012. National assembly internal question paper 11/2012. Department of Basic Education. [online] available from http://www.education.gov.za/Newsroom/ParliamentaryQuestions/2012ParliamentaryQuestions/tabid/709/ctl/Details/mid/1991/ItemID/3375/Default.aspx [Accessed March 20, 2015].

——— (2013). Department of Basic Education on its First Quarter 2013/14 Performance Report. Online. [online] available from https://pmg.org.za/committee-meeting/16521/ [Accessed May 12, 2015].

——— (2014*a*). Five-Year Strategic Plan 2014/15 - 2018/19. Strategic plan. Pretoria: Department of Basic Education.

——— (2014*b*). School Realities 2014, EMIS 14/2/010. Report. Pretoria: Department of Basic Education.

DBE and DHET (2011). Integrated Strategic Planning Framework for Teacher Education and Development in South Africa 2011 - 2025. Technical report. Pretoria: Department of Basic Education (DET) and Department of Higher Education and Training.

De Villiers, P. (2012). The National Student Financial Aid Scheme: Important gains, significant challenges. In J. Hofmeyr (Ed.) *2012 Transformation Audit. The Youth Dividend: Unlocking the potential of young South African.* 2012 Transformation Audit. pp. 56 – 62. Wynberg: Institue for Justice and Reconciliation.

De Villiers, P., Van Wyk, C. and Van der Berg, S. (2013). The first five years project - a cohort study of students awarded NSFAS loans in the first five years 2000 - 2004. Stellenbosch Economic Working Paper 11/13. Department of Economics and the Bureau for Economic Research at the University of Stellenbosch.

Deacon, R. (2010*a*). Educating the Educators: Challenges facing Teacher Education and Development in South Africa. *FOCUS* **2010**(59), pp. 38 – 43.

——— (2010*b*). Teacher Demand, Supply and Quality in South Africa and in International Perspective: A Review of the Literature. CDE Draft Publication. Johannesburg: Centre for Development and Enterprise (CDE).

——— (2012). The Initial Teacher Education Research Project: The initial professional development of teachers: A literature review. Report. Johannesburg: JET Education Services.

DHET (2010). The Supply and Development of Teachers by Public Higher Education Institutions in South Africa. Report. Pretoria: Department of Higher Education and Training.

——— (2011*a*). National Qualifications Framework Act 67 of 2008: Policy on the Minimum Requirements for

Teacher Education Qualifications. Act. Pretoria: Department of Higher Education and Training.

——— (2011*b*). Trends in Teacher Education 2009-2010: Teacher Education Enrolment and Graduation Patterns at Public Universities in South Africa. Report. Pretoria: Department of Higher Education and Training.

DHET (2012). Green Paper for Post-School Education and Training. Green paper. Pretoria: Department of Higher Education and Training.

DHET (2013). White paper for post-school education and training: Building an expanded, effective and integrated post-school system. White paper. Pretoria: Department of Higher Education and Training.

——— (2014*a*). Enrolment Tables 2.12 for all institutions. Excel Tables. [online] available from http://www.dhet.gov.za/HEMIS/Enrolments/ [Accessed 24 July 2014].

——— (2014*b*). Graduates Table 2.13 for all institutions. Excel Tables. [online] available from http://www.dhet.gov.za/HEMIS/Graduates/ [Accessed 24 July 2014].

——— (2014*c*). Minesterial Statement of student enrolment planning 2014/15 - 2019/20 for universities. Pretoria: Department of Higher Education and Training.

——— (2015). Statistics on Post-School Education and Training in Sounth Africa: 2013. Report. Department of Higher Education and Training.

DHET, CHE and SAQA (2008). Procedures and Guidelines for Academic Programme AApplication: 2009 and 2010. Communiqué. Pretoria: Department of Higher Education and Training, Council on Higher Education and South African Qualifications Authority.

Diko, N. and Meyiwa, T. (2012). The State of Graduate Teacher Transition to the Labour Market. LMIP Working Paper 19. Labour Market Intelligence Partnership.

Dlomo, Z., Jansen, A., Moses, M. and Yu, D. (2011). Investigating the signifiance of the 2008 Matric curriculum on fist-year Economics performance. *South African Journal of Higher Education* **25**(4), pp. 696 – 709.

DoE (1997). Education White Paper 3: A programme for the transformation of Higher Education. White paper. Pretoria: Department of Education.

DoE (2001). National Plan for Higher Education. Pretoria: Department of Education.

DOE (2005*a*). Education Statistics in South Africa at a Glance in 2004. Report. Pretoria: Department of Education.

——— (2005*b*). Teachers for the Future: Meeting Teacher Shortages to Achieve Education For All. Report. Pretoria: Department of Education (DOE).

DoE (2006). School Realities 2006. Report. Pretoria: Department of Education.

——— (2007). School Realities 2007. Report. Pretoria: Department of Education.

DOE (2008). *Classification of Educational Subject Matter*. Pretoria: Department of Education. [online] available from http://www.dhet.gov.za/Management%20and%20Information%20Systems/CESM%20August%202008.pdf

DoE (2009). School Realities 2009. Report. Pretoria: Department of Education.

DOE (2014). VALPAC - Specifications for unit record student, staff, and building space collections. Website. [online] available from http://41.72.139.116/Valpac_Help/Main_menu.htm [Accessed February 4, 2015].

DPME (2015). DPME POA progress report 2014/2015. The Presidency of South Africa: Department of Performance Monitoring and Evaluation.

DRPU (2006). Graduate Unemployment in Post-Apartheid South Africa: Nature and Possible Policy Responses. Research Report Compiled for Business Leadership South Africa. Cape Town: University of Cape Town, Development Policy Reseach Unit.

Du Plessis, L. and Gerber, D. (2012). Academic preparedness of students - an exploratory study. *The Journal*

for Transdisciplinary Research in Southern Africa **8**(1), pp. 81 – 94.

Erens, G., Louw, J. and Venter, R. (1982). *Classification of Educational Subject Matter (SA-CESM)*. Pretoria: Department of Education (DOE). first edition manual: sapse-003 edn.

Fatti, L. P. (2006). The statistical adjustment of matric marks. In V. Reddy (Ed.) *Marking Matric: Colloquim Proceedings*. chap. 5, pp. 45 – 57. Pretoria: Human Sciences Research Council.

Filmer, D. (2012). Challenges and Options for Technical and Post-Basic Education in South Africa. Closing the skills and technology gap in south africa: Policy note. World Bank Human Development Group, Africa Region.

Financial and Fiscal Commission (2012). Technical Report: Submission for the 2013/14 Division of Revenue. Technical report. Financial and Fiscal Commission.

Fisher, G. and Scott, I. (2011). The Role of Higher Education in Closing the Skills Gap in South Africa. Closing the Skills and Technology Gap in South Africa: Background Paper 3. World Bank Human Development Group, Africa Region.

Foxcroft, C. and Stumpf, R. (2005). What is Matric for? In CHET (Ed.) *Papers and presentations to the Umalusi and CHET seminar on Matric: What is to be done? Pretoria, 23 June, 8 - 20*. pp. 10 – 22. Centre for Higher Education Transformation (CHET).

Foxcroft, C. D. (2006). Evaluating the school-leaving examination against measurement principles and methods. In V. Reddy (Ed.) *Marking Matric: Colloquim Proceedings*. chap. 6, pp. 58 – 71. Pretoria: Human Sciences Research Council.

Gibbons, S. and Vignoles, A. (2012). Geography, choice and participation in higher education in England. *Regional Science and Urban Economics* **42**, pp. 98 – 113.

Goldstein, H., Harron, K. and Wade, A. (2012). The analysis of record-linked data using multiple imputation with data value priors. *Statististics in Medicine* **31**(28), pp. 3481 – 3493.

Gordon, A. (2009). Restructuring Teacher Education. Issues in Education Policy 6. Johannesburg: Centre for Education Policy Development (CEPD).

Greenaway, D. and Haynes, M. (2004). Funding higher education. In G. Johnes and J. Johnes (Eds.) *International Handbook on the Economics of Education*. chap. 8, pp. 298 – 328. United Kingdom: Edward Elgar Publishing Limited.

Griesel, H. (1999). Access and the Higher Education sector: A South African case study on policy and programme achievement. Background document. Association for the Development of Education in Africa (ADEA) and South African National Department of Education (DoE).

Gujarati, D. (2003). *Basic Econometrics*. New York: MeGraw-Hill.

Gurgand, M., Lorenceau, A. and Mélonio, T. (2011). Student Loans: Liquidity Constraint and Higher Education in South Africa. Working Paper 117. Agence Française de Cévelopment.

Gustafsson, M. (2011). The When and How of Leaving School: The Policy Implications of New Evidence on Secondary Schooling in South Africa. Stellenbosch Economic Working Papers: 09/11. Department of Economics and The Bereau for Economic Research at the University of Stellenbosch.

——— (2014). Inflow of new teachers into the public system. Indicator report. Pretoria: Department of Basic Education.

Hall, E., Altman, M., Nkomo, N., Peltzer, K. and Zuma, K. (2005). Potential Attrition in Education: The impact of job satisfaction, morale, workload and HIV/AIDS. Report presented to the education labour relations council. Education Labour Relations Council (ELRC).

HEDA (2015). Higher Education Data Analyzer. [online] available from http://www.heda.co.za/pds/background.aspx [Accessed September 11, 2015].

Heitjan, D. F. and Basu, S. (1996). Distinguishing "Missing at Random" and "Missing Completely at Random". *The American Statistician* **50**(3), pp. 207 – 213.

Herman, H. D. (1995). School-leaving Examinations, Selection and Equity in Higher Education in South Africa. *Comparative Education* **31**(2 Special Number(17): Educational Reconstruction and Transformation in South Africa), pp. 261 – 274.

HESA (2012). Key data on Higher Education in South Africa. Presentation. Pretoria: Higher Education South Africa (HESA).

——— (2015). Matriculation Endorsement Regulations. webpage. [online] available from http://www.hesa.org.za/matriculation-endorsement-regulations [Accessed August 12, 2015].

Hoare, A. and Johnston, R. (2010). Widening participation through admissions policy - a British case study of school and university performance. *Studies in Higher Education* **31**(1), pp. 21 – 41.

Hof, M. H. P. and Zwinderman, A. H. (2012). Methods for analyzing data from probabilistic linkage strategies based on partially identifying variables. *Statististics in Medicine* **31**(30), pp. 4231 – 4242.

Horn, L., Cataldi, E. F., Sikorana, A. and Carrol, C. D. (2005). Waiting to Attend College: Undergraduates Who Delay Their Postsecondary Enrollment (NCES 2005 - 152). Postsecondary education descriptive analysis report. U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

HSRC (2005). *Educator Supply and Demand in the South African Public Education System*. Cape Town: HSRC Press.

——— (2013). *Towards a 20 year review: Basic and Post School Education*. Education and Skills Development. Cape Town: HSRC Press.

Huettner, F. and Sunder, M. (2012). Axiomatic arguments for decomposing goodness of fit according to Shapley and Owen values. *Electronic Joutnal of Statistics* **6**(2012), pp. 1239 – 1250.

Humburg, M., De Grip, A. and Van der Velden, R. (2012). Which skills protect graduates against a slack labour market? Working Paper RM/12/002. Maastricht University School of Business and economics.

JET (2014). The Initial Teacher Education Research Project: An examination of aspects of initial teacher education curricula at five higher education institutions. Progress report. Joint Education Trust (JET).

Juárez, F. W. C. (2012). SHAPLEY2: Stata module to compute additive decomposition of estimation statistics by regressors or groups of regressors. Statistical Software Components, Boston College Department of Economics. [online] available from http://ideas.repec.org/c/boc/bocode/s457543.html [Accessed July 27, 2015].

Keevy, J., Green, W. and Manik, S. (2014). The Status of Migrant Teachers in South Africa. Implications for policy, research, practice. Report. The South African Qualifications Authority.

Kim, G. and Chambers, R. (2012). Regression analysis under incomplete linkage. *Computational Statistics & Data Analysis* **56**(9), pp. 2756 – 2770.

Kingdon, G. and Knight, J. (2006). The measurement of unemployment when unemployment is high. *Labour Economics* **13**(3), pp. 291 – 315.

Koch, E. (2007). Critical questions about the new entrance test for higher education. *South African Journal of Higher Education* **21**(1), pp. 102 – 111.

Koen, C. (2006). *Higher education and work: Setting a new research agenda*. Cape Town: HSRC Press.

Kraak, A. (2010). The collapse of the graduate labour market in South Africa: evidence from recent studies. *Research in Post-Compulsory Education* **15**(1), pp. 81 – 102.

——— (2015). The value of graduate destination survey data in understanding graduate unemployment: A focus on the universities of technology. *South African Journal of Labour Relations* **39**(1), pp. 93 – 113.

Kruss, G. (2007). Employment and employability: expectations of higher education responsiveness in South Africa. *Journal of Education Policy* **19**(6), pp. 673 – 689.

Lam, D., Ardington, C., Branson, N., Goostrey, K. and Leibbrandt, M. (2010). Credit Constraints and the Racial Gap in Post-Secondary Education in South Africa. In *Prepared for the 2010 meeting of the Population Association of America Dallas Texas April 2010*.

Lemmens, J.-C., Du Plessis, G. I. and Maree, D. J. F. (2011). Measuring Readiness and Success at a Higher Education Institution. *Journal of Psychology in Africa* **4**(21), pp. 615 – 622.

Letseka, M., Cosser, M., Breier, M. and Visser, M. (Eds.) (2010). *Student Retention & Graduate Destination: Higher Education & Labour Market Access & Success*. Pretoria: HSRC Press.

Letseka, M. and Pitsoe, V. (2013). The challenges and prospects of access to higher education at UNISA. *Studies in Higher Education* **39**(10), pp. 1942 – 1954.

Lewis, F. (2008). Re-thinking teacher education and development - Can other models provide a solution for improving teacher training programmes? In *Reflections on the Human Capital Development Strategy (HCDS): the third series of conceptual papers supporting the implementation of the HCDS*. chap. 2, pp. 21 – 4. Cape Town: Western Cape Education Department.

Mabizela, M. (2005). *The Business of Higher Education - A study of public-private partnerships in the provision of Higher Education in South Africa*. Pretoria: HSRC Press.

Maharasoa, M. and Hay, D. (2010). Higher Education and Graduate Employment in South Africa. *Quality in Higher Education* **7**(2), pp. 139 – 147.

Mahomed, H. (2009). Challenges and prospects for improving teacher education and development through the National Policy Framework on Teacher Education and Development. *African Education Review* **1**(6), pp. 159 – 173.

Makhafola, M. (2005). Student access and articulation. In *Developing a New Academic Organisational and Programme Structure in Merged HE Institutions, Pretoria, 18-20 Sep 2005*. Pretoria: Council on Higher Education.

Manik, S. (2014). South African Migrant Teachers' Decision-Making: Levels of Influence and 'Relative Depravation'. *Journal of Southern African Studies* **40**(1), pp. 151 – 165.

Mashiya, N. (2014). Becoming a (male) foundation phase teacher: A need in South African schools? *South African Journal of Childhood Education* **4**(3), pp. 24 – 36.

McKay, V. (2015). Personal correspondence on 14 January 2015. Email. professor Veronica McKay: Deputy Executive Dean, College of Education, University of South Africa (UNISA).

McLoughlin, K. and Dwolatzky, B. (2014). The information gap in higher education in South Africa. *South African Journal of Higher Education* **2**(28), pp. 584 – 604.

Mitchell, G., Fridjhon, P. and Haupt, J. (1997). On the relationship between the matriculation examination and university performance in South Africa 1980 - 1991. *South African Journal of Science* **93**(9), pp. 382 – 386.

Mlatsheni, C. and Rospabe, S. (2002). Why is Youth Unemployment so High and Unequally spread in South Africa? DPRU Working Paper 02/65. Development Policy Research Unit, University of Cape Town.

Moleke, P. (2010). The Gradaute Labour Market. In M. Letseka, M. Cosser, M. Breier and M. Visser (Eds.) *Student Retention & Graduate Destination: Higher Education & Labour Market Access & Success*. chap. 6, pp. 87 – 95. Pretoria: HSRC Press.

Mulvey, M. E. (2008). Under-prepared Students - A Continuing Challenge for Higher Education. *Research and Teaching in Developmental Education* **24**(2), pp. 77 – 87.

Myburgh, J. (2007). The 2006 matric results by race. Online. [online] available from http://www.politicsweb.

co.za/documents/the-2006-matric-results-by-race [Accessed March 5, 2015].

Naidoo, M. (2006). Transitioning from Senior Certificate to the Further Education and Training Certificate. In V. Reddy (Ed.) *Marking Matric: Colloquim Proceedings*. chap. 2, pp. 10 – 17. Pretoria: Human Sciences Research Council.

Naong, M. N. (2011). Promotion of Entrepreneurship Education - A Remedy to Graduates and Youth Unemployment - A Theoretical Perspective. *Journal of Social Science* **28**(3), pp. 181 – 189.

NATIONAL PRESIDENCY (2013). National Evaluation Plan 2014/15 - 2016/17. Department of Performance Monitoring and Evaluation.

National Treasury (2014). Budget 2014. Estimates of National Expenditure. Vote 15: Basic Education. Budget. National Treasury.

Nel, C. (2008). *Die oorgrang van skool na universiteit: 'n Teoretiese raamwerk vir 'n pre-universitêre intervensie*. Ph.D. thesis. Stellenbosch University.

Nel, C. and Kistner, L. (2009). The National Senior Certificate: Implications for access to higher education. *South African Journal of Higher Education* **23**(5), pp. 953 – 973.

NPC (2011). National Development Plan: Vision for 2030. Pretoria: National Planning Commission.

Nunez, I. and Livanos, I. (2010). Higher education and unemployment in Europe: an analysis of the academic subject and national effects. *Higher Education* **59**(4), pp. 475 – 487.

Nyalashe, V. (2007). Increasing access to higher education (HE): a focus on the disadvantaged youth. In F. M. Lewis, V. H. Nyalashe, Z. Hartley and S. M. Naicker (Eds.) *Reflections on the Human Capital Development Strategy (HCDS): the first series of conceptual papers supporting the implementation of the HCDS*. chap. 6, pp. 81 – 93. Cape Town: Western Cape Education Department.

OECD (2008). *Reviews of National Policies for Education: South Africa*. Paris: OECD Publishing.

——— (2013). *OECD Economic Surveys: South Africa 2013*. Paris: OECD Publishing.

OECD (2014). *Education at a Glance 2014: Highlights*. chap. How many young people enter tertiary education?, pp. 28 – 30. Paris: OECD Publishing.

Onwu, G. O. M. and Sehoole, C. T. (2011). Why Teachers matter: Policy issues in the professional development of teachers in South Africa. In *Africa-Asia University Dialogue for Educational Development Report of the International Experience Sharing Seminar(2) - Actual Status and Issues of Teacher Professional Development*. CICE Series 4. pp. 121–136. Hiroshima University: Center for the Study of International Cooperation in Education.

Parker, D. and Sheppard, C. (2015). How HEMIS and the Development Grants can be used to improve SA student success. In *Siyaphumelela Launch Conference May 14 - 15 2015, Johannesburg*. [online] available from http://siyaphumelela.org.za/wp-content/uploads/2015/05/Parker-Sheppard-15-May.pdf [Accessed August 14, 2015].

Paterson, A. and Arends, F. (2009). Teacher Graduate Production in South Africa. Human sciences research council report. Cape Town: HSRC Press.

Pauw, K., Oosthuizen, M. and van der Westhuizen, C. (2008). Graduate Unemployment in the Face of Skills Shortages: A Labour Market Paradox. *South African Journal of Economics* **76**(1), pp. 45–57.

Perry, H. and Fleisch, B. (2006). Gender and educational achievement in South Africa. In V. Reddy (Ed.) *Marking Matric: Colloquim Proceedings*. chap. 9, pp. 107 – 126. Pretoria: Human Sciences Research Council.

Petersen, N. and Petker, G. (2011). Foundation phase teaching as a career choice: Building the nation where it is needed. *Education as Change* **15**(sup1), pp. S49 – S61.

Pischke, S. (2007). Lecture Notes on Measurement Error. [online] available from http://econ.lse.ac.uk/staff/

spischke/ec524/Merr_new.pdf [Accessed July 4, 2015].

Pretorius, F. (2008). Keeping abreast of changing times and demands in education: Implications for teacher education in South Africa. *South African Review of Education* **14**(1-2), pp. 165 – 182.

Pritchett, L. (2000). Where has all the education gone?. World Bank.

Ridder, G. and Moffitt, R. (2007). The Econometrics of Data Combination. In J. J. Heckman and E. E. Leamer (Eds.) *Handbook of Econometrics*. chap. 75, pp. 5469 – 5547. Elsevier BV.

Robinson, R. A. (2004). Pathways to Completion: Patterns of Progression through a University Degree. *Higher Education* **47**(1), pp. 1– 20.

——— (2005). *Pathways in Context: Background Characteristics and Demographics in Student Progression through Higher Education*. Ph.D. thesis. The university of Syndey.

Robinson, R. A. and Bornholt, L. J. (2007). Pathways Theory of Progression through Higher Education. *Australian Journal of Educational & Developmental Psychology* **7**(2007), pp. 49 – 62.

Roksa, J. and Velez, M. (2012). A Late Start: Delayed Entry, Life Course Transitions and Bachelor's Degree Completion. *Social Forces* **90**(3), pp. 769 – 794.

SACE (2010). A review of teacher demand and supply. Identifying research gaps and the role of SACE. Report. South African Council for Educators. [online] available from http://www.sace.org.za/upload/files/A%20review%20on%20teacher%20demand%20and%20supply%20in%20South%20Africa.pdf [Accessed January 10, 2015].

——— (2011). Teacher Migration in South Africa. Advice to the ministries of basic and higher training. Pretoria: South African Council for Educators.

SAIRR (2012). South Africa Survey 2010/2011: Education. South African Institute for Race Relations.

Scott, I., Yeld, N. and Hendry, J. (2007). Higher Education Monitor: A Case for Improving Teaching and Learning in South African Higher Education. Cape Town: Council on Higher Education (CHE).

Shapiro, D., Dundar, A., Yuan, X., Harrell, A. and Wakhungu, P. K. (2014). Completing College: A National View of Student Attainment Rates - Fall 2008 Cohort. Signature report no. 8. Herndon, VA: National Student Clearinghouse Research Center.

Sheppard, C. (2009). The State of Youth in South Africa: Trends in Education Attainment. Pretoria: Human Sciences Research Council.

Simkins, C. (2015). Teacher Supply and Demand in South Africa: 2013 to 2012. Technical report. Johannesburg: Centre for Development and Enterprise.

Soudien, C. (2010). Transformation in higher education: A briefing paper. Pretoria: Development Bank of Southern Africa.

South Africa (2000). Higher Education Act (Act 101 of 1997) Committee of principals: Requirements and conditions for matriculation endorsement and the issuing of certificates of exemption. *Government Gazette* **426**(21805).

Spaull, N. (2013). South Africa's Education Crisis: The quality of education in South Africa 1994 - 2011. Comissioned report. Johannesburg: Centre for Development and Enterprise (CDE).

Steyn, A. G. W. (2009). Measuring student participation in the higher education sector in South Africa. Technical report. Stellenbosch: Institutional Research and Planning Division, Stellenbosch University.

Steyn, M. G., Harris, T. and Hartell, C. G. (2014). Institutional factors that affect black South African students' perceptions of early childhood teacher education. *South African Journal of Education* **34**(3), pp. 1 – 7.

Taylor, N. (2011). Priorities for Addressing South Africa's Education and Training Crisis: A Review commissioned by the National Planning Commission. Report. Cape Town: Joint Education Trust (JET).

Taylor, S., Van der Berg, S. and Burger, R. (2012). Low quality Education as a Poverty Trap in South Africa. Research paper. University of Stellenbosch.

Teichler, U. (2007). Does Higher Education Matter? Lessons from a Comparative Graduate Survey. *European Journal of Education* **42**(1), pp. 11 – 34.

Tumen, S., Shulruf, B. and Hattie, J. (2008). Student pathways at the university: patterns and predictors of completion. *Studies in Higher Education* **33**(3), pp. 233 – 252.

UMALUSI (2012). The certificates that Umalusi issues: A guide for verification and placement. PretoriaL UMALUSI, Council for Quality Assurance in General and Further Education and Training.

Van der Berg, S. (2006). How effective are poor schools? Poverty and educational outcomes in South Africa. Working Papers 06/06. Stellenbosch University, Department of Economics.

van der Berg, S. (2007). Apartheid's Enduring Legacy: Inequalities in Education. *Journal of African Economies* **16**(5), pp. 849 – 880.

Van der Berg, S. (2008). How effective are poor schools? Poverty and educational outcomes in South Africa. *Studies in Educational Evaluation* **34**(3), pp. 145 – 154.

Van der Berg, S. and Shepherd, D. (2010). Signalling performance: Continuous assessment and matriculation examination marks in South African schools. Stellenbosch Economic Working Paper 28/10. Department of Economics and the Bereau for Economic Research at the University of Stellenbosch.

Van der Merwe, A. (2010). Does Human Capital Theory Explain the Value of Higher Education? A South African Case Study. *American Journal of Business Education* **3**(1), pp. 107 – 118.

van Schalkwyk, F. (2013). Supply-side variants in the supply of open data in university governance. In *Processings of the 7th International Conference on Theory and Practice of Electronic Governance*. pp. 334–337. ACM New York.

Van Zyl, A. (2010). *The predictive value of pre-entry attributes for student academic performance in the South African context*. Ph.D. thesis. Faculty of Education, University of Johannesburg.

van Zyl, A., Gravett, S. and De Bruin, G. P. (2012). To what extent do pre-entry attributes predict first year student academic performance in the South African context? *South African Journal of Higher Education* **26**(5), pp. 1095 – 1111.

Van Zyl, D. and Barnes, G. (2012*a*). An institutional profile of UNISA: UNISA Facts & Figures. Report. Pretoria: Department of Institutional Statistics & Analysis.

——— (2012*b*). An update of the institutional profile of UNISA. HEMIS 2007 - 2011. Report. Pretoria: Department of Institutional Statistics & Analysis.

WCED (2005). Senior Certificate Examination : November 2005: Entries Of Full-Time And Part-Time (Abet) Learners: Manually And/Or Online. WCED Minute NO: DEA/0006/2005. Cape Town: Western Cape Education Department. [online] available from http://wced.school.za/circulars/minutes05/edea6_05.html [Accessed July 17, 2015].

Wedekind, V. (2013). NSC Pass Requirements: A discussion document for Umalusi on the NSC Pass Mark. Discussion docment. Pretoria: UMALUSI.

World Bank (2015). World Development Indicators Database. [online] available from http://databank.worldbank.org/data/ [Accessed 30 January 2016].

Wu, C.-C. (2011). High graduate unemployment rate and Taiwanese undergraduate education. *International Journal of Educational Development* **31**(3), pp. 303 – 310.

Yu, D. (2008). The South African labour market: 1995 - 2006. Stellenbosch Economic Working Paper 05/08. Department of Economics and the Bereau for Economic Research at the University of Stellenbosch.

——— (2010). Defining and measuring informal employment in South Africa: A review of recent approaches.

Stellenbosch Economic Working Paper 09/10. Department of Economics and the Bereau for Economic Research at the University of Stellenbosch.

Zaaiman, H. (1998). *Selecting students for mathematics and science: the challenge facing higher education in South Africa*. Phd thesis. Vrije Universiteit te Amseterdam. Pretoria: HSRC Press.

A Chapter 2: HEI and HE qualification classifications

Table A.1: NQF exit levels of HEMIS qualification types

	Qualification type	Code	NQF Exit Level
Technikons (1986 - 2003)	National Certificate	21	5
	National Higher Certificate	22	6
	National Diploma	23	6
	National Higher Diploma	25	7
	Baccalaureus Technologiae Degree	26	7
	Post-diploma Diploma	24	8
	Master's Diploma in Technology	27	9
	Magister Technologiae Degree	28	9
	Laureatus in Technology	29	10
	Doctor Technologiae Degree	30	10
Universities (1986 - 2003)	Undergraduate Diploma or Certificate (1 or 2 years)	11	5
	Undergraduate Diploma or Certificate (3 yrs)	1	6
	General Academic Bachelor's Degree	2	7
	Professional First Bachelor's Degree (3 years)	33	7
	Professional First Bachelor's Degree (4 years)	3	8
	Post-graduate Diploma or Certificate	4	8
	Post-graduate Bachelor's Degree	5	8
	Honours Degree	6	8
	Masters Degree	7	9
	Doctoral Degree	8	10
All HEIs (2004 -)	Higher Certificate	41	5
	Advanced Certificate	42	6
	Diploma	43	6
	Advanced Diploma	44	7
	Bachelor's Degree (360 credits)	45	7
	Bachelor's Degree (480 credits)	46	8
	Postgraduate Diploma	47	8
	Bachelor Honours Degree	48	8
	Master's Degree	49	9
	Doctoral Degree	50	10

NOTES: National Qualifications Framework (NQF) exit level classifications of Higher Education Management Information System (HEMIS) qualifications based on the Higher Education Qualifications Framework (HEQF) Implementation Template and the South African Qualifications Authority's (SAQA) suggested NQF exit level classifications.

Table A.2: HEI classifications, before and after amalgamation in 2004

	Pre-Amalgamation			Post-Amalgamation		
	Instcode	**Institution**	**Type**	**Instcode**	**Institution**	**Type**
Former traditional universities (before 2004)	101	University of Cape Town	HAI	H02	UCT	HAI
	102	University of Durban-Westville	HDI	H08	UKZN	HDI
	103	University of Fort Hare	HDI	H05	UFH	HDI
	104	Medical Uni. of South Africa	HDI	H09	UL	HDI
	105	University of Natal	HAI	H08	UKZN	HDI
	106	University of the North	HDI	H09	UL	HDI
	107	University of the Free State	HAI	H06	UFS	HAI
	108	University of Port Elizabeth	HAI	H10	NMMU	HAI
	109	Potchefstroom University	HAI	H11	NWU	HDI
	110	University of Pretoria	HAI	H12	UP	HAI
	111	Rand Afrikaans University	HAI	H07	UJ	HAI
	112	Rhodes University	HAI	H13	RU	HAI
	113	University of South Africa	HAI	H14	UNISA	HAI
	114	University of Stellenbosch	HAI	H15	US	HAI
	115	University of Western Cape	HDI	H20	UWC	HDI
	116	University of Witwatersrand	HAI	H21	WITS	HAI
	117	University of Zululand	HDI	H22	UZ	HDI
	118	Vista University	HDI	—	—	—
	119	University of Transkei	HDI	H19	WSU	HDI
	120	University of North West	HDI	H11	NWU	HDI
	121	University of Venda	HDI	H17	UNIVEN	HDI
Former technikons (before 2004)	301	Cape Technikon	HAI	H01	CPUT	HAI
	302	Northern Gauteng Technikon	HDI	H16	TUT	HDI
	303	Mangosuthu Technikon	HDI	H25	MUT	HDI
	304	M.L. Sultan Technikon	HDI	H04	DUT	HDI
	305	Natal Technikon	HAI	H04	DUT	HDI
	306	Technikon Free State	HAI	H03	CUT	HAI
	307	Peninsula Technikon	HDI	H01	CPUT	HDI
	308	Port Elizabeth Technikon	HAI	H10	NMMU	HAI
	309	Pretoria Technikon	HAI	H16	TUT	HDI
	310	Technikon SA	HAI	H14	UNISA	HAI
	311	Vaal Triangle Technikon	HAI	H18	VUT	HAI
	312	Witwatersrand Technikon	HAI	H07	UJ	HAI
	313	Border Technikon	HDI	H19	WSU	HDI
	314	Technikon North West	HDI	H16	TUT	HDI
	315	Eastern Cape Technikon	HDI	H19	WSU	HDI

NOTES: Former and current HE institution classifications based on Financial and Fiscal Commission (2012:55), Bunting (2002:49 - 51). * Vista University's satellite campuses were merged in to various universities including Nelson Mandela Metropolitan University (NMMU), University of the Free State (UFS), University of Johannesburg (UJ), University of Pretoria (UP), University of South Africa (UNISA), and the Vaal University of Technology (VUT).

Table A.3: Current HEI classifications

Instcode	Abbreviation	Institution	Type	HAI/HDI	CHET Cluster
H01	CPUT	Cape Peninsula University of Technology	Technology	HDI	2
H02	UCT	University of Cape Town	Traditional	HAI	1
H03	CUT	Central University of Technology, Free State	Technology	HAI	2
H04	DUT	Durban Institute of Technology	Technology	HDI	2
H05	UFH	University of Fort Hare	Traditional	HDI	2
H06	UFS	University of the Free State	Traditional	HAI	2
H07	UJ	University of Johannesburg	Comprehensive	HAI	2
H08	UKZN	University of KwaZulu-Natal	Traditional	HDI	1
H09	UL	University of Limpopo	Traditional	HDI	3
H10	NMMU	Nelson Mandela Metropolitan University	Comprehensive	HAI	2
H11	NWU	North West University	Traditional	HDI	1
H12	UP	University of Pretoria	Traditional	HAI	1
H13	RU	Rhodes University	Traditional	HAI	1
H14	UNISA	University of South Africa	Comprehensive	HAI	2
H15	US	University of Stellenbosch	Traditional	HAI	1
H16	TUT	Tshwane University of Technology	Technology	HDI	2
H17	UV	University of Venda	Comprehensive	HDI	3
H18	VUT	Vaal University of Technology	Technology	HAI	3
H19	WSU	Walter Sisulu University	Comprehensive	HDI	3
H20	UWC	University of Western Cape	Traditional	HDI	2
H21	WITS	University of Witwatersrand	Traditional	HAI	1
H22	UZ	University of Zululand	Comprehensive	HDI	3
H25	MUT	Mangosuthu University of Technology	Technology	HDI	3

NOTES: Current HE institution classifications based on Financial and Fiscal Commission (2012:55), Bunting (2002:49 - 51). * Vista University's various satellite campuses were merged in to various universities including Nelson Mandela Metrolpolitan University (NMMU), University of the Free State (UFS), University of Johannesburg (UJ), University of Pretoria (UP), University of South Africa (UNISA), and the Vaal University of Technology (VUT). Traditional: Traditional Unvirsity; Comprehensive: Comprehensive University; Technology: University of Technology; HDI: Historically Disadvantaged Institution; HAI: Historically Advantaged Institution; Cluster1: CHET Cluster 1

B Chapter 2: HEMIS - LFS/QLFS probabilistic linking diagnostics

Table B.1: Unique combinations and sample sizes across probabilistic linking criteria for the LFS and HEMIS samples

LFS / QLFS Years	HEMIS Data Years	Unique Combinations of Criteria Variables						Sample Size	
		Criteria 1		Criteria 2		Criteria 3			
		LFS	*HEMIS*	*LFS*	*HEMIS*	*LFS*	*HEMIS*	*LFS*	*HEMIS*
2000	2000	1 078	6 236	311	1 291	318	422	2 172	62 252
2001	2000 - 2001	1 373	8 044	332	1 426	348	449	3 458	123 232
2002	2000 - 2002	1 355	9 170	320	1 514	327	474	3 557	186 674
2003	2000 - 2003	1 332	10 024	321	1 597	326	492	3 478	254 398
2004	2000 - 2004	2 005	10 791	869	1 670	328	514	3 120	327 076
2005	2000 - 2005	1 738	11 457	808	1 734	332	524	2 722	399 979
2006	2000 - 2006	1 677	12 026	779	1 788	311	537	2 620	474 238
2007	2000 - 2007	1 648	12 590	764	1 850	317	552	2 598	549 793
2008	2000 - 2008	—	13 134	1 006	1 912	344	563	6 690	628 913
2009	2000 - 2009	—	13 644	998	1 958	343	574	6 412	713 602
2010	2000 - 2010	—	14 416	961	2 022	340	588	6 240	805 398
2011	2000 - 2011	—	15 085	1 037	2 073	347	598	6 693	902 738
2012	2000 - 2012	1 749	15 730	1 042	2 121	344	605	6 532	1 007 976
2013	2000 - 2013	2 990	16 277	1 055	2 165	351	617	7 089	1 122 981
2014	2000 - 2013	2 957	16 277	1 063	2 165	351	617	7 230	1 122 981
2015	2000 - 2013	1 882	16 277	857	2 165	327	617	3 292	1 122 981

NOTES: Figures represent (a) the number of unique combinations of variables for each of the match criteria used and (b) the sample sizes of the respective LFS and corresponding HEMIS data samples against which they were probabilistically matched. Samples included only graduates with NQF exit level 7 or higher qualifications. Criterion 1: Unique combination of year of birth, race, gender, level of degree awarded (bachelor, postgraduate, etc), and SAQA field of study. Criterion 2: Unique combination of year of birth, race, gender, and level of degree awarded (bachelor, postgraduate, etc). Criterion 3: Unique combination of year of birth, race, and gender. Given that the "field of study" variable was not asked in the 2008 - 2011 QLFS questionnaires, it was not possible to use criterion 1 to probabilistically matched 2008 - 2011 LFS graduates to HEMIS data. Figures correspond to sample estimates and are unweighted.

Table B.2: Percentage of LFS/QLFS sample graduates probabilistically linked to HEMIS data, by criterion

LFS / QLFS Years	HEMIS Years to Match on	Percentage successfully 'linked' (%)			
		Criteria 1	Criteria 2	Criteria 3	Unmatched
2000	2000	80.0	16.9	1.8	1.2
2001	2000 - 2001	88.4	10.2	0.4	1.0
2002	2000 - 2002	90.2	9.0	0.4	0.3
2003	2000 - 2003	91.5	7.9	0.3	0.3
2004	2000 - 2004	91.3	8.0	0.2	0.4
2005	2000 - 2005	92.0	7.3	0.1	0.6
2006	2000 - 2006	92.1	7.6	0.1	0.1
2007	2000 - 2007	91.7	7.5	0.2	0.7
2008	2000 - 2008	0.0	100.0	0.0	0.0
2009	2000 - 2009	0.0	100.0	0.0	0.0
2010	2000 - 2010	0.0	100.0	0.0	0.0
2011	2000 - 2011	0.0	100.0	0.0	0.0
2012	2000 - 2012	44.0	55.9	0.0	0.0
2013	2000 - 2013	94.3	5.6	0.0	0.1
2014	2000 - 2013	93.8	6.1	0.1	0.1
2015	2000 - 2013	93.4	6.4	0.1	0.0

NOTES: Figures represent the percentages of graduates for each year of the pooled LFS/QLFS sample that were probabilistically matched using a specific criterion. Linking criteria were used sequentially: An a attempt was made to probabilistically match on criterion 1 first, then on criterion 2 and, finally, on criterion 3. The LFS/QLFS sample included only graduates with NQF exit level 7 or higher qualifications. Criterion 1: Unique combination of year of birth, race, gender, level of degree awarded (bachelor, postgraduate, etc), and SAQA field of study. Criterion 2: Unique combination of year of birth, race, gender, and level of degree awarded (bachelor, postgrad, etc). Criterion 3: Unique combination of year of birth, race, and gender. Given that the "field of study" variable was not asked in the 2008Q1 - 2012Q2 QLFS questionnaires, it was not possible to use criterion 1 to probabilistically match 2008Q1 - 2011Q2 QLFS graduates to HEMIS data. Figures correspond to sample estimates and are unweighted.

B.1 Probabilistic linking and measurement error

To illustrate the implications of the measurement error that is likely to arise from the probabilistic linking approach described in Section 2.5.2, consider the case where one wishes to estimate the association between having attended an HDI and a given labour market outcome.[1] In its most basic form, the population relationship can be expressed as

$$y_{ic} = \alpha + \beta HDI_{ic} + \varepsilon_{ic} \tag{1}$$

where y_{ic} denotes the labour market outcome for individual i for whom the criterion variable $c_i^L = c$ (see equation (2.1)), β is the population parameter of interest, $HDI_{ic} \in \{0, 1\}$ is an indicator variable for whether individual i graduated from and HDI or not, and ε_{ic} is the additive error term.

HDI_{ic} is not observed in the LFS/QLFS data. However, under the assumption that the HEMIS data represents the population from which all graduates in the LFS/QLFS data are drawn, it is possible to estimate the population proportion of graduates from the group $c_i^H = c$ who graduated from HDIs as

$$\begin{aligned} \tilde{HDI}_c &= \frac{\sum_{j=1}^{N} \mathbf{1}\left(\mathbf{c}_j^H = c\right) \mathbf{1}\left(HEI_j = HDI\right)}{\sum_{k=1}^{N} 1\left(\mathbf{c}_k^H = c\right)} \\ &= E\left[HDI_i | C = c\right] \end{aligned} \tag{2}$$

such that

$$\tilde{HDI}_c = HDI_{ic} + u_{ic} \tag{3}$$

where u_{ic} captures the difference between the true HDI indicator variable and the imputed HDI proxy variable. Substituting (3) into (1) yields

$$\begin{aligned} y_{ic} &= \alpha + \beta\left(\tilde{HDI}_c - u_{ic}\right) + \varepsilon_{ic} \\ &= \alpha + \beta \tilde{HDI}_c + (\varepsilon_{ic} - \beta u_{ic}) \end{aligned}$$

By construction, $E\left(u\right) = 0$ and $\rho\left(\tilde{HDI}_c, u\right) = 0$. From this it follows that the OLS estimator of β will be consistent

$$\begin{aligned} \hat{\beta} &= \frac{cov\left(y_{ic}, \tilde{HDI}_c\right)}{var\left(\tilde{HDI}_c\right)} \\ &= \frac{cov\left(\beta \cdot HDI_{ic} + \varepsilon_{ic}, \tilde{HDI}_c\right)}{var\left(\tilde{HDI}_c\right)} \\ &= \frac{cov\left(\beta \cdot \left(\tilde{HDI}_c + u_{ic}\right) + \varepsilon_{ic}, \tilde{HDI}_c\right)}{var\left(\tilde{HDI}_c\right)} \\ \therefore p\lim \hat{\beta} &= \frac{\beta \sigma^2_{\tilde{HDI}_c}}{\sigma^2_{\tilde{HDI}_c}} = \beta \end{aligned}$$

[1] The discussion in this section is based on Pischke (2007).

While the parameter estimate, $\hat{\beta}_{H\tilde{D}I_c}$ will be consistent, the standard error, $\hat{se}_{H\tilde{D}I_c}$ will be inflated. This can be illustrated using Monte Carlo simulations on the HEMIS data.

Using the 2000 - 2013 aggregate HEMIS datasets, a hypothetical outcome variable, y, was defined as a function of the HDI indicator variable in the data

$$y_{ic} = \beta HDI_{ic} + \mu_{ic}$$

with $\beta = 0.1$ and $\mu_{ic} \sim N(0, 1)$. Next, $H\tilde{D}I_c$ was estimated via equation (2.1) in Section 2.5.2 for each of the three criteria variables. Finally, Monte Carlo simulations were used to calculate the average of $\hat{\beta}_{HDI}$, $\hat{\beta}_{H\tilde{D}I_c}$, $\hat{se}_{HDI}$, and $\hat{se}_{H\tilde{D}I_c}$ over 1000 trials for variously sized random samples. The results from these estimations are presented in Tables B.3 - B.5.

For each of the three probabilistic linking criteria used, it is clear that, on average, $\hat{\beta}_{H\tilde{D}I_c} \approx \hat{\beta}_{HDI} \approx \beta_{HDI}$ in sufficiently large samples. That is, $p\lim \hat{\beta}_{H\tilde{D}I_c} = p\lim \hat{\beta}_{HDI} = \beta$. However, regardless of the sample size, it remains the case that $\hat{se}_{H\tilde{D}I_c} > \hat{se}_{HDI}$. In other words, standard errors will be inflated whenever $H\tilde{D}I_c$ is used as a proxy for HDI_{ic}.

Table B.3: Average betas and standard errors obtained from Monte Carlo simulations using Criteria 1

Sample Size	$\hat{\beta}_{HDI}$	$\hat{se}_{HDI}$	$\hat{\beta}_{H\tilde{D}I}$	$\hat{se}_{H\tilde{D}I}$	$\hat{\beta}_{H\tilde{D}I}/\hat{\beta}_{HDI}$	$\hat{se}_{H\tilde{D}I}/\hat{se}_{HDI}$
100	0.100	0.210	0.091	0.496	0.906	2.366
200	0.104	0.148	0.098	0.350	0.937	2.368
500	0.099	0.093	0.098	0.220	0.991	2.357
1 000	0.098	0.066	0.110	0.156	1.117	2.366
2 000	0.099	0.047	0.097	0.110	0.981	2.356
5 000	0.099	0.030	0.098	0.070	0.989	2.359
10 000	0.099	0.021	0.098	0.049	0.993	2.358
20 000	0.099	0.015	0.098	0.035	0.990	2.358
100 000	0.099	0.007	0.099	0.016	0.999	2.358

NOTES: Figures represent the average betas and standard errors from the OLS estimations of (a) $y_{ic} = \alpha + \beta HDI_{ic} + \mu_{ic}$ and (b) $y_{ic} = \alpha + \beta H\tilde{D}I_c + \mu_{ic}$ using 1000 Monte Carlo trials for each of the variously sized random samples in the 2000 - 2013 aggregate HEMIS data. $\beta = 0.1$. Criterion 1 is given by the unique combinations of year of birth, race, gender, level of degree awarded (bachelor, postgraduate, etc), and SAQA field of study.

Table B.4: Average betas and standard errors obtained from Monte Carlo simulations using Criteria 2

Sample Size	$\hat{\beta}_{HDI}$	$\hat{se}_{HDI}$	$\hat{\beta}_{H\tilde{D}I}$	$\hat{se}_{H\tilde{D}I}$	$\hat{\beta}_{H\tilde{D}I}/\hat{\beta}_{HDI}$	$\hat{se}_{H\tilde{D}I}/\hat{se}_{HDI}$
100	0.093	0.210	0.086	0.562	0.931	2.682
200	0.096	0.148	0.100	0.397	1.040	2.687
500	0.098	0.093	0.103	0.250	1.042	2.677
1 000	0.098	0.066	0.115	0.177	1.167	2.689
2 000	0.099	0.047	0.103	0.125	1.043	2.677
5 000	0.101	0.030	0.099	0.079	0.972	2.681
10 000	0.100	0.021	0.102	0.056	1.017	2.681
20 000	0.100	0.015	0.101	0.040	1.011	2.681
100 000	0.099	0.007	0.101	0.018	1.021	2.681

NOTES: Figures represent the average betas and standard errors from the OLS estimations of (a) $y_{ic} = \alpha + \beta HDI_{ic} + \mu_{ic}$ and (b) $y_{ic} = \alpha + \beta H\tilde{D}I_c + \mu_{ic}$ using 1000 Monte Carlo trials for each of the variously sized random samples in the 2000 - 2013 aggregate HEMIS data. $\beta = 0.1$. Criterion 2 is given by the unique combinations of year of birth, race, gender, and level of degree awarded (bachelor, postgraduate, etc).

Table B.5: Average betas and standard errors obtained from Monte Carlo simulations using Criteria 3

Sample Size	$\hat{\beta}_{HDI}$	$\hat{se}_{HDI}$	$\hat{\beta}_{H\tilde{D}I}$	$\hat{se}_{H\tilde{D}I}$	$\hat{\beta}_{H\tilde{D}I}/\hat{\beta}_{HDI}$	$\hat{se}_{H\tilde{D}I}/\hat{se}_{HDI}$
100	0.094	0.210	0.089	0.583	0.942	2.780
200	0.099	0.148	0.105	0.412	1.059	2.793
500	0.101	0.094	0.099	0.259	0.980	2.771
1 000	0.095	0.066	0.115	0.184	1.215	2.786
2 000	0.102	0.047	0.103	0.130	1.011	2.774
5 000	0.099	0.030	0.099	0.082	0.998	2.778
10 000	0.100	0.021	0.101	0.058	1.009	2.778
20 000	0.100	0.015	0.101	0.041	1.008	2.778
100 000	0.099	0.007	0.102	0.018	1.027	2.778

NOTES: Figures represent the average betas and standard errors from the OLS estimations of (a) $y_{ic} = \alpha + \beta HDI_{ic} + \mu_{ic}$ and (b) $y_{ic} = \alpha + \beta H\tilde{D}I_c + \mu_{ic}$ using 1000 Monte Carlo trials for each of the variously sized random samples in the 2000 - 2013 aggregate HEMIS data. $\beta = 0.1$. Criterion 3 is given by the unique combinations of year of birth, race, and gender.

B.2 Composition of graduates in HEMIS and LFS/QLFS data

Table B.6: Proportion of graduates from the 2000 - 2013 HEMIS data sample, by HEI type

	Tech	**Comp**	**Trad**	**UTech**	**HDI**	**Clust1**	**Clust2**	**Clust3**
				Gender				
Male	3.0	20.9	68.1	8.0	32.4	47.5	42.3	10.2
Female	1.9	23.5	67.4	7.2	34.7	46.4	44.0	9.6
				Race				
Black	3.1	27.3	58.8	10.9	48.0	32.9	46.2	20.9
Coloured	2.8	16.2	68.9	12.0	41.6	39.3	60.4	0.3
Indian	1.8	21.1	72.4	4.7	40.2	60.9	38.1	1.0
White	1.7	18.3	76.4	3.6	15.1	61.5	38.1	0.4
				Birth Cohort				
1930s	4.5	17.6	76.7	1.2	13.4	43.3	53.2	3.5
1940s	5.3	14.8	77.2	2.7	23.9	41.4	53.2	5.4
1950s	5.3	18.2	71.4	5.1	30.2	40.7	52.2	7.1
1960s	5.6	22.7	65.3	6.4	29.8	38.9	53.4	7.7
1970s	4.8	20.7	67.4	7.1	29.7	34.6	55.8	9.6
1980s	0.5	23.9	67.1	8.6	36.0	50.0	39.5	10.5
1990s	0.0	20.4	73.9	5.7	40.5	59.3	31.2	9.5
All	2.4	22.4	67.7	7.5	33.7	46.8	43.3	9.8

NOTES: Figures represent the actual proportions of graduates in HEMIS administrative data sample who graduated from specific types of HEIs over the period 2000 - 2013. Tech: Technikon; Comp: Comprehensive university; Trad: Traditional university; UTech: University of Technology; HDI: Historically Disadvantaged Institution; Clust1: CHET Cluster 1; Clust2: CHET Cluster 2; Clust3: CHET Cluster 3.

Table B.7: Estimated proportion of graduates in the 2000 - 2015 LFS/QLFS sample, by HEI type

	Tech	Comp	Trad	UTech	HDI	Clust1	Clust2	Clust3
				Gender				
Male	14.0	13.5	65.9	6.6	25.2	34.7	57.5	7.8
Female	8.8	17.2	68.0	6.1	29.0	32.7	58.9	8.4
				Race				
Black	12.2	16.1	63.5	8.2	41.5	28.3	55.6	16.1
Coloured	11.5	12.8	64.9	10.8	39.2	30.8	68.8	0.4
Indian	8.7	16.0	69.9	5.3	30.0	42.9	55.5	1.6
White	10.7	14.9	70.6	3.7	9.1	38.8	59.6	1.6
				Birth Cohort				
1930s	16.5	1.1	82.4	0.0	3.3	23.1	76.9	0.0
1940s	12.1	9.0	77.2	1.7	14.3	34.9	61.3	3.8
1950s	15.5	13.0	66.4	5.2	21.7	30.1	64.1	5.8
1960s	14.9	15.8	62.6	6.6	24.1	28.8	64.4	6.8
1970s	10.1	15.0	68.4	6.5	31.2	30.8	59.7	9.5
1980s	0.9	21.0	68.9	9.2	38.4	48.6	39.7	11.7
1990s	0.0	21.1	72.1	6.7	44.9	56.8	32.8	10.4
All	11.3	15.4	67.0	6.3	27.1	33.7	58.2	8.1

NOTES: Figures represent the proportions of working-age graduates in the labour force survey data sample who are estimated to have graduated from specific types of HEI over the period 2000 - 2013, based on probabilistic linking between aggregate HEMIS data and LFS data. Tech: Technikon; Comp: Comprehensive university; Trad: Traditional university; UTech: University of Technology; HDI: Historically Disadvantaged Institution; Clust1: CHET Cluster 1; Clust2: CHET Cluster 2; Clust3: CHET Cluster 3. Estimates are unweighted.

Table B.8: Estimated proportion of graduates in the working-age population, by HEI type

	Tech	Comp	Trad	UTech	HDI	Clust1	Clust2	Clust3
				Gender				
Male	12.2	14.5	66.6	6.7	24.5	36.5	56.0	7.6
Female	7.5	18.5	68.0	6.0	27.9	34.2	57.8	8.1
				Race				
Black	10.4	17.9	62.8	8.9	42.6	29.4	54.2	16.4
Coloured	10.8	13.2	65.1	10.9	39.0	31.0	68.6	0.4
Indian	7.7	17.7	69.2	5.5	31.0	43.4	54.9	1.7
White	9.8	15.3	71.2	3.7	9.4	40.2	58.2	1.6
				Birth Cohort				
1930s	16.3	1.2	82.5	0.0	2.3	18.0	82.0	0.0
1940s	12.2	10.7	75.5	1.6	11.6	33.6	63.0	3.4
1950s	13.9	14.6	66.4	5.2	19.6	31.9	62.9	5.2
1960s	13.4	16.7	63.4	6.5	22.1	30.2	63.6	6.2
1970s	9.3	15.6	68.5	6.6	30.2	31.8	58.8	9.4
1980s	0.8	21.2	69.2	8.8	36.9	50.1	38.9	11.0
1990s	0.0	20.5	73.1	6.4	42.3	59.3	31.3	9.3
All	9.9	16.4	67.3	6.4	26.1	35.4	56.8	7.8

NOTES: Figures represent the proportions of working-age graduates in the South African population who are estimated to have graduated from specific types of HEI over the period 2000 - 2013, based on probabilistic linking between aggregate HEMIS data and LFS/QLFS data. Tech: Technikon; Comp: Comprehensive university; Trad: Traditional university; UTech: University of Technology; HDI: Historically Disadvantaged Institution; Clust1: CHET Cluster 1; Clust2: CHET Cluster 2; Clust3: CHET Cluster 3. Estimates are weighted.

C Chapter 2: Graduate unemployment/employment probit tables

C.1 Probability of narrow unemployment

Table C.1: Estimated probability of narrow unemployment for graduates, by HEI type

	(1)	(2)	(3)
Age	−0.200***	−0.196***	−0.199***
Age^2	0.002***	0.002***	0.002***
Coloured	−0.494***	−0.444***	−0.528***
Indian	−0.313***	−0.328***	−0.614***
White	−0.713***	−0.719***	−0.797***
Female	−0.006	−0.022	−0.020
Honnours	−0.137***	−0.185***	−0.189***
Masters+	−0.110**	−0.098**	−0.106**
Technikon		−0.153*	−0.200**
Technology		−0.395**	−0.650***
Comprehensive		0.669***	0.451***
Technikon × Coloured			−0.314
Technikon × Indian			0.467*
Technikon × White			0.065
Technology × Coloured			0.659*
Technology × Indian			1.210***
Technology × White			0.848**
Comprehensive × Coloured			0.223
Comprehensive × Indian			0.873***
Comprehensive × White			0.146
Observations	66 167	66 139	66 139
P-value	0.000	0.000	0.000
Area under ROC curve	0.794	0.796	0.796
Sensitivity	73.028	72.696	72.523
Specificity	72.807	73.255	73.525
Cutoff used	0.05	0.05	0.05

NOTES: *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on linearised robust standard errors which have been adjusted for complex survey design. Estimates are weighted and were estimated using probit regression. The dependent variable is *narrow unemployment*. The sample includes only working-age graduates in the narrow labour force from the pooled 2000a LFS - 2015QLFSQ2 data. Regressions include controls for the survey period, province, and enrolment at an educational institution (suppressed in output). Reference categories are as follows: Race (Black); Gender (Male); Qualification (Bachelor's degree or equivalent); HEI (Traditional University). The chosen cut-off value for the calculated prediction sensitivity and specificity is equal to the proportion of the estimation sample who are narrowly unemployed.

Table C.2: Estimated probability of narrow unemployment for graduates, by HEI historical status

	(1)	(2)	(3)
Age	−0.200***	−0.197***	−0.199***
Age^2	0.002***	0.002***	0.002***
Coloured	−0.494***	−0.483***	−0.505***
Indian	−0.313***	−0.285***	−0.002
White	−0.713***	−0.640***	−0.546***
Female	−0.006	−0.009	−0.012
Honnours	−0.137***	−0.115***	−0.105***
Masters+	−0.110**	−0.092**	−0.069
HDI		0.219***	0.375***
HDI × Coloured			0.071
HDI × Indian			−0.806***
HDI × White			−0.381
Observations	66 167	66 139	66 139
P-value	0.000	0.000	0.000
Area under ROC curve	0.794	0.794	0.795
Sensitivity	73.028	72.437	72.206
Specificity	72.807	73.133	73.517
Cutoff used	0.05	0.05	0.05

NOTES: *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on linearised robust standard errors which have been adjusted for complex survey design. Estimates are weighted and were estimated using probit regression. The dependent variable is *narrow unemployment*. The sample includes only working-age graduates in the narrow labour force from the pooled 2000a LFS - 2015QLFSQ2 data. Regressions include controls for the survey period, province, and enrolment at an educational institution (suppressed in output). Reference categories are as follows: Race (Black); Gender (Male); Qualification (Bachelor's degree or equivalent); HEI historical status (Historically Advantaged Institution (HAI)). The chosen cut-off value for the calculated prediction sensitivity and specificity is equal to the proportion of the estimation sample who are narrowly unemployed.

Table C.3: Estimated probability of narrow unemployment for graduates, by HEI cluster

	(1)	(2)	(3)
Age	−0.200***	−0.206***	−0.203***
Age^2	0.002***	0.002***	0.002***
Coloured	−0.461***	−0.380***	−7.935*
Indian	−0.276***	−0.180***	−5.772***
White	−0.671***	−0.578***	−0.535
Female	−0.027	−0.028	−0.027
Honours	−0.139***	−0.068*	−0.123***
Masters+	−0.120***	−0.027	−0.080
Cluster 1 HEI		−0.593***	−0.345**
Cluster 2 HEI		−0.405***	−0.503***
Cluster 1 × Coloured			7.500
Cluster 1 × Indian			5.174**
Cluster 1 × White			−0.298
Cluster 2 × Coloured			7.632
Cluster 2 × Indian			5.990***
Cluster 2 × White			0.114
Observations	55 018	54 991	54 991
P-value	0.000	0.000	0.000
Area under ROC curve	0.786	0.786	0.788
Sensitivity	71.064	70.301	69.248
Specificity	73.232	74.101	75.091
Cutoff used	0.05	0.05	0.05

NOTES: *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on linearised robust standard errors which have been adjusted for complex survey design. Estimates are weighted and were estimated using probit regression. The dependent variable is *narrow unemployment*. The sample includes only working-age graduates in the narrow labour force from the pooled 2004a LFS - 2015QLFSQ2 data. Regressions include controls for the survey period, province, and enrolment at an educational institution (suppressed in output). Reference categories are as follows: Race (Black); Gender (Male); Qualification (Bachelor's degree or equivalent); HEI cluster (Cluster 3 Institution). The chosen cut-off value for the calculated prediction sensitivity and specificity is equal to the proportion of the estimation sample who are narrowly unemployed.

C.2 Probability of employment

Table C.4: Estimated probability of employment for graduates, by HEI type

	(1)	(2)	(3)
Age	0.264***	0.264***	0.264***
Age^2	−0.003***	−0.003***	−0.003***
Coloured	0.259***	0.218***	0.215***
Indian	−0.113***	−0.091***	−0.031
White	0.063***	0.081***	0.093***
Female	−0.404***	−0.376***	−0.378***
Honnours	0.148***	0.181***	0.185***
Masters+	0.246***	0.214***	0.218***
Technikon		0.175**	0.281***
Technology		0.380***	0.405**
Comprehensive		−0.662***	−0.639***
Technikon × Coloured			−0.105
Technikon × Indian			−0.124
Technikon × White			−0.186
Technology × Coloured			−0.015
Technology × Indian			−0.247
Technology × White			0.029
Comprehensive × Coloured			0.117
Comprehensive × Indian			−0.190
Comprehensive × White			0.030
Observations	73 808	73 753	73 753
P-value	0.000	0.000	0.000
Area under ROC curve	0.745	0.748	0.748
Sensitivity	71.791	71.835	71.767
Specificity	63.248	63.260	63.332
Cutoff used	0.85	0.85	0.85

NOTES: *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on linearised robust standard errors which have been adjusted for complex survey design. Estimates are weighted and were estimated using probit regression. The dependent variable is *employment*. The sample includes only working-age graduates from the pooled 2000a LFS - 2015QLFSQ2 data. Regressions include controls for the survey period, province, and enrolment at an educational institution (suppressed in output). Reference categories are as follows: Race (Black); Gender (Male); Qualification (Bachelor's degree or equivalent); HEI (Traditional University). The chosen cut-off value for the calculated prediction sensitivity and specificity is equal to the proportion of the estimation sample who are employed.

Table C.5: Estimated probability of employment for graduates, by HEI historical status

	(1)	(2)	(3)
Age	0.264***	0.263***	0.264***
Age^2	−0.003***	−0.003***	−0.003***
Coloured	0.259***	0.257***	0.183**
Indian	−0.113***	−0.121***	−0.375***
White	0.063***	0.033	−0.174***
Female	−0.404***	−0.404***	−0.399***
Honnours	0.148***	0.142***	0.128***
Masters+	0.246***	0.244***	0.212***
HDI		−0.087	−0.421***
HDI × Coloured			0.141
HDI × Indian			0.651***
HDI × White			0.909***
Observations	73 808	73 753	73 753
P-value	0.000	0.000	0.000
Area under ROC curve	0.745	0.745	0.746
Sensitivity	71.791	71.701	71.540
Specificity	63.248	63.179	63.513
Cutoff used	0.85	0.85	0.85

NOTES: *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on linearised robust standard errors which have been adjusted for complex survey design. Estimates are weighted and were estimated using probit regression. The dependent variable is *employment*. The sample includes only working-age graduates from the pooled 2000a LFS - 2015QLFSQ2 data. Regressions include controls for the survey period, province, and enrolment at an educational institution (suppressed in output). Reference categories are as follows: Race (Black); Gender (Male); Qualification (Bachelor's degree or equivalent); HEI historical status (Historically Advantaged Institution (HAI)). The chosen cut-off value for the calculated prediction sensitivity and specificity is equal to the proportion of the estimation sample who are employed.

Table C.6: Estimated probability of employment for graduates, by HEI cluster

	(1)	(2)	(3)
Age	0.260***	0.274***	0.271***
Age^2	−0.003***	−0.003***	−0.003***
Coloured	0.227***	0.137***	0.013
Indian	−0.153***	−0.278***	3.365***
White	0.027	−0.083***	0.293
Female	−0.391***	−0.390***	−0.387***
Honours	0.151***	0.045	0.083***
Masters+	0.253***	0.100**	0.125***
Cluster 1 HEI		0.819***	0.579***
Cluster 2 HEI		0.489***	0.646***
Cluster 1 × Coloured			0.224
Cluster 1 × Indian			−3.441***
Cluster 1 × White			−0.063
Cluster 2 × Coloured			0.048
Cluster 2 × Indian			−3.841***
Cluster 2 × White			−0.574
Observations	61 190	61 146	61 146
P-value	0.000	0.000	0.000
Area under ROC curve	0.748	0.749	0.751
Sensitivity	72.298	72.150	72.049
Specificity	62.991	63.539	63.880
Cutoff used	0.86	0.86	0.86

NOTES: *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on linearised robust standard errors which have been adjusted for complex survey design. Estimates are weighted and were estimated using probit regression. The dependent variable is *employment*. The sample includes only working-age graduates from the pooled 2004a LFS - 2015QLFSQ2 data. Regressions include controls for the survey period, province, and enrolment at an educational institution (suppressed in output). Reference categories are as follows: Race (Black); Gender (Male); Qualification (Bachelor's degree or equivalent); HEI Cluster (Cluster 3 Institution). The chosen cut-off value for the calculated prediction sensitivity and specificity is equal to the proportion of the estimation sample who are employed.

C.3 Predicted average marginal racial differentials in graduate narrow unemployment and employment

Table C.7: Predicted average racial differentials (percentage point difference relative to Blacks) in narrow unemployment and employment rates (%) for graduates by race and HEI type (2000 - 2015)

	Narrow Unemployment			Employment		
HEI Type	**Coloured**	**Indian**	**White**	**Coloured**	**Indian**	**White**
Traditional	−5.1***	−5.6***	−6.4***	3.9***	−0.6	1.8***
Technikon	−4.8***	−1.4	−4.5***	1.5	−2.5	−1.5
Technology	0.7	5.1	0.3	2.3	−4.2	1.5
Comprehensive	−5.9	6.5	−10.5***	9.4	−7.1	3.7
HDI	−5.9***	−8.8***	−9.4***	7.2***	6.2***	13.6***
HAI	−3.8***	−0.0	−4.0***	2.9**	−7.8**	−3.3***
Cluster 1	−4.3***	−5.3***	−6.3***	3.9**	−1.5**	3.9***
Cluster 2	−2.6***	2.7*	−3.3***	1.0	−10.4	−5.7***
Cluster 3	−13.4***	−13.4***	−7.9	0.4	27.8	7.8

NOTES: [a]Figures reflect the estimated average percentage point difference in the predicted graduate narrow unemployment rate for the respective race groups relative to Black graduates by HEI type over the period 2000 - 2015 and are based on the marginal predictions from the regressions in columns (3) of Tables C.1 - C.3. [b]Figures reflect the estimated average percentage point difference in the predicted graduate employment rates for the respective race groups relative to Black graduates by HEI type over the period 2000 - 2015 and are based on the marginal predictions from the regressions in columns (3) of Tables C.1 - C.3. Predictions generated by setting the relevant HEI type proxy variables equal to 1 or 0. E.g. the predicted rates for graduates from traditional HEIs was generated using Technikon = 0, Technology = 0, and Comprehensive = 0, whereas the predicted rates for graduates from Cluster 2 HEIs was generated using Cluster 1 = 0 and Cluster 2 = 1.All other variables were kept at their observed values in the data when calculating the respective expected graduate unemployment/employment rates. *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on linearised robust standard errors which have been adjusted for complex survey design. Estimates are weighted.

Table C.8: Predicted average racial differentials (% difference relative to Blacks) in narrow unemployment and employment rates (%) for graduates by race and HEI type (2000 - 2015)

	Narrow Unemployment			Employment		
HEI Type	**Coloured**	**Indian**	**White**	**Coloured**	**Indian**	**White**
Traditional	−63.0***	−69.1***	−79.0***	4.6***	−0.7	2.1***
Technikon	−84.2***	−24.6	−78.9***	1.7	−2.8	−1.7
Technology	29.2	212.5	12.5	2.5	−4.6	1.6
Comprehensive	−36.4	40.1	−64.8***	13.7	−10.3	5.4
HDI	−51.8***	−77.2***	−82.5***	9.1***	7.9***	17.3***
HAI	−63.3***	−0.0	−66.7***	3.3**	−8.9**	−3.8***
Cluster 1	−55.8***	−68.8***	−81.8***	4.5**	−1.7**	4.5***
Cluster 2	−44.1***	45.8*	−55.9***	1.1	−11.9	−6.5***
Cluster 3	= 100.0***	= 100.0***	−59.0	0.6	38.6	10.8

NOTES: [a]Figures reflect the estimated average percentage (%) difference in the predicted graduate narrow unemployment rate for the respective race groups relative to Black graduates by HEI type over the period 2000 - 2015 and are based on the marginal predictions from the regressions in columns (3) of Tables C.1 - C.3. [b]Figures reflect the estimated average percentage (%) difference in the predicted graduate employment rates for the respective race groups relative to Black graduates by HEI type over the period 2000 - 2015 and are based on the marginal predictions from the regressions in columns (3) of Tables C.1 - C.3. Predictions generated by setting the relevant HEI type proxy variables equal to 1 or 0. E.g. the predicted rates for graduates from traditional HEIs was generated using Technikon = 0, Technology = 0, and Comprehensive = 0, whereas the predicted rates for graduates from Cluster 2 HEIs was generated using Cluster 1 = 0 and Cluster 2 = 1.All other variables were kept at their observed values in the data when calculating the respective expected graduate unemployment/employment rates. *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on linearised robust standard errors which have been adjusted for complex survey design. Estimates are weighted.

D Chapter 3: Data and Methodology

D.1 Using only HEMIS data to estimate HE access and entry

In theory, certain variables in the HEMIS data should allow one to identify students who transitioned from secondary school to higher education immediately after writing the SCE. The *previous year's activity* and *secondary education completion* fields, for example, should jointly identify all first-time entering undergraduate students who were (a) enrolled in secondary school and (b) completed secondary school in the year preceding enrolment in public HE. However, in reality, these variable fields are often subject to considerable capturing/classification error.

For example, using identification numbers to link learner records from the DOE's 2008 matric data with students records in the 2009 HEMIS data, Blom (2014:10) finds that 72 729 of the learners who wrote the SCE in South Africa in 2008 were enrolled as first-time entering undergraduate students in 2009. However, the "previous year's activity" field in the 2009 HEMIS data suggests that 79 167 first-time entering undergraduate students in 2009 indicated that they were in secondary school in 2008. A further 11 317 non-first-time entering undergraduate students in the 2009 HEMIS data indicated that they were also in secondary school in 2008. The implication is that if one were to use only the HEMIS data to determine the extent of immediate transition between high school and HE for learners from the 2008 national matric cohort, the resultant estimate would have been between 8.9% and 24.4% too high.

Table D.1: Percentage of matrics entering public HE by number of years to first enrolment

	2005 cohort		*2006 cohort*		*2007 cohort*		*2008 cohort*	
	Number	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
First-time undergraduates[1]	7 638	100.0	7 925	100.0	7 713	100.0	9 152	100.0
PREVACT: Secondary school[2]	6 191	81.1	6 384	80.6	6 958	90.2	8 343	91.2
SECED: Senior Certificate[3]	7 031	92.0	7 824	98.7	7 497	97.2	7 216	78.8
MATRIC: Aggregate total[4]	7 181	94.0	6 658	84.0	6 354	82.4	4 787	52.3

NOTES: [1]First-time entering undergraduate students as estimated by linking individuals from the WCED matric data in year t to HEMIS data in year $t + 1$ using unique identifiers. [2] Number of first-time entering undergraduate students whose predominant activity in the year prior to the enrolment year is classified as *"secondary school student"* according to the HEMIS *PREVACT* variable field (element 021). [3]Number of first-time entering undergraduate students who are classified as having completed some form of NSC/SSC according to the HEMIS *SECED* variable field (element 022). [4]Number of first-time entering undergraduate students for whom matric aggregate data is available in the HEMIS *MATRIC* variable field (element 023).

D.2 Linear Probability Model (LPM) specification: dependant variables and covariates

D.2.1 Outcome/Dependent variables

Variable	Type and description
4-year access	indicator variable which is equal to one if a learner from the 2005 WCED matric cohort accessed HE at any stage between 2006 and 2009, and zero otherwise.
4-year completion	indicator variable which is equal to one if a student from the WCED 2006 first-time entering undergraduate cohort successfully completed an undergraduate programme within the first four years of study (i.e. between 2006 and 2009), and zero otherwise.
3-year dropout	indicator variable which is equal to one if a student from the WCED 2006 first-time entering undergraduate cohort was not enrolled in HE in 2009 and was not observed to have completed any undergraduate programme within the first 3 years of study (i.e. between 2006 and 2008), and zero otherwise.

D.2.2 Covariates

Table D.2: Learner/student demographic factors

Variable	Type and description
Age	categorical variable indicating whether a learner/student was underage, overage, or of appropriate age for matric in 2005. The reference category in all estimations is *"appropriate age"*.
Gender	indicator variable which is equal to 1 if a learner/student is female, and zero otherwise.
Race	categorical variable indicating whether a learner/student is Black, Coloured, Asian, or White. The reference category in all estimations is *"Black"*.

Table D.3: HEI and programme-specific factors

Variable	Type and description
Qualification type	categorical variable indicating the type of undergraduate qualification for which a student was enrolled in 2006. The reference category in all estimations is *"1 to 2-year undergraduate certificate"*.
Field of study	categorical variable indicating the broad field of study of the programme for which student was enrolled in 2006. The reference category in all estimations is *"Human and social sciences (HSS)"*.
NSFAS	indicator variable which is equal to one if a student received a NSFAS award at any stage between 2006 and 2009, and zero otherwise.
HEI	categorical variable indicating the HEI at which a student enrolled in 2006. The reference category in all estimations is *"UNISA"*.

Table D.4: Learner-level matric performance factors

Variable	Type and description
Pass type	categorical variable indicating whether a learner/student passed matric with endorsement, without endorsement, or failed. Learners who achieved an "incomplete" pass in the 2005 SC were excluded from all estimations. The reference category in all estimations is "pass without endorsement".
SC aggregate	continuous variable reflecting learner's/student's overall matric aggregate (expressed as a percentage) achieved on the 2005 SC.
Mathematics	categorical variable indicating whether a learner/student offered mathematics as a subject in the 2005 SCE and the grade at which it was offered. The reference category in all estimations is "did not offer mathematics".
Physical science	categorical variable indicating whether a learner/student offered physical science as a subject in the 2005 SCE and the grade at which it was offered. The reference category in all estimations is "did not offer physical science".
Biology	categorical variable indicating whether a learner/student offered biology as a subject in the 2005 SCE and the grade at which it was offered. The reference category in all estimations is "did not offer biology".
Accounting	categorical variable indicating whether a learner/student offered accounting as a subject in the 2005 SCE and the grade at which it was offered. The reference category in all estimations is "did not offer accounting".

Table D.5: School type and school-level matric performance factors

Variable	Type and description
SC pass rate	continuous variable reflecting the percentage of learners from the learner's/student's school who passed the 2005 SC.
SC endorsement rate	continuous variable reflecting the percentage of learners from the learner's/student's school who passed the 2005 SC with endorsement.
Average SC aggregate	continuous variable reflecting the average SC aggregate (expressed as a percentage) achieved on the 2005 SC in the learner's/student's school.
LOLT	categorical variable indicating the language of learning and teaching (LOLT) in the school where the learner/student wrote the 2005 SCE. The reference category in all estimations is *"Dual Medium"*.
Quintile	categorical variable indicating the national school poverty quintile classification for the school where the learner/student wrote the 2005 SCE. The reference category in all estimations is *"Quintile 1"*.
Ex-department	categorical variable indicating the ex-department of the school where the learner/student wrote the 2005 SCE. The reference category in all estimations is *"Cape Education Department (CED) (Model C schools)"*.

E Chapter 3: Supplementary tables and figures

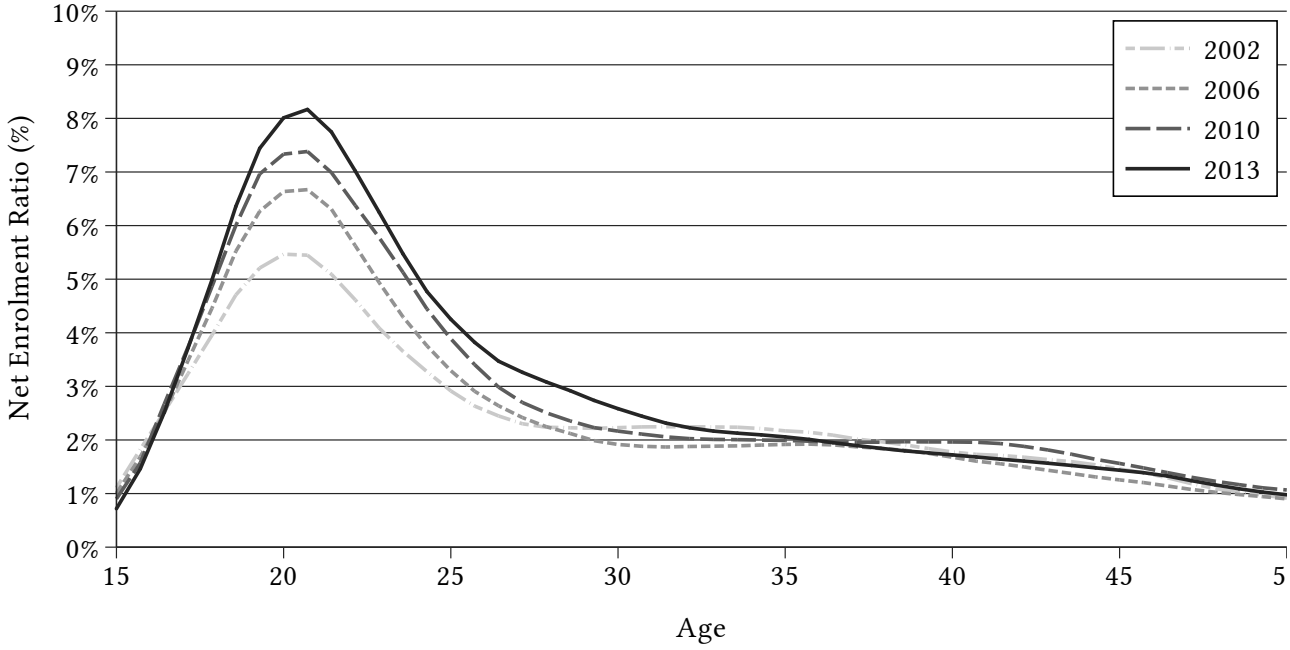
E.1 HE participation in South Africa

Table E.1: Higher education participation rates (%) in South Africa (2001 - 2013): Gross and Net Enrolment ratios

	Gross enrolment ratio (GER)					*Net enrolment ratio (NER)*				
Year	**All**	**Black**	**Coloured**	**Asian**	**White**	**All**	**Black**	**Coloured**	**Asian**	**White**
2001	14.6	10.6	9.4	42.5	58.8	4.7	3.1	2.8	14.9	22.4
2002	14.9	10.9	9.9	44.5	53.0	4.8	3.2	2.8	15.4	20.4
2003	16.1	11.6	12.1	51.0	67.2	5.3	3.6	3.5	17.5	26.7
2004	15.7	11.5	12.1	50.2	59.4	5.4	3.6	3.6	17.3	24.7
2005	15.9	11.7	12.3	50.6	60.4	5.7	3.9	4.0	17.6	25.5
2006	15.9	11.7	13.2	50.7	59.2	5.9	4.1	4.4	17.9	25.2
2007	16.3	12.3	13.4	48.5	57.2	6.1	4.4	4.7	17.7	25.0
2008	16.7	13.0	13.5	44.7	56.5	6.1	4.5	4.5	16.0	24.8
2009	17.0	13.3	14.3	44.9	58.5	6.1	4.5	4.6	15.7	25.3
2010	17.8	14.1	15.5	45.6	57.3	6.4	4.8	5.0	16.4	24.9
2011	19.1	15.7	15.2	48.4	57.4	6.9	5.3	5.0	17.8	25.0
2012	19.2	16.0	14.2	47.4	54.7	7.1	5.6	5.0	18.3	24.3
2013	19.4	16.4	14.5	48.7	54.4	7.3	5.9	5.2	19.0	24.2

NOTES: Author's own estimations based on headcount enrolment figures from aggregate HEMIS data (HEDA, 2015) and population figures in Statistics South Africa's mid-year population estimates for 2001 - 2013. The GER expresses total headcount enrolments in higher education as a percentage of the estimated total number of 20 - 24 year-olds in the population. The NER expresses the the total headcount enrolments for students between the ages of 20 and 24 in higher education as a percentage of the estimated total number of 20 - 24 year-olds in the population.(Steyn, 2009:3 - 4)

Figure E.1: HE Net Enrolment Ratios (NER) in South Africa by age



NOTES: Author's own estimations based on headcount enrolment figures from aggregate HEMIS data (HEDA, 2015) and population figures in Statistics South Africa's General Household Survey (GHS) datasets for the years 2002, 2006, 2010, and 2013. The NER at each age expresses the estimated percentage of the age cohort in the population that is enrolled in public HE.

Table E.2: Higher education participation rates (%) in South Africa (2001 - 2013): Net Entry Rates

	17 - 70 year-olds					*17 - 22 year-olds*				
Year	**All**	**Black**	**Coloured**	**Asian**	**White**	**All**	**Black**	**Coloured**	**Asian**	**White**
2002	16.9	13.8	12.6	49.8	50.1	10.3	7.0	8.2	39.1	41.4
2003	16.3	13.3	13.1	46.9	46.8	10.5	7.5	8.8	37.7	38.8
2004	16.6	13.6	13.6	48.4	46.3	10.7	7.8	8.9	40.3	36.3
2005	15.2	12.1	12.3	52.5	43.9	10.2	7.4	8.5	44.9	35.6
2006	15.7	12.3	13.6	46.7	46.0	10.3	7.6	8.7	36.4	34.7
2007	16.9	14.1	13.8	38.5	46.6	11.1	8.5	9.1	30.0	39.0
2008	16.5	14.1	13.7	43.1	39.5	10.9	8.4	9.5	36.4	32.9
2009	17.3	14.6	13.8	46.6	50.7	12.2	9.5	9.7	39.4	43.7
2010	17.5	15.4	12.7	42.9	44.9	11.8	9.4	8.8	36.9	38.6
2011	18.9	16.9	13.5	41.0	44.4	12.4	10.1	9.3	35.1	38.4
2012	17.5	16.1	12.2	27.5	36.3	12.1	10.4	8.7	23.0	31.4
2013	16.1	14.1	12.4	33.6	42.1	12.8	10.8	9.6	29.8	38.2

NOTES: Author's own estimations based on headcount enrolment figures from aggregate HEMIS data (HEDA, 2015) and population figures in Statistics South Africa's General Household Survey (GHS) datasets for the years 2002 to 2013. The net entry rate is calculated as $\sum_j$ [first-time entering students aged j] / [population size aged j] (Steyn, 2009:8). Figures in columns 1 -5 are estimated for individuals between the ages of 17 and 70 and are thus comparable to the international figures presented in OECD (2014:29).

Table E.3: Matric pass type for the 2005 national matric cohort by race

	Black	**Coloured**	**Asian**	**White**
Share of matric cohort[a]	80.6	6.2	2.8	8.6
Passed with endorsement	11.8	17.2	54.7	52.1
Passed without endorsement	51.0	66.6	37.4	46.1

NOTES: Author's own estimations based on matric results data for the year 2005. Data on SC results were obtained from DBE (2006). [a] Figures denote the racial shares (%) of all learners who wrote the SCE in South Africa in 2005.

Table E.4: National average SC pass and endorsement rates by race (2002 - 2007)

	Race				
	Black	**Coloured**	**Asian**	**White**	**All**
Share (%) of learners[a]	80.0	6.8	3.0	9.4	100.0
% passing SC	63.6	84.6	92.1	98.1	69.2
% passing SC with endorsement	11.6	17.1	53.7	51.3	17.2

NOTES: Author's own estimations based on matric results data for the years 2002 - 2007. Figures have been averaged over all years. Data on SC results for the respective years were obtained from the following sources: Perry and Fleisch (2006:119) for 2002, Nel (2008:27) for 2003, DBE (2006) for 2004 and 2005, Myburgh (2007) for 2006, and DBE (2008) for 2007. [a] Figures denote the average racial shares (%) of learners who wrote the SCE between 2002 and 2007.

E.2 HE enrolment flows

Table E.5: HE enrolment, exit, and completion numbers for the 2005 WCED matric cohort (2006 - 2009)

	2006	2007	2008	2009
Enrolled	7 654	9 031	8 933	7 267
- First-time entering	7 654	2 308	732	407
- Non-entering	—	6 723	8 201	6 860
Not enrolled	32 838	31 461	31 559	33 225
- Non-participants	32 838	30 530	29 798	29 380
- Exit HE - Completers[a]	—	7	33	1 503
- Exit HE - Non-completers[a]	—	683	1 505	2 362
- Exit HE - Stop out[b]	—	242	231	—
Completers[a]	28	190	2 048	4 309
- Completers (non-cumulative)	28	162	1 858	2 261
Dropouts[a]	683	1 505	2 362	—
- Dropouts (non-cumulative)	683	822	857	—

NOTES: Estimates are weighted and are calculated only for learners from the 2005 WCED matric cohort. *Completers* refer to students who successfully completed undergraduate qualifications between 2006 and 2009 whereas *dropouts* refer to students who left HE prior to 2009 without having completed any undergraduate qualification. [a]Numbers are cumulative. [b]Non-completing students who temporarily exited the system for one or two years (i.e. were not observed to be enrolled), but returned to HE in either 2008 or 2009.

Table E.6: HE enrolment, exit, and completion numbers for the WCED 2006 first-time entering undergraduate cohort (2006 - 2009)

	2006	2007	2008	2009
Enrolled	7 654	6 723	6 301	4 656
- Non-completers[a]	7 626	6 563	4 381	2 337
Not enrolled	—	931	1 353	2 998
- Exit HE - Completers[b]	—	7	32	1 465
- Exit HE - Non-completers[b]	—	683	1 156	1 563
- Exit HE - Stop out[c]	—	242	173	—
Completers[b]	28	167	1 944	3 754
- Completers (non-cumulative)	28	139	1 777	1 810
Dropouts[b]	683	1 156	1 563	—
- Dropouts (non-cumulative)	683	473	407	—

NOTES: Estimates are weighted calculated only for students from the WCED 2006 first-time entering undergraduate cohort. *Completers* refer to students who successfully completed undergraduate qualifications between 2006 and 2009 whereas *dropouts* refer to students who left HE prior to 2009 without having completed any undergraduate qualification. [a]Number of students from the cohort who were enrolled in undergraduate studies but had not completed any undergraduate qualification by the end of the year in question. [b]Figures are cumulative. [c]Non-completing students who temporarily exited the system for one or two years (i.e. were not observed to be enrolled), but returned to HE in either 2008 or 2009.

E.3 National completion and dropout rates in the public HE system

Table E.7: Cumulative completion rates (%) for the 2000 - 2009 national first-time entering undergraduate cohorts

	First-time entering undergraduate cohort									
Year	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
1	1.0	1.5	1.2	1.0	1.1	0.9	0.5	0.4	0.6	1.2
2	2.6	3.5	4.9	3.1	3.4	3.3	2.3	2.1	2.4	—
3	16.0	16.3	18.7	16.1	17.5	17.7	15.3	15.9	—	—
4	29.7	29.4	32.3	31.0	32.9	33.5	30.4	—	—	—
5	37.4	36.8	40.1	39.1	41.5	42.5	—	—	—	—
6	42.0	41.3	44.5	43.8	46.4	—	—	—	—	—
7	44.4	43.7	47.0	46.4	—	—	—	—	—	—
8	46.0	45.3	48.6	—	—	—	—	—	—	—
9	47.3	46.5	—	—	—	—	—	—	—	—
10	48.2	—	—	—	—	—	—	—	—	—

NOTES: Figures denoted the cumulative completion rates for the 2000 - 2009 national first-time entering undergraduate cohorts over the period 2000 to 2009 and were estimated using student-level HEMIS data.

Table E.8: Completion rates (%) for first-time entering undergraduate student enrolled in 1- and 2-year diploma/certificate programmes: 2000 - 2009 cohorts

Years	*First-time entering cohort*									
elapsed	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
1	5.2	9.1	6.6	11.3	8.1	7.0	4.4	4.5	5.2	12.6
2	12.1	18.3	24.7	28.7	23.4	25.6	17.9	19.5	22.2	—
3	14.9	21.5	36.4	42.0	38.0	38.4	28.7	34.9	—	—
4	18.0	25.2	40.0	46.1	42.9	43.3	37.1	—	—	—
5	20.2	27.3	42.1	48.9	45.3	46.1	—	—	—	—
6	21.5	28.9	43.8	50.6	46.7	—	—	—	—	—
7	22.6	30.1	45.1	52.1	—	—	—	—	—	—
8	23.7	31.0	46.2	—	—	—	—	—	—	—
9	24.7	32.5	—	—	—	—	—	—	—	—
10	25.7	—	—	—	—	—	—	—	—	—

NOTES: Figures denoted the cumulative completion rates for the 2000 - 2009 national first-time entering 1- and 2-year undergraduate diploma/certificate programme cohorts over the period 2000 to 2009 and were estimated using student-level HEMIS data.

Table E.9: Completion rates (%) for first-time entering undergraduate students enrolled in 3-year diploma programmes: 2000 - 2007 cohorts

Years	*First-time entering cohort*							
elapsed	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
1	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—
3	12.7	13.3	15.9	12.5	14.4	14.8	14.2	14.1
4	22.1	21.5	24.5	22.5	25.3	25.8	24.8	—
5	27.4	25.8	29.5	28.2	31.9	32.6	—	—
6	30.0	28.5	32.3	31.4	35.4	—	—	—
7	31.7	30.0	34.1	33.2	—	—	—	—
8	32.8	31.0	35.2	—	—	—	—	—
9	33.6	31.8	—	—	—	—	—	—
10	34.3	—	—	—	—	—	—	—

NOTES: Figures denoted the cumulative completion rates for the 2000 - 2007 national first-time entering 3-year undergraduate diploma programme cohorts over the period 2000 to 2009 and were estimated using student-level HEMIS data.

Table E.10: Completion rates (%) for first-time entering undergraduate students enrolled in 3-year degree programmes: 2000 - 2007 cohorts

Years	*First-time entering cohort*							
elapsed	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
1	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—
3	20.2	19.3	19.2	18.8	20.0	21.9	17.7	19.3
4	34.4	31.6	31.3	32.2	33.7	36.6	31.0	—
5	41.4	37.9	38.2	38.9	41.0	43.9	—	—
6	44.2	41.2	41.3	42.2	44.5	—	—	—
7	46.0	43.0	43.1	44.1	—	—	—	—
8	47.1	44.2	44.2	—	—	—	—	—
9	48.0	45.2	—	—	—	—	—	—
10	48.7	—	—	—	—	—	—	—

NOTES: Figures denoted the cumulative completion rates for the 2000 - 2007 national first-time entering 3-year undergraduate degree programme cohorts over the period 2000 to 2009 and were estimated using student-level HEMIS data.

Table E.11: Completion rates (%) for first-time entering undergraduate students enrolled in 4-year degree programmes: 2000 - 2006 cohorts

Years	*First-time entering cohort*						
elapsed	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	20.1	19.4	22.6	21.5	29.5	27.2	25.7
5	28.3	27.7	31.4	30.2	42.2	39.8	—
6	34.8	33.3	36.6	35.6	50.3	—	—
7	37.0	35.2	38.6	37.9	—	—	—
8	38.0	36.2	39.6	—	—	—	—
9	38.7	36.8	—	—	—	—	—
10	39.1	—	—	—	—	—	—

NOTES: Figures denoted the cumulative completion rates for the 2000 - 2006 national first-time entering 4-year undergraduate degree programme cohorts over the period 2000 to 2009 and were estimated using student-level HEMIS data.

Table E.12: 3-year and 7-year dropout rates for the 2000 - 2003 national first-time entering undergraduate cohorts:

	As % of cohort	**As % of estimated 3-year dropouts**
3-year dropout *(using 4 years of data)*	37.3	100.0
» Returners	8.5	22.8
»» Returners who become completers	2.0	5.4
3-year dropout *(using 8+ years of data)*	28.8	77.2
7-year dropout *(using 8+ years of data)*	45.0	120.6

NOTES: Figures denoted the cumulative average 3-year and 7-year dropout rates for the 2000 - 2002 national first-time entering undergraduate cohorts based on the number of years of underlying data used and were estimated using student-level HEMIS data.

Table E.13: Average completion rates in regulation time for the national 2000 - 2006 first-time entering undergraduate cohorts, by race and qualification type

	Black	**Coloured**	**Asian**	**White**	**All**
1 to 2-year diplomas/certificates	20.6	33.2	21.3	24.1	21.7
3-year diplomas	11.5	18.2	18.1	25.5	14.0
3-year degrees	10.8	14.7	16.0	33.1	20.0
4-year degrees	15.1	22.5	22.5	36.9	24.3

NOTES: Figures represent the estimated cohort-weighted cumulative completion rates (%) for all first-time entering undergraduate cohorts for whom full regulation periods could be observed between 2000 and 2009.

Table E.14: National dropout in regulation time (2000 - 2009)

	Black	Coloured	Asian	White	All
1 to 2-year diplomas/certificates	21.9	24.8	20.2	25.9	22.4
3-year diplomas	38.9	41.5	35.1	37.9	38.8
3-year degrees	28.0	29.7	21.6	18.6	23.7
4-year degrees	31.3	28.6	15.3	18.0	24.8
All undergraduate programmes	32.4	33.7	22.7	21.9	29.1

NOTES: Figures represent the estimated cohort-weighted cumulative completion rates (%) for all first-time entering undergraduate cohorts for whom full regulation periods could be observed between 2000 and 2009.

Table E.15: Average 5-year drop-out rates for first-time entering undergraduate students (2000 - 2009)

	Black	Coloured	Asian	White	All
1 to 2-year diplomas/certificates	34.6	34.7	30.6	35.7	34.6
3-year diplomas	50.5	49.9	44.3	45.9	49.7
3-year degrees	39.0	39.6	30.9	24.9	32.5
4-year degrees	35.7	32.5	18.2	20.3	28.2
All undergraduate programmes	42.9	42.0	30.6	27.5	38.0

NOTES: Figures represent the estimated average cohort-weighted cumulative dropout rates (%) for all national first-time entering undergraduate cohorts for whom full regulation periods could be observed between 2000 and 2009. Author's own estimations using HEMIS 2000 - 2009 data.

E.4 Pre-entry correlates

Table E.16: Matric pass type and HE access, completion, and dropout rates for the 2005 WCED matric cohort by race and type of undergraduate qualification

	Black	Coloured	Asian/Indian	White	All
			Matric pass rates		
Matric pass rate	58.0	86.1	95.3	97.2	83.4
Matric endorsement rate	13.1	28.0	75.8	68.0	37.2
			4-year access rates[a]		
All undergraduate	21.5	20.0	63.0	47.8	27.4
1 to 2-year certificates	3.4	2.7	3.5	2.3	2.8
3-year diplomas	11.8	7.0	12.0	10.3	9.2
3-year degrees	5.6	8.1	31.9	25.9	11.8
4-year degrees	3.9	5.3	23.1	14.6	7.3
			1-year access rates[b]		
All undergraduate	11.7	14.6	52.1	34.4	18.9
1 to 2-year certificates	1.7	2.1	2.7	1.8	2.0
3-year diplomas	5.9	4.6	7.0	6.0	5.4
3-year degrees	4.2	6.6	28.2	19.6	9.2
4-year degrees	2.4	4.1	20.9	11.6	5.5
			4-year completion rates[c]		
All undergraduate	31.9	43.0	46.9	62.1	49.0
1 to 2-year certificates	53.0	65.9	84.7	63.4	62.8
3-year diplomas	36.9	51.1	36.3	56.9	47.9
3-year degrees	23.7	40.1	50.3	62.3	49.0
4-year degrees	12.7	21.6	33.7	47.9	33.5
			3-year dropout rates[d]		
All undergraduate	30.1	26.1	9.6	12.2	20.4
1 to 2-year certificates	22.5	19.2	0.0	8.2	17.0
3-year diplomas	28.7	25.3	22.5	19.3	24.6
3-year degrees	28.2	25.4	11.5	11.9	18.7
4-year degrees	23.4	20.8	2.2	6.7	13.5

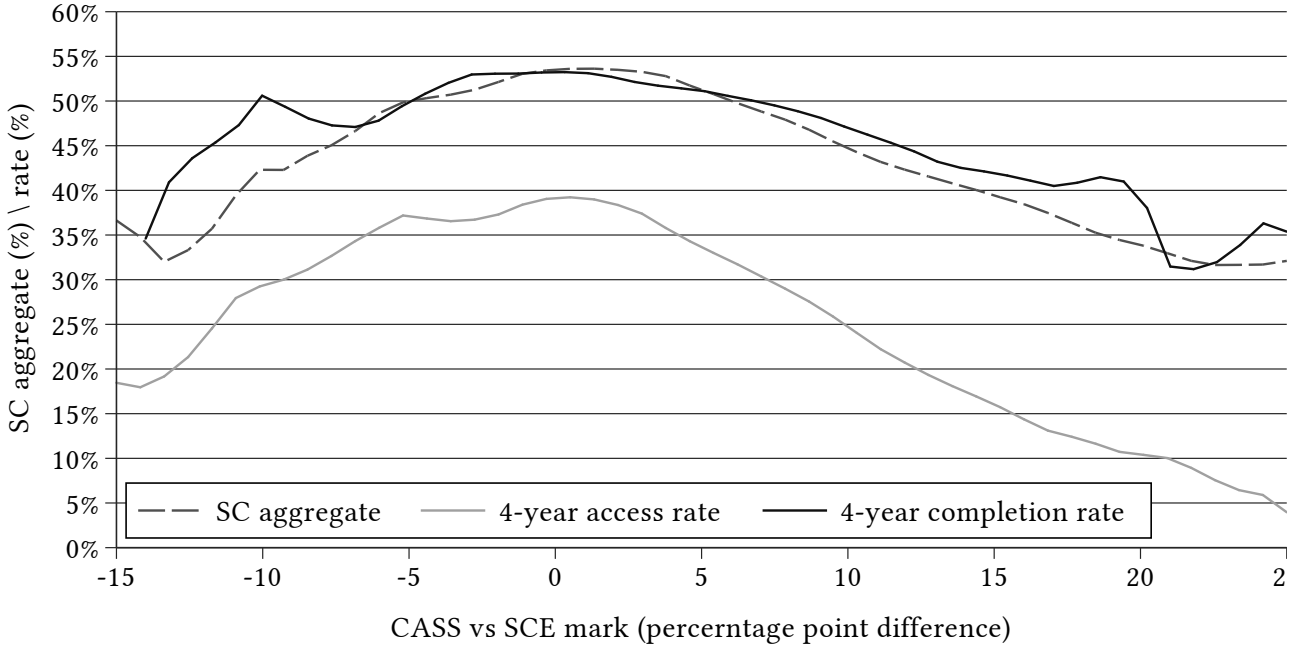
NOTES: Estimates are weighted and are calculated only for the sample of learners from the 2005 WCED matric cohort. Completion and dropout rates are estimated only for those learners who were part of the WCED 2006 first-time entering undergraduate cohort. [a] Figures reflect the estimated percentage of the learners from each race group in the 2005 WCED matric cohort who enrolled for specific HE qualifications types between 2006 and 2009. [b] Figures reflect the estimated percentage of the learners from each race group in the 2005 WCED matric cohort who enrolled for specific HE qualifications types in 2006. [c] Figures reflect the estimated percentage of the students from each race group in the WCED 2006 first-time entering undergraduate cohort who successfully completed specific HE qualification types between 2006 and 2009. [d] Figures reflect the estimated percentage of the students from each race group in the WCED 2006 first-time entering undergraduate cohort who were enrolled for specific HE qualification types in 2006, but dropped out of HE without completing any undergraduate qualification before 2009.

Table E.17: Racial composition and distribution of learners from different race groups in the 2005 WCED matric cohort across school quintile, ex-department, and LOLT

	Racial shares (%)				*% of race group*			
	Black	**Coloured**	**Asian**	**White**	**Black**	**Coloured**	**Asian**	**White**
Quintile 1	79.8	19.0	0.2	0.2	11.4	1.4	0.8	0.0
Quintile 2	85.9	13.5	0.0	0.1	28.1	2.3	0.0	0.0
Quintile 3	54.9	41.2	0.5	3.3	39.1	15.5	8.9	2.8
Quintile 4	13.0	83.9	0.4	2.6	9.6	32.8	6.6	2.3
Quintile 5	6.2	48.4	1.9	42.0	11.7	48.0	83.7	94.8
CED	5.0	28.0	1.9	64.0	5.4	18.2	44.0	88.5
DET	99.3	0.3	0.2	0.2	52.5	0.1	2.4	0.1
HOD	0.5	63.0	36.1	0.4	0.0	0.9	18.0	0.0
HOR	8.1	89.8	0.5	0.5	11.3	75.2	15.0	0.8
WCED	73.8	20.5	0.2	4.7	15.2	2.6	0.8	1.3
English	60.0	21.4	2.4	14.3	89.2	19.0	78.1	27.1
Afrikaans	2.7	66.5	0.3	30.3	2.2	32.5	6.2	31.6
Dual medium	7.0	66.0	0.6	26.3	8.6	48.5	15.8	41.3

NOTES: Estimates are weighted and are calculated only for the sample of learners from the 2005 WCED matric cohort. The estimates in the first four columns reflect the racial shares among learners in different quintile, ex-department, and LOLT schools. The estimates in the final four columns reflect the percentages of Black, Coloured, Asian, and White learners from the 2005 WCED matric cohort who were enrolled in different quintile, ex-department, and LOLT schools. Figures may not sum to a 100% in certain case because of missing information regarding school quintile, ex-department, or LOLT.

Figure E.2: Average SC aggregate, and HE access and completion rates for the 2005 WCED matric cohort, by deviation between matric CASS and SCE marks



NOTES: Lines represent average SC aggregate marks and 4-year HE access and 4-year HE completion rates conditional on the percentage point difference between a learner's average 2005 CASS mark and their average 2005 SCE mark and were estimated using weighted local polynomial regression. Completion ates are estimated only for those learners who were part of the WCED 2006 first-time entering undergraduate cohort.

E.5 Conversion rate differentials

Table E.18: LPM - Unconditional racial HE access, completion, and conversion rate differentials

	1-year access	4-year completion	4-year conversion
Coloured	0.024***	0.116***	0.024***
Asian	0.398***	0.160***	0.208***
White	0.226***	0.307***	0.179***
Observations	28 463	6 083	28 463
Adjusted R^2	0.062	0.054	0.060

NOTES: All linear probability models (LPM) were estimated via Ordinary Least Squares (OLS). Estimates are weighted. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors. The 4-year completion sample includes all students in the WCED 2006 first-time entering undergraduate cohort. The estimated 4-year conversion rates for each group is equal to the product of the 1-year access and 4-year completion rates for that group. Student's who achieved an "incomplete" pass on the 2005 SCE are excluded from all estimation samples. Reference categories are as follows: Race (Black). Estimations do not include any other control variables.

Table E.19: LPM - Conditional racial HE access, completion, and conversion rate differentials

	1-year access	4-year completion	4-year conversion
Coloured	−0.075***	0.029	−0.018**
Asian	−0.049*	0.047	−0.016
White	−0.213***	0.190***	−0.036***
Includes controls for:[a]			
Demographics	X	X	X
Matric performance	X	X	X
Schooling	X	X	X
Higher Education		X	
Observations	26 934	5 554	26 934
Adjusted R^2	0.393	0.188	0.255

NOTES: All linear probability models (LPM) were estimated via Ordinary Least Squares (OLS). Estimates are weighted. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors. The 4-year completion sample includes all students in the WCED 2006 first-time entering undergraduate cohort. The estimated 4-year conversion rates for each group is equal to the product of the 1-year access and 4-year completion rates for that group. Student's who achieved an "incomplete" pass on the 2005 SCE are excluded from all estimation samples. Reference categories are as follows: Race (Black). [a]Estimations include controls for the various demographic, learner matric performance, school type and school-level matric performance, and HEI and HE programme factors listed in Appendix D.2.

F Chapter 4: ITE Tables

Table F.1: Total headcount enrolments, FTEN, and graduations in ITE and non-ITE programmes (2004 - 2013)

	ITE Programmes			*Non-ITE Programmes*		
Year	**Enrolments**	**FTEN**	**Graduates**	**Enrolments**	**FTEN**	**Graduates**
2004	39 892	13 229	10 506	330 710	109 879	45 537
2005	29 316	12 258	7 626	336 364	111 588	48 685
2006	29 884	9 469	7 188	346 104	105 466	51 059
2007	29 926	10 950	6 413	355 782	118 710	52 611
2008	34 641	12 807	6 159	365 718	116 779	55 512
2009	42 151	16 553	6 953	384 374	129 693	59 193
2010	52 477	18 832	8 284	412 069	130 574	62 770
2011	74 038	28 947	10 540	429 184	134 266	64 824
2012	86 880	29 737	13 153	445 997	143 133	71 094
2013	94 127	26 503	15 655	465 755	144 692	78 177

NOTES: Figures represent the estimated numbers of total headcount enrolments, first-time enrolments (FTEN), and graduations for undergraduate and postgraduate ITE programmes and for non-ITE undergraduate degree and postgraduate diploma/certificate programmes respectively.

Table F.2: Estimated total growth (%) and average annual growth (%) in ITE and non-ITE total headcount enrolments, FTEN, and graduations

(a) Total growth (%)[a]

	ITE Programmes			*Non-ITE Programmes*		
Period	**Enrolments**	**FTEN**	**Graduations**	**Enrolments**	**FTEN**	**Graduations**
2000 - 2004	16.9	5.7	31.3	18.9	12.1	9.7
2004 - 2008	−13.2	−3.2	−41.4	10.6	6.3	21.9
2008 - 2013	171.7	106.9	154.2	27.4	23.9	40.8
2004 - 2013	135.9	100.3	49.0	40.8	31.7	71.7

(b) Average annual growth rates (%)[b]

	ITE Programmes			*Non-ITE Programmes*		
Period	**Enrolments**	**FTEN**	**Graduations**	**Enrolments**	**FTEN**	**Graduations**
2000 - 2004	4.4**	3.1	7.5	4.5*	2.4	2.5
2004 - 2008	−2.6	−1.8	−11.7**	2.6***	1.9*	4.9***
2008 - 2013	23.9***	18.1**	21.5***	5.0***	4.1**	6.8***
2004 - 2013	14.1**	12.8**	6.4	4.1***	3.6***	5.8***

NOTES: [a]Figures represent the total percentage change in the dependent variable(s) over the indicated periods. [b]Figures represent the percentage average annual growth rates in the dependent variables over the indicated periods and were estimated using the least-squares methodology described in Appendix G. *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.3: Total headcount enrolments, FTEN, and graduates in ITE and non-ITE programmes by programme level (2004 - 2013)

(a) Undergraduate degree programmes

	ITE Programmes			*Non-ITE Programmes*		
Year	**Enrolments**	**FTEN**	**Graduations**	**Enrolments**	**FTEN**	**Graduations**
2004	27 688	8 385	5 962	322 182	105 426	41 716
2005	23 187	9 240	4 789	328 326	107 186	44 964
2006	24 524	7 176	4 631	338 404	101 218	47 501
2007	24 745	8 581	4 162	347 069	114 278	48 879
2008	28 678	10 129	3 722	355 529	111 223	51 336
2009	35 400	13 412	4 055	372 022	122 267	53 955
2010	43 964	15 191	4 673	399 156	123 829	57 307
2011	61 886	24 236	5 586	416 797	127 992	59 497
2012	74 132	24 921	7 354	428 141	132 837	63 918
2013	79 052	20 281	8 402	445 893	134 901	70 689

(b) Postgraduate diplomas/certificate programmes

	ITE Programmes			*Non-ITE Programmes*		
Year	**Enrolments**	**FTEN**	**Graduations**	**Enrolments**	**FTEN**	**Graduations**
2004	12 205	4 844	4 544	8 527	4 453	3 821
2005	6 129	3 018	2 837	8 037	4 402	3 721
2006	5 360	2 292	2 557	7 700	4 249	3 558
2007	5 181	2 369	2 251	8 713	4 432	3 732
2008	5 964	2 678	2 437	10 188	5 556	4 176
2009	6 751	3 142	2 898	12 352	7 426	5 238
2010	8 513	3 641	3 612	12 913	6 745	5 462
2011	12 151	4 711	4 954	12 388	6 274	5 327
2012	12 748	4 817	5 799	17 856	10 295	7 176
2013	15 075	6 222	7 253	19 863	9 791	7 488

NOTES: Figures represent the estimated numbers of total headcount enrolments, first-time enrolments (FTEN), and graduations for (a) undergraduate ITE and non-ITE undergraduate degree programmes and (b) postgraduate ITE and non-ITE postgraduate diploma/certificate programmes.

Table F.4: Estimated average annual growth (%) in total headcount enrolments, FTEN, and graduations for ITE and non-ITE programmes by programme level (2004 - 2013)

(a) Undergraduate degree programmes

	ITE Programmes			*Non-ITE Programmes*		
Year	**Enrolments**	**FTEN**	**Graduations**	**Enrolments**	**FTEN**	**Graduations**
2000 - 2004	−0.2	−2.1	−1.5	4.5*	2.6	2.0
2004 - 2008	1.4	3.1	−10.3***	2.6***	1.7*	5.1***
2008 - 2013	24.4***	18.0**	18.8***	4.7***	3.6**	6.3***
2004 - 2013	15.8***	14.9***	4.6	3.9***	3.2***	5.5***

(b) Postgraduate diploma/certificate programmes

	ITE Programmes			*Non-ITE Programmes*		
Year	**Enrolments**	**FTEN**	**Graduations**	**Enrolments**	**FTEN**	**Graduations**
2000 - 2004	20.9***	19.3*	28.1***	5.0	−1.6	8.7**
2004 - 2008	−14.8	−13.3	−13.7	4.5	4.6	1.8
2008 - 2013	21.8***	17.9***	25.1***	13.4***	11.3**	11.6***
2004 - 2013	8.0	6.6	8.9	10.8***	10.5***	8.9***

Figures represent the percentage average annual growth rates in total headcount enrolments, FTEN, and graduations for (a) undergraduate ITE and non-ITE undergraduate degree programmes and (b) postgraduate ITE and non-ITE postgraduate diploma/certificate programmes over the indicated periods and were estimated using the least-squares methodology described in Appendix G. *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.5: FTEN in ITE and non-ITE programmes at UNISA and other HEIs (2004 - 2013)

	ITE Programmes			*Non-ITE Programmes*		
Year	**All HEIs**	**Contact HEIs**	**Unisa**	**All HEIs**	**Contact HEIs**	**Unisa**
2004	13 229	11 602	1 627	109 879	82 979	26 900
2005	12 258	10 317	1 941	111 588	83 581	28 007
2006	9 469	7 082	2 387	105 466	74 632	30 835
2007	10 950	7 895	3 055	118 710	81 330	37 380
2008	12 807	8 664	4 144	116 779	78 702	38 077
2009	16 553	10 628	5 925	129 693	93 534	36 159
2010	18 832	10 816	8 016	130 574	93 949	36 625
2011	28 947	13 300	15 647	134 266	94 602	39 664
2012	29 737	12 407	17 330	143 133	93 765	49 368
2013	26 503	14 256	12 248	144 692	101 612	43 080

NOTES: Figures represent the estimated number of first-time enrolments (FTEN) in undergraduate and postgraduate ITE programmes and non-ITE undergraduate degree and postgraduate diploma/certificate programmes in the entire public HE system, at contact HEIs, and at UNISA.

Table F.6: Estimated average annual growth rates in FTEN in ITE and non-ITE programmes for all HEIs, contact HEIs, and UNISA (2004 - 2013)

	ITE Programmes			*Non-ITE Programmes*		
Period	**ALL HEIs**	**Contact HEIs**	**Unisa**	**ALL HEIs**	**Contact HEIs**	**Unisa**
2000 - 2004	3.1	−0.1	30.2*	2.4	−0.1	12.3**
2004 - 2008	−1.8	−8.2	26.2***	1.9*	−1.3	10.3***
2008 - 2013	18.1**	9.5***	30.5**	4.1**	3.8*	4.8
2004 - 2013	12.8**	4.6	32.3***	3.6***	2.7**	5.8***

Figures represent the percentage average annual growth rates in FTEN in undergraduate and postgraduate ITE programmes and non-ITE undergraduate degree and postgraduate diploma/certificate programmes for the entire public HE system, contact HEIs, and UNISA over the indicated periods and were estimated using the least-squares methodology described in Appendix G. *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.7: FTEN in undergraduate and postgraduate ITE programmes at UNISA and other (contact) HEIs (2004 - 2013)

	Contact HEIs		*Unisa*		*Unisa share (%)*	
Year	**UG ITE**	**PG ITE**	**UG ITE**	**PG ITE**	**UG ITE**	**PG ITE**
2004	7 155	4 447	1 230	397	14.7	8.2
2005	7 757	2 560	1 483	458	16.0	15.2
2006	5 354	1 728	1 823	564	25.4	24.6
2007	6 093	1 802	2 488	567	29.0	23.9
2008	6 757	1 906	3 372	772	33.3	28.8
2009	8 579	2 049	4 832	1 093	36.0	34.8
2010	8 260	2 556	6 931	1 085	45.6	29.8
2011	10 287	3 013	13 949	1 698	57.6	36.0
2012	9 582	2 826	15 339	1 991	61.6	41.3
2013	10 880	3 376	9 402	2 846	46.4	45.7

NOTES: Figures represent the estimated number of first-time enrolments (FTEN) in undergraduate and postgraduate ITE programmes at contact HEIs and at UNISA as well as UNISA's share of all annual FTEN in undergraduate and postgraduate ITE FTEN in the public HE system. UG: undergraduate; PG: postgraduate.

Table F.8: Estimated average annual growth rates in FTEN in ITE and non-ITE undergraduate and postgraduate programmes including and excluding UNISA (2004 - 2013)

(a) Undergraduate degree programmes

	ITE Programmes			*Non-ITE Programmes*		
Period	**All HEIs**	**Contact HEIs**	**Unisa**	**All HEIs**	**Contact HEIs**	**Unisa**
2000 - 2004	−2.1	−6.0	35.3*	2.6	0.0	12.5**
2004 - 2008	3.1	−3.5	28.8***	1.7*	−1.6*	10.1***
2008 - 2013	18.0**	8.7**	30.4*	3.6**	3.9*	3.1
2006 - 2013	20.0***	10.6***	35.0**	3.9***	4.0***	3.6*
2004 - 2013	14.9***	6.0**	34.0***	3.2***	2.5**	5.0**

(b) Postgraduate diploma/certificate programmes

	ITE Programmes			*Non-ITE Programmes*		
Period	**All HEIs**	**Contact HEIs**	**Unisa**	**All HEIs**	**Contact HEIs**	**Unisa**
2000 - 2004	19.3*	18.4	19.9	−1.6	−1.6	−10.6
2004 - 2008	−13.3	−18.5*	16.7***	4.6	2.5	48.3**
2008 - 2013	17.9***	12.1***	28.5***	11.3**	2.1	54.3**
2006 - 2013	15.9***	10.7***	26.8***	13.1***	7.1**	39.0**
2004 - 2013	6.6	1.3	24.2***	10.5***	5.8***	42.2**

Figures represent the percentage average annual growth rates in FTEN in ITE and non-ITE (a) undergraduate degree and (b) postgraduate diploma/certificate programmes for the entire public HE system, contact HEIs, and UNISA over the indicated periods and were estimated using the least-squares methodology described in Appendix G. *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.9: FTEN in ITE and non-ITE programmes with and without NSFAS awards (2004 - 2013)

	FTEN in ITE Programmes				*FTEN in Non-ITE Programmes*			
Year	**Without NSFAS**	**With NSFAS**	**% With NSFAS**	**Share of NSFAS[1]**	**Without NSFAS**	**With NSFAS**	**% With NSFAS**	**Share of NSFAS[1]**
2004	10 825	2 404	18.2	9.8	87 817	22 062	20.1	90.2
2005	9 604	2 655	21.7	12.1	92 287	19 300	17.3	87.9
2006	7 518	1 951	20.6	11.1	89 868	15 598	14.8	88.9
2007	8 347	2 603	23.8	13.5	102 071	16 639	14.0	86.5
2008	9 854	2 953	23.1	16.7	102 087	14 692	12.6	83.3
2009	12 448	4 105	24.8	18.1	111 123	18 570	14.3	81.9
2010	15 148	3 684	19.6	18.6	114 478	16 096	12.3	81.4
2011	22 407	6 540	22.6	27.6	117 124	17 142	12.8	72.4
2012	22 100	7 637	25.7	25.2	120 416	22 717	15.9	74.8
2013	20 258	6 245	23.6	27.9	128 575	16 117	11.1	72.1

NOTES: Figures represent the numbers of FTEN in undergraduate and postgraduate ITE programmes and FTEN in non-ITE undergraduate degree and postgradaute diploma/certificate programmes by NSFAS recipiency. [a]Figures represent the respective ITE and non-ITE - shares of all NSFAS awards that are awarded to FTEN in undergraduate degree and postgraduate diploma/certificate programmes.

Table F.10: Estimated average annual growth rates in FTEN in ITE and non-ITE programmes with and without NSFAS awards (2004 - 2013)

Year	*FTEN in ITE Programmes*				*FTEN in Non-ITE Programmes*			
	Without NSFAS	**With NSFAS**	**% With NSFAS**	**Share of NSFAS**[a]	**Without NSFAS**	**With NSFAS**	**% With NSFAS**	**Share of NSFAS**[a]
2000 - 2004	−2.1	108.1***	101.9**	60.4***	−1.1	26.8**	23.9***	−2.3***
2004 - 2008	−3.2	4.0	5.9*	12.5***	4.1***	−9.2***	−10.8***	−1.7**
2008 - 2013	17.7**	19.3**	1.0	11.9***	4.1***	3.3	−0.8	−3.1***
2004 - 2013	12.2**	15.2***	2.1	13.0***	4.4***	−0.7	−4.1*	−2.6***

NOTES: Figures represent the percentage average annual growth rates in FTEN in undergraduate and postgraduate ITE programmes and non-ITE undergraduate degree and postgraduate diploma/certificate programmes for studetns with and without NSFAS awards over the indicated periods as estimated using the least-squares methodology described in G. *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.11: Projected cumulative completion rate (%) schedules in undergraduate and postgraduate ITE programmes at contact HEIs and UNISA (2014 - 2025)

Enrolment year	*Contact HEIs*		*Unisa*	
	Undergraduate	**Postgraduate**	**Undergraduate**	**Postgraduate**
1	2.7	58.4	0.1	13.7
2	4.9	82.1	0.1	47.4
3	9.3	86.1	0.2	68.0
4	58.0	88.5	5.0	77.5
5	68.7	90.3	18.4	82.4
6	71.7	92.0	26.8	85.3
7	72.7	92.2	32.9	87.0
8	73.2	92.3	36.3	88.2
9	73.6	92.3	38.6	88.9
10	73.8	92.4	40.9	89.8

NOTES: Figures denote cumulative completion rates and represent the average estimated completion rates for (a) undergraduate ITE programmes at contact HEIs, (b) postgraduate ITE programmes at contact HEIs, (b) undergraduate ITE programmes at contact UNISA, and (c) postgraduate ITE programmes at UNISA, over the three most recent years of data for which completion rates over the specified time-horizons were estimable in aggregate HEMIS. For the sake of simplicity, the cumulative completion rate after 10 years is assumed to approximate the total cumulative completion rate (See Section 4.5 and G.2).

Table F.12: Projected FTEN and graduations in undergraduate and postgraduate ITE programmes (2014 - 2025)

	FTEN			*Graduations*		
Year	**UG**	**PG**	**All ITE**	**UG**	**PG**	**All ITE**
2014	27 144	6 217	33 361	9 666	5 136	14 802
2015	29 734	6 769	36 502	10 969	5 582	16 552
2016	32 323	7 320	39 644	12 387	6 044	18 431
2017	34 913	7 872	42 785	13 209	6 527	19 736
2018	37 503	8 424	45 927	14 603	7 026	21 630
2019	40 092	8 975	49 068	15 917	7 523	23 440
2020	42 682	9 527	52 209	17 338	8 026	25 364
2021	45 272	10 079	55 351	18 611	8 526	27 137
2022	47 861	10 631	58 492	19 849	9 030	28 879
2023	50 451	11 182	61 633	21 264	9 528	30 792
2024	53 041	11 734	64 775	22 584	10 030	32 613
2025	55 630	12 286	67 916	23 903	10 532	34 434

NOTES: Figures represent projected numbers of FTEN and graduations in undergraduate and postgraduate ITE programmes based on the completion rate schedules in Table F.11 and the methodology described in Sections 4.3.4.3 and G.3.

Table F.13: FTEN and graduations in ITE programmes by gender (2004 - 2013)

	First-time enrolments (FTEN)				*Graduations*			
Year	**Male**	**Female**	**Male (%)**	**Female (%)**	**Male**	**Female**	**Male (%)**	**Female (%)**
2004	3 930	9 299	29.7	70.3	2 991	7 515	28.5	71.5
2005	3 699	8 559	30.2	69.8	1 917	5 709	25.1	74.9
2006	2 889	6 580	30.5	69.5	1 738	5 451	24.2	75.8
2007	3 403	7 547	31.1	68.9	1 586	4 826	24.7	75.3
2008	3 664	9 143	28.6	71.4	1 493	4 666	24.2	75.8
2009	4 600	11 953	27.8	72.2	1 764	5 189	25.4	74.6
2010	5 027	13 804	26.7	73.3	2 131	6 153	25.7	74.3
2011	7 623	21 324	26.3	73.7	2 837	7 703	26.9	73.1
2012	7 651	22 087	25.7	74.3	3 718	9 435	28.3	71.7
2013	7 685	18 818	29.0	71.0	4 253	11 403	27.2	72.8

NOTES: Figures represent the estimated numbers and shares of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmesand other programmes non-ITE undergraduate degree and postgraduate diploma/certificate programmes for males and females respectively.

Table F.14: Average annual growth in FTEN and graduations in ITE programmes by gender

	First-time enrolments (FTEN)				*Graduations*			
Year	**Male**	**Female**	**Male (%)**	**Female (%)**	**Male**	**Female**	**Male (%)**	**Female (%)**
2000 - 2004	3.3**	1.3	3.8	−1.7	0.7	0.5	11.1*	−6.6**
2004 - 2008	1.2	−2.2	−1.6	−0.5	0.2	−14.6**	−10.6**	−3.3
2008 - 2013	−0.9**	17.5***	18.3**	−0.5	0.2	24.8***	20.4***	2.7**
2004 - 2013	−0.2	11.1**	13.5**	−1.5*	0.6*	7.1	6.1	0.7

NOTES: Figures represent the percentage average annual growth rates in the dependent variables over the indicated periods and were estimated using the least-squares methodology described in Appendix G. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.15: FTEN and graduations in ITE programmes by race (2004 - 2013)

	First-time enrolments (FTEN)							
Year	**Black**	**Coloured**	**Asian**	**White**	**Black (%)**	**Coloured (%)**	**Asian (%)**	**White (%)**
2004	8 805	899	540	2 974	66.6	6.8	4.1	22.5
2005	8 053	671	683	2 847	65.7	5.5	5.6	23.2
2006	5 210	598	615	3 040	55.0	6.3	6.5	32.1
2007	6 057	811	596	3 461	55.3	7.4	5.4	31.6
2008	7 500	1 112	702	3 485	58.6	8.7	5.5	27.2
2009	9 910	1 412	906	4 320	59.9	8.5	5.5	26.1
2010	11 315	1 771	983	4 743	60.1	9.4	5.2	25.2
2011	20 721	1 826	1 317	5 055	71.6	6.3	4.6	17.5
2012	21 601	1 704	1 311	5 072	72.6	5.7	4.4	17.1
2013	18 245	1 763	1 541	4 891	68.8	6.7	5.8	18.5
	Graduations							
2004	7 528	462	215	2 282	71.7	4.4	2.0	21.7
2005	4 475	428	241	2 476	58.7	5.6	3.2	32.5
2006	3 718	431	291	2 738	51.7	6.0	4.1	38.1
2007	2 961	425	293	2 733	46.2	6.6	4.6	42.6
2008	2 635	482	378	2 661	42.8	7.8	6.1	43.2
2009	3 061	683	441	2 765	44.0	9.8	6.3	39.8
2010	3 984	931	448	2 911	48.1	11.2	5.4	35.1
2011	5 613	1 027	532	3 312	53.2	9.7	5.0	31.4
2012	7 651	955	673	3 828	58.2	7.3	5.1	29.1
2013	9 399	1 191	770	4 251	60.0	7.6	4.9	27.2

NOTES: Figures represent the estimated numbers and shares of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes and other programmes non-ITE undergraduate degree and postgraduate diploma/certificate programmes for the Black, Coloured, Indian/Asian, and White population groups respectively. Estimated shares of FTEN/graduations may not sum to 100 because of some missing information on the HEMIS *race* variable.

Table F.16: Estimated average annual growth (%) in FTEN and graduations in ITE programmes by race

(a) First-time enrolments (FTEN)

	FTEN				*Racial share of FTEN (%)*			
Period	**Black**	**Coloured**	**Asian**	**White**	**Black (%)**	**Coloured (%)**	**Asian (%)**	**White (%)**
2000 - 2004	−4.2	36.4**	33.1**	25.1	−7.1	32.4***	29.1*	21.4
2004 - 2008	−5.9	6.3	4.0	5.3**	−4.2	8.2	5.8	7.1
2008 - 2013	23.5**	8.6*	16.5***	6.6*	4.6**	−8.0**	−1.4	−9.7**
2004 - 2013	14.6**	13.4**	12.6***	7.7***	1.6	0.5	−0.2	−4.6

(b) Graduations

	Graduations				*Racial share of graduations (%)*			
Period	**Black**	**Coloured**	**Asian**	**White**	**Black (%)**	**Coloured (%)**	**Asian (%)**	**White (%)**
2000 - 2004	4.4	35.1***	3.3	22.2***	−2.9**	25.7**	−3.9	13.6*
2004 - 2008	−22.2**	0.8	14.2***	4.1*	−11.9***	14.1***	29.2***	17.9**
2008 - 2013	31.0***	17.4**	15.3***	10.4***	7.8***	−3.4	−5.1**	−9.2***
2004 - 2013	5.5	13.7***	15.0***	6.1***	−0.8	6.9*	8.1*	−0.2

NOTES: Figures represent the percentage average annual growth rates in the dependent variables over the indicated periods and were estimated using the least-squares methodology described in Appendix G. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.17: FTEN and graduations in ITE programmes by race and gender (2004 - 2013)

(a) First-time enrolments (FTEN)

	Black		*Coloured*		*Asian/Indian*		*White*	
Year	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
2004	2 958	5 846	304	595	92	448	575	2 399
2005	2 814	5 239	214	458	108	575	562	2 285
2006	2 041	3 169	163	435	94	520	589	2 451
2007	2 418	3 639	215	596	84	512	677	2 784
2008	2 609	4 891	351	762	92	611	609	2 876
2009	3 360	6 550	349	1 063	125	781	764	3 556
2010	3 543	7 773	440	1 331	138	845	904	3 839
2011	6 066	14 655	448	1 378	176	1 142	927	4 128
2012	6 140	15 462	409	1 294	158	1 153	924	4 148
2013	6 170	12 075	410	1 353	231	1 310	856	4 035

(b) Graduations

	Black		*Coloured*		*Asian/Indian*		*White*	
Year	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
2004	2 405	5 123	167	296	41	174	373	1 909
2005	1 309	3 166	165	263	43	198	397	2 079
2006	1 132	2 586	131	300	40	251	435	2 304
2007	953	2 008	126	300	37	256	470	2 263
2008	907	1 728	121	362	52	326	412	2 248
2009	1 060	2 001	223	460	57	385	423	2 342
2010	1 319	2 665	242	689	74	375	492	2 419
2011	1 969	3 643	268	759	64	468	521	2 791
2012	2 701	4 950	262	693	99	574	636	3 191
2013	3 120	6 278	278	912	123	647	722	3 529

NOTES: Figures represent the estimated numbers of male and female first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes and other non-ITE undergraduate degree and postgraduate diploma/certificate programmes for the Black, Coloured, Indian/Asian, and White population groups respectively.

Table F.18: Shares of FTEN and graduations in ITE programmes by race and gender (2004 - 2013)

(a) Share of first-time enrolments (FTEN)

	Black		*Coloured*		*Asian/Indian*		*White*	
Year	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
2004	22.4	44.2	2.3	4.5	0.7	3.4	4.3	18.1
2005	23.0	42.7	1.7	3.7	0.9	4.7	4.6	18.6
2006	21.6	33.5	1.7	4.6	1.0	5.5	6.2	25.9
2007	22.1	33.2	2.0	5.4	0.8	4.7	6.2	25.4
2008	20.4	38.2	2.7	5.9	0.7	4.8	4.8	22.5
2009	20.3	39.6	2.1	6.4	0.8	4.7	4.6	21.5
2010	18.8	41.3	2.3	7.1	0.7	4.5	4.8	20.4
2011	21.0	50.6	1.5	4.8	0.6	3.9	3.2	14.3
2012	20.6	52.0	1.4	4.4	0.5	3.9	3.1	13.9
2013	23.3	45.6	1.5	5.1	0.9	4.9	3.2	15.2

(b) Share of graduations

	Black		*Coloured*		*Asian/Indian*		*White*	
Year	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
2004	22.9	48.8	1.6	2.8	0.4	1.7	3.6	18.2
2005	17.2	41.5	2.2	3.5	0.6	2.6	5.2	27.3
2006	15.7	36.0	1.8	4.2	0.6	3.5	6.0	32.0
2007	14.9	31.3	2.0	4.7	0.6	4.0	7.3	35.3
2008	14.7	28.1	2.0	5.9	0.8	5.3	6.7	36.5
2009	15.2	28.8	3.2	6.6	0.8	5.5	6.1	33.7
2010	15.9	32.2	2.9	8.3	0.9	4.5	5.9	29.2
2011	18.7	34.6	2.5	7.2	0.6	4.4	4.9	26.5
2012	20.5	37.6	2.0	5.3	0.8	4.4	4.8	24.3
2013	19.9	40.1	1.8	5.8	0.8	4.1	4.6	22.5

NOTES: Figures represent the estimated shares of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes for males and females from the Black, Coloured, Indian/Asian, and White population groups respectively. Estimated shares of FTEN/graduations may not sum to 100 because of some missing information on the HEMIS *gender* and/or *race* variables.

Table F.19: Estimated average annual growth (%) in FTEN and graduations in ITE programmes by race and gender

(a) First-time enrolments (FTEN)

	Black		*Coloured*		*Asian/Indian*		*White*	
Period	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
2000 - 2004	−3.5	−4.6	28.4**	41.5***	25.1**	35.0**	26.2	24.8
2004 - 2008	−3.9	−7.0	3.0	7.9	−2.5	5.2	3.1	5.8**
2008 - 2013	20.9***	24.7**	3.7	10.5*	17.3***	16.3***	6.8	6.6*
2004 - 2013	12.2**	15.9**	9.1*	15.1**	10.1**	13.0***	6.5***	8.0***

(b) Graduations

	Black		*Coloured*		*Asian/Indian*		*White*	
Period	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
2000 - 2004	−2.1	8.2	27.0***	41.2***	−8.5	6.5	25.0**	21.7***
2004 - 2008	−20.3**	−23.1***	−8.8***	5.5	3.4	16.3***	3.7	4.2*
2008 - 2013	30.8***	31.1***	14.6	18.5***	18.0***	14.9***	12.4***	10.0***
2004 - 2013	7.1	4.8	8.9**	15.9***	13.0**	15.4***	6.4***	6.1***

NOTES: Figures represent the percentage average annual growth rates in the dependent variables over the indicated periods and were estimated using the least-squares methodology described in Appendix G. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.20: FTEN and graduations in ITE programmes by home language (2004 - 2013)

(a) First-time enrolments (FTEN)

	Languages				*African Languages*								
Year	**ALL**	**Afr**	**Eng**	**African**	**Sets**	**Tshiv**	**Xits**	**Xhosa**	**Ndeb**	**Zulu**	**Sotho**	**NSotho**	**Swati**
2004	13 229	2 164	2 625	8 193	783	52	109	99	2 304	3 464	1 022	226	133
2005	12 258	1 836	2 538	7 633	317	204	169	58	1 964	3 807	475	426	212
2006	9 469	1 894	2 627	4 660	532	119	129	55	1 082	1 752	470	198	323
2007	10 950	2 449	2 635	5 676	214	271	190	79	933	2 818	574	234	364
2008	12 807	2 759	3 132	6 720	272	151	170	81	1 173	3 610	509	285	471
2009	16 553	3 491	3 484	9 240	392	183	231	106	1 456	5 220	734	448	470
2010	18 832	3 984	3 756	10 682	548	200	263	111	1 964	5 874	842	377	504
2011	28 947	4 022	4 545	19 781	684	339	395	155	3 764	12 073	1 185	632	555
2012	29 737	3 842	4 704	20 466	863	427	452	220	2 978	12 994	1 221	758	553
2013	26 503	3 492	5 074	17 218	911	509	631	263	2 395	9 412	1 668	711	718

(b) Graduations

	Languages				*African Languages*								
Year	**ALL**	**Afr**	**Eng**	**African**	**Sets**	**Tshiv**	**Xits**	**Xhosa**	**Ndeb**	**Zulu**	**Sotho**	**NSotho**	**Swati**
2004	10 506	1 631	3 112	5 417	899	189	162	84	1 641	1 451	662	257	72
2005	7 626	1 654	2 274	3 489	406	105	89	37	1 012	1 278	366	145	51
2006	7 188	1 866	2 639	2 529	479	67	58	8	890	512	320	143	54
2007	6 413	1 827	2 133	2 294	139	63	38	10	745	913	248	89	49
2008	6 159	1 742	2 009	2 223	164	80	42	22	561	975	208	87	85
2009	6 953	2 028	2 080	2 638	122	77	63	38	687	1 070	291	109	181
2010	8 284	2 181	2 289	3 554	170	156	120	37	704	1 591	393	105	279
2011	10 540	2 557	2 678	5 020	207	241	192	62	926	2 104	720	182	384
2012	13 153	2 737	2 966	6 986	261	254	235	86	1 083	3 593	821	291	363
2013	15 655	3 048	3 376	8 730	422	345	317	95	1 308	4 358	921	471	493

NOTES: Figures represent the estimated number of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes by home language. ALL: all languages; Afri: Afrikaans; Eng: English; African: All African languages; Sets: Setswana; Tshiv: Tshivenda; Xits: Xitsonga; Xhosa: isiXhosa; Ndeb: isiNdebele; Zulu: isiZulu; Sotho: seSotho; NSotho: seSotho sa Lebowa; Swati: siSwati. The figures presented in Afr, Eng, and African columns may not sum to those presented in the ALL column because of individuals who indicated that they spoke other languages or failed to indicate their home language in HEMIS.

Table F.21: Provincial distribution of public HEIs in South Africa and overall shares of enrolments and graduations in ITE and all programmes between 2004 and 2013

	ITE Programmes		**All Programmes**	
Province/HEI	*Enrolments (%)*	*Graduates (%)*	*Enrolments (%)*	*Graduates (%)*
Eastern Cape	**8.26**	**9.86**	**7.98**	**9.28**
WSU	3.52	2.22	2.97	2.60
NMMU	2.80	4.13	3.01	3.85
UFH	1.74	2.69	1.20	1.42
RHODES	0.20	0.83	0.80	1.41
Free State	**4.62**	**6.52**	**4.71**	**5.65**
UFS	2.81	3.82	3.32	3.89
CUT	1.80	2.70	1.40	1.76
Gauteng	**15.85**	**18.13**	**23.77**	**29.37**
TUT	5.55	6.87	6.39	7.07
UP	5.34	5.90	6.29	8.75
WITS	2.86	2.97	3.26	4.08
UJ	2.05	2.25	5.57	7.31
VUT	0.05	0.14	2.26	2.16
KwaZulu-Natal	**13.34**	**17.17**	**10.41**	**12.42**
UZ	7.06	9.44	1.52	1.77
UKZN	4.90	6.58	4.85	5.95
DUT	1.38	1.15	2.83	3.56
MUT	0.00	0.00	1.21	1.14
Limpopo	**1.92**	**2.76**	**3.48**	**3.76**
UNIVEN	1.32	1.76	1.28	1.31
UL	0.60	1.00	2.19	2.45
Northern Cape[1]	N/A	N/A	N/A	N/A
NIHE	N/A	N/A	N/A	N/A
North West	**5.76**	**8.94**	**5.87**	**8.75**
NWU	5.76	8.94	5.87	8.75
Mpumalanga				
Western Cape	**8.49**	**14.12**	**11.38**	**15.98**
CPUT	5.07	7.21	3.66	4.98
US	1.56	3.44	2.95	4.52
UWC	1.53	2.37	1.99	2.33
UCT	0.33	1.10	2.79	4.15
National	**41.78**	**22.49**	**32.39**	**14.79**
UNISA	41.78	22.49	32.39	14.79

NOTES: Figures represent estimated shares of total enrolments and graduations in undergraduate and postgraduate ITE programmes and all programmes for each province/HEI over the period 2004 - 2013. *"All programmes"* include all prediplomate, undergraduate, and postgraduate programmes offered by the public HE system. HEIs are Walter Sisulu University (WSU), Nelson Mandela Metropolitan University (NMMU), University of Fort Hare (UFH), Rhodes University (RHODES), University of the Free State (UFS), Central University of Technology (CUT), Tshwane University of Technology (TUT), University of Pretoria (UP), University of Johannesburg (UJ), Vaal University of Technology (VUT), University of Zululand (UZ), University of KwaZulu-Natal (UKZN), Durban University of Technology (DUT), Mangosuthu University of Technology (MUT), University of Venda (UNIVEN), University of Limpopo (UL), National Institute for Higher Education (NIHE), North West University (NWU), Cape Peninsula University of Technology (CPUT), Stellenbosch University (US), University of the Western Cape (UWC), University of Cape Town (UCT), University of South Africa (UNISA).
[1] HEMIS does not contain any information on the National Institute for Higher Education in the Northern Cape.

Table F.22: FTEN and graduations in ITE programmes by HEI province (2004 - 2013)

(a) First-time enrolments (FTEN) and graduations

	First-time enrolments (FTEN)								*Graduations*							
Year	**UNISA** [a]	**WC**	**EC**	**FS**	**KZN**	**NW**	**GAU**	**LIM**	**UNISA** [a]	**WC**	**EC**	**FS**	**KZN**	**NW**	**GAU**	**LIM**
2004	1 627	1 462	2 035	1 331	3 879	1 037	1 742	116	837	1 064	1 164	914	1 357	2 023	3 052	94
2005	1 941	1 198	1 939	524	4 082	471	1 537	568	892	1 142	985	413	1 496	629	1 986	84
2006	2 387	1 133	1 117	527	1 445	465	2 070	325	1 029	1 140	911	469	1 190	809	1 491	150
2007	3 055	1 326	802	767	1 676	623	2 206	495	1 068	969	943	459	1 391	505	980	98
2008	4 144	1 698	1 004	680	2 107	753	2 255	166	1 253	1 023	634	320	1 269	545	1 008	107
2009	5 925	1 581	1 323	1 086	2 881	943	2 626	188	1 525	1 257	714	442	1 175	510	1 235	95
2010	8 016	2 116	1 535	1 107	1 906	1 244	2 569	340	1 721	1 656	698	431	1 382	622	1 403	371
2011	15 647	1 782	2 609	1 425	2 611	1 189	3 095	589	2 666	1 749	829	834	1 638	708	1 619	498
2012	17 330	1 406	1 862	1 365	2 685	1 514	2 983	592	3 940	1 457	1 051	1 017	2 689	828	1 725	446
2013	12 248	1 572	1 742	798	3 610	1 509	3 511	1 514	5 870	1 599	1 193	732	2 293	1 086	2 269	613

(b) Share of first-time enrolments (FTEN) and graduations (%)

	First-time enrolments (FTEN)								*Graduations*							
Year	**UNISA** [b]	**WC**	**EC**	**FS**	**KZN**	**NW**	**GAU**	**LIM**	**UNISA** [b]	**WC**	**EC**	**FS**	**KZN**	**NW**	**GAU**	**LIM**
2004	12.3	11.1	15.4	10.1	29.3	7.8	13.2	0.9	8.0	10.1	11.1	8.7	12.9	19.3	29.1	0.9
2005	15.8	9.8	15.8	4.3	33.3	3.8	12.5	4.6	11.7	15.0	12.9	5.4	19.6	8.3	26.0	1.1
2006	25.2	12.0	11.8	5.6	15.3	4.9	21.9	3.4	14.3	15.9	12.7	6.5	16.6	11.2	20.7	2.1
2007	27.9	12.1	7.3	7.0	15.3	5.7	20.1	4.5	16.7	15.1	14.7	7.2	21.7	7.9	15.3	1.5
2008	32.4	13.3	7.8	5.3	16.5	5.9	17.6	1.3	20.3	16.6	10.3	5.2	20.6	8.9	16.4	1.7
2009	35.8	9.5	8.0	6.6	17.4	5.7	15.9	1.1	21.9	18.1	10.3	6.4	16.9	7.3	17.8	1.4
2010	42.6	11.2	8.2	5.9	10.1	6.6	13.6	1.8	20.8	20.0	8.4	5.2	16.7	7.5	16.9	4.5
2011	54.1	6.2	9.0	4.9	9.0	4.1	10.7	2.0	25.3	16.6	7.9	7.9	15.5	6.7	15.4	4.7
2012	58.3	4.7	6.3	4.6	9.0	5.1	10.0	2.0	30.0	11.1	8.0	7.7	20.4	6.3	13.1	3.4
2013	46.2	5.9	6.6	3.0	13.6	5.7	13.2	5.7	37.5	10.2	7.6	4.7	14.6	6.9	14.5	3.9

NOTES: Figures represent the estimated numbers and shares of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes by province of contact HEIs location. [a] Includes UNISA which, due to be a distance-education provider, is not located in any single province *per se.* . [b] Represents UNISA's share of FTEN and graduations.

Table F.23: Estimated average annual growth (%) in FTEN and graduations in ITE and non-ITE programmes by HEI province (2004 - 2013)

(a) ITE programmes

	First-time enrolments (FTEN)								*Graduations*							
Year	**UNISA**[a]	**WC**	**EC**	**FS**	**KZN**	**NW**	**GAU**	**LIM**	**UNISA**[a]	**WC**	**EC**	**FS**	**KZN**	**NW**	**GAU**	**LIM**
2000 - 2004	30.2*	7.6*	−3.2	28.4	27.7*	18.2	−21.6**	−23.5	7.4	22.2***	40.0**	56.3	10.0	20.4**	−4.9	−32.6*
2004 - 2008	26.2***	4.1	−20.5**	−9.2	−19.0*	−3.5	9.2**	5.9	10.4***	−2.4	−11.8**	−18.1*	−2.1	−24.7	−25.3**	4.2
2008 - 2013	30.5**	−2.6	13.1*	5.1	8.3	14.9***	8.3***	53.7***	37.0***	8.1*	13.7***	23.2**	17.4**	15.4**	16.0***	47.8**
2004 - 2013	32.3***	3.3	2.9	5.4	0.0	11.9*	8.6***	16.6	23.1***	5.8**	−0.3	4.5	6.5*	−2.3	−1.2	26.2***

(b) Non-ITE undergraduate degree and postgraduate diploma/certificate programmes

	First-time enrolments (FTEN)								*Graduations*							
Year	**UNISA**[1]	**WC**	**EC**	**FS**	**KZN**	**NW**	**GAU**	**LIM**	**UNISA**[1]	**WC**	**EC**	**FS**	**KZN**	**NW**	**GAU**	**LIM**
2000 - 2004	12.3**	5.7**	7.6*	3.6	5.9**	19.2***	−9.4	19.4**	−4.0*	5.6***	0.9	17.6***	4.3***	2.4	7.8***	−4.7
2004 - 2008	10.3***	4.2***	2.2	−2.9**	−15.3**	−0.8	2.4	−2.7	1.0	5.4**	5.7**	2.9*	2.0*	5.2**	5.0***	17.6***
2008 - 2013	4.8	1.1	4.2**	7.3**	6.1	5.6	1.9	7.7*	14.7***	4.4***	8.2***	7.3***	7.4***	7.7***	4.6***	1.0
2004 - 2013	5.8***	2.7***	3.4***	3.6*	0.3	4.4**	3.1***	3.0**	9.9**	4.7***	7.5***	5.2***	4.0**	6.8***	4.3***	7.7**

NOTES: Figures represent the percentage average annual growth rates in the dependent variables over the indicated periods and were estimated using the least-squares methodology described in Appendix G. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.24: Shares of FTEN in ITE programmes between 2004 and 2014 by province of enrolment/HEI and sending province

	Province of FTEN (%)									
Sending Region	**WC**	**EC**	**FS**	**KZN**	**NW**	**GAU**	**LIM**	**UNISA**	**CONT.**[a]	**ALL**[b]
Western Cape	86.09	2.66	1.53	0.03	2.52	0.22	0.01	5.65	13.11	10.10
Eastern Cape	5.00	79.67	4.33	0.41	1.37	0.48	0.04	4.25	13.34	9.67
Northern Cape	3.81	0.20	5.37	0.00	11.92	0.14	0.01	0.84	2.18	1.64
Free State	0.46	0.54	70.61	0.08	7.01	0.80	0.04	1.69	7.33	5.05
KwaZulu-Natal	0.84	12.79	9.04	95.28	4.31	10.24	0.13	55.49	29.54	40.01
North West	0.11	0.30	1.31	0.13	29.37	3.01	1.39	2.10	3.64	3.02
Gauteng	1.06	1.09	2.62	0.52	32.34	58.93	1.44	20.87	17.24	18.70
Mpumalanga	0.19	0.77	1.47	2.44	5.78	11.28	20.77	4.87	4.96	4.92
Limpopo	0.16	0.22	0.33	0.19	2.21	4.03	75.13	2.37	4.70	3.76
Other/Unknown[c]	2.28	1.77	3.38	0.92	3.15	10.87	1.04	1.88	3.96	3.12

NOTES: Figures represent the estimated numbers and shares of first-time enrolments (FTEN) in undergraduate and postgraduate ITE programmes by the provinces where various contact HEIs are located. [a] Includes all contact HEIs that offer ITE programmes. [b] Includes all contact HEIs that offer ITE programmes and UNISA.[c] Represents the percentage of FTEN for which no postal code information is available in HEMIS. The majority of these individuals are not South African residents.

Table F.25: Shares of graduations in ITE programmes between 2004 and 2014 by province of graduation/HEI and sending province

	Province of Graduation (%)									
Sending Region	**WC**	**EC**	**FS**	**KZN**	**NW**	**GAU**	**LIM**	**UNISA**	**CONT.**[a]	**ALL**[b]
Western Cape	82.58	2.41	0.95	0.03	1.98	0.30	0.00	8.44	15.73	14.09
Eastern Cape	5.96	76.04	4.40	0.53	3.82	3.30	0.04	5.17	12.46	10.82
Northern Cape	4.70	0.27	4.11	0.02	8.25	0.58	0.00	1.18	2.33	2.07
Free State	0.52	1.65	74.22	0.07	8.34	1.67	0.00	2.81	7.92	6.77
KwaZulu-Natal	1.30	13.27	3.90	92.61	6.63	9.03	0.16	35.30	25.65	27.82
North West	0.23	0.49	1.38	0.19	25.98	4.43	2.23	2.55	4.37	3.96
Gauteng	1.52	1.97	2.40	0.56	31.12	50.55	1.22	29.30	16.31	19.23
Mpumalanga	0.32	0.60	1.86	2.52	6.12	11.78	15.64	6.20	4.87	5.17
Limpopo	0.35	0.82	0.36	0.55	3.70	7.78	80.18	3.30	5.43	4.95
Other/Unknown[c]	2.53	2.47	6.41	2.92	4.06	10.57	0.53	5.76	4.92	5.11

NOTES: Figures represent the estimated numbers and shares of graduations in undergraduate and postgraduate ITE programmes by the provinces where various contact HEIs are located. [1] Includes all contact HEIs that offer ITE programmes.[2] Represents the percentage of FTEN for which no postal code information is available in HEMIS. The majority of these individuals are not South African residents.

Table F.26: FTEN and graduations in ITE programmes by sending province (2004 - 2013)

(a) First-time enrolments (FTEN) and graduations

	First-time enrolments (FTEN)									*Graduations*								
Year	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**
2004	1 456	2 035	348	1 232	4 598	372	1 892	408	221	929	1 591	298	1 014	2 239	697	1 686	584	665
2005	1 188	1 854	148	509	4 943	185	1 680	532	607	977	1 051	163	440	2 034	292	1 280	315	349
2006	1 163	1 017	126	483	2 694	382	1 953	619	412	1 016	899	186	525	1 537	423	1 404	301	292
2007	1 416	876	173	634	3 458	305	2 316	663	563	942	840	129	413	1 798	209	1 197	218	206
2008	1 704	1 066	231	612	4 674	416	2 351	775	351	1 025	664	103	341	1 640	244	1 341	266	153
2009	1 851	1 407	301	925	6 144	421	3 187	934	532	1 218	706	167	448	1 742	234	1 423	342	190
2010	2 414	1 843	326	1 047	6 887	623	3 395	916	562	1 614	748	163	449	2 165	273	1 601	428	381
2011	2 396	3 027	409	1 346	13 757	758	4 780	1 234	913	1 723	939	210	787	2 955	339	1 930	660	638
2012	2 210	2 308	459	1 276	14 300	995	5 561	1 271	989	1 683	1 178	233	962	4 531	411	2 334	762	752
2013	2 317	1 905	414	999	10 268	960	6 418	1 473	1 593	1 904	1 393	263	882	5 090	543	3 589	906	947

(b) Share of first-time enrolments (FTEN) and graduations (%)

	First-time enrolments (FTEN)									*Graduations*								
Year	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**
2004	11.0	15.4	2.6	9.3	34.8	2.8	14.3	3.1	1.7	8.8	15.1	2.8	9.7	21.3	6.6	16.0	5.6	6.3
2005	9.7	15.1	1.2	4.2	40.3	1.5	13.7	4.3	5.0	12.8	13.8	2.1	5.8	26.7	3.8	16.8	4.1	4.6
2006	12.3	10.7	1.3	5.1	28.4	4.0	20.6	6.5	4.4	14.1	12.5	2.6	7.3	21.4	5.9	19.5	4.2	4.1
2007	12.9	8.0	1.6	5.8	31.6	2.8	21.1	6.1	5.2	14.7	13.1	2.0	6.4	28.0	3.3	18.7	3.4	3.2
2008	13.3	8.3	1.8	4.8	36.5	3.3	18.4	6.0	2.7	16.6	10.8	1.7	5.5	26.6	4.0	21.8	4.3	2.5
2009	11.2	8.5	1.8	5.6	37.1	2.5	19.3	5.6	3.2	17.5	10.2	2.4	6.4	25.1	3.4	20.5	4.9	2.7
2010	12.8	9.8	1.7	5.6	36.6	3.3	18.0	4.9	3.0	19.5	9.0	2.0	5.4	26.1	3.3	19.3	5.2	4.6
2011	8.3	10.5	1.4	4.7	47.5	2.6	16.5	4.3	3.1	16.4	8.9	2.0	7.5	28.0	3.2	18.3	6.3	6.1
2012	7.4	7.8	1.5	4.3	48.1	3.4	18.7	4.3	3.3	12.8	9.0	1.8	7.3	34.5	3.1	17.8	5.8	5.7
2013	8.7	7.2	1.6	3.8	38.7	3.6	24.2	5.6	6.0	12.2	8.9	1.7	5.6	32.5	3.5	22.9	5.8	6.0

NOTES: Figures represent the estimated (a) numbers and (b) shares of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes by students' province of permanent residence (i.e. sending region).

Table F.27: Estimated average annual growth (%) in FTEN and graduations in ITE programmes and non-ITE programmes by sending province

(a) ITE programmes

	First-time enrolments (FTEN)									*Graduations*								
Year	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**
2000 - 2004	23.1**	−0.5	7.5	4.3	21.7	−21.3*	1.5	−18.1	−22.4**	25.0***	17.5***	36.0**	23.1***	21.4	4.3	1.6	3.7	5.1
2004 - 2008	5.0	−18.5*	−6.5	−11.1	−3.2	7.5	7.8*	16.2***	8.9	1.6	−17.9***	−21.0**	−20.1*	−7.2**	−21.6*	−5.1	−17.7	−29.3***
2008 - 2013	6.1*	15.0	13.4**	11.0	22.7*	22.0***	22.3***	13.5***	32.7***	12.5***	16.9***	18.5**	24.3***	28.7***	18.4**	20.7**	29.2***	48.1***
2004 - 2013	8.7**	5.5	11.2	7.3	16.5**	17.0**	16.6***	14.4***	16.8**	9.3***	−0.3	1.9	4.2	10.8*	−0.1	8.5*	10.4	9.2

(b) Non-ITE undergraduate degree and postgraduate diploma/certificate programmes

	First-time enrolments (FTEN)									*Graduations*								
Year	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**
2000 - 2004	7.2***	5.1	4.4	−3.5	10.9*	−5.9	4.9	−9.6	4.4	4.5*	−0.2	4.4	3.6	7.2**	−5.5	7.3**	0.0	0.7
2004 - 2008	4.1**	3.1**	2.3	−1.6*	−5.8**	4.7	4.6**	2.3*	−0.5	6.4***	5.2***	5.8***	1.4	3.6***	6.7***	3.4***	7.9***	15.1***
2008 - 2013	4.2***	5.1**	3.0	4.0*	5.1**	5.0*	5.7***	9.0***	7.7**	6.8***	7.8***	4.7**	6.7***	9.9***	6.4***	7.7**	10.1***	4.4***
2004 - 2013	4.2***	4.4***	3.1**	2.3*	2.3	5.0**	5.2***	6.8***	3.8***	6.6***	7.1***	5.6***	4.1***	6.7***	6.0***	5.4***	9.3***	9.4***

NOTES: Figures represent the percentage average annual growth rates in the dependent variables over the indicated periods and were estimated using the least-squares methodology described in Appendix G. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.28: FTEN and graduations in ITE programmes at UNISA by sending province (2004 - 2013)

(a) First-time enrolments (FTEN) and graduations

	First-time enrolments (FTEN)									*Graduations*								
Year	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**
2004	179	74	16	31	566	36	441	123	55	79	42	8	17	207	47	268	54	34
2005	149	67	22	48	662	61	540	172	92	78	33	12	24	209	31	299	55	48
2006	181	94	18	42	987	70	638	156	78	92	38	8	32	240	39	358	72	45
2007	220	99	29	63	1 397	68	777	205	64	95	67	15	37	252	47	336	68	49
2008	245	116	32	95	2 105	107	872	295	106	137	56	9	37	293	41	427	102	27
2009	364	239	57	124	2 931	134	1 258	430	175	152	52	17	44	416	39	457	119	47
2010	411	411	79	128	4 559	190	1 510	415	207	171	83	20	34	564	37	504	118	36
2011	719	836	109	231	10 140	254	2 307	588	299	208	141	30	102	1 008	61	685	168	91
2012	818	718	122	248	10 787	364	3 074	655	334	357	263	57	95	1 633	85	921	238	119
2013	800	419	125	209	5 993	238	3 674	484	307	386	301	69	162	2 521	105	1 841	296	190

(b) Share of first-time enrolments (FTEN) and graduations (%)

	First-time enrolments (FTEN)									*Graduations*								
Year	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**
2004	11.0	4.5	1.0	1.9	34.8	2.2	27.1	7.6	3.4	9.4	5.0	1.0	2.0	24.7	5.6	32.0	6.5	4.1
2005	7.7	3.5	1.1	2.5	34.1	3.1	27.8	8.9	4.7	8.7	3.7	1.3	2.7	23.4	3.4	33.5	6.2	5.4
2006	7.6	3.9	0.8	1.8	41.4	2.9	26.7	6.5	3.3	8.9	3.7	0.8	3.1	23.3	3.7	34.8	7.0	4.4
2007	7.2	3.2	0.9	2.1	45.7	2.2	25.4	6.7	2.1	8.9	6.3	1.4	3.5	23.6	4.4	31.5	6.4	4.6
2008	5.9	2.8	0.8	2.3	50.8	2.6	21.0	7.1	2.6	10.9	4.5	0.7	3.0	23.4	3.3	34.1	8.1	2.2
2009	6.1	4.0	1.0	2.1	49.5	2.3	21.2	7.3	2.9	10.0	3.4	1.1	2.9	27.2	2.5	29.9	7.8	3.0
2010	5.1	5.1	1.0	1.6	56.9	2.4	18.8	5.2	2.6	9.9	4.8	1.2	2.0	32.8	2.2	29.3	6.9	2.1
2011	4.6	5.3	0.7	1.5	64.8	1.6	14.7	3.8	1.9	7.8	5.3	1.1	3.8	37.8	2.3	25.7	6.3	3.4
2012	4.7	4.1	0.7	1.4	62.2	2.1	17.7	3.8	1.9	9.1	6.7	1.4	2.4	41.4	2.2	23.4	6.0	3.0
2013	6.5	3.4	1.0	1.7	48.9	1.9	30.0	4.0	2.5	6.6	5.1	1.2	2.8	42.9	1.8	31.4	5.0	3.2

NOTES: Figures represent the estimated (a) numbers and (b) shares of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes by students' province of permanent residence (i.e. the sending region) for UNISA.

Table F.29: Estimated average annual growth (%) in FTEN and graduations in ITE and non-ITE programmes at UNISA by sending province

(a) ITE programmes

	First-time enrolments (FTEN)									*Graduations*								
Year	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**
2000 - 2004	178.6***	91.7**	65.2	76.2	213.7*	81.5	137.1**	73.6	84.4	93.8	43.5	5.9	14.2	53.7	79.8	113.4	60.9	23.2
2004 - 2008	10.7*	13.7**	18.1***	28.6***	40.1***	25.8**	18.9***	21.2***	10.0	13.9*	13.7	4.7	22.0**	9.2***	1.6	11.1***	16.0**	−4.3
2008 - 2013	29.0***	34.8	31.0**	20.8**	32.8*	23.1*	34.2***	12.4	24.4**	25.5***	48.3***	50.1***	36.1***	55.5***	24.2**	32.0**	24.8***	47.1***
2004 - 2013	23.3***	33.9***	29.8***	27.1***	40.7***	26.9***	27.5***	20.5***	23.8***	20.6***	27.0***	26.2***	24.1***	32.8***	10.1*	19.8**	21.1***	16.3**

(b) Non-ITE undergraduate degree and postgraduate diploma/certificate programmes

	First-time enrolments (FTEN)									*Graduations*								
Year	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**
2000 - 2004	83.6***	56.8**	88.6**	70.4**	134.5**	87.0**	105.9***	88.0**	89.4*	61.1**	29.1	36.9	29.9	57.4	38.1	44.2	47.7	50.3
2004 - 2008	6.5***	14.3***	7.6***	9.4***	4.8	11.0***	11.5***	8.8**	4.3*	6.3*	−2.4	−1.3	−9.0*	0.3	−6.7	3.1	−3.1	−6.9
2008 - 2013	4.5*	9.7*	5.0*	6.0*	1.3	5.3	9.1**	5.6	3.0	10.6***	17.5***	14.3***	9.7***	15.6***	6.3**	20.0**	12.0***	11.4**
2004 - 2013	5.0***	12.5***	6.5***	7.3***	2.3	8.3**	8.6***	7.0**	1.8	10.1***	9.0**	8.8**	3.1	11.5**	2.8	13.2**	7.9**	5.6*

NOTES: Figures represent the percentage average annual growth rates in the dependent variables over the indicated periods and were estimated using the least-squares methodology described in Appendix G. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.30: FTEN and graduations in ITE programmes by age cohort (2004 - 2013)

(a) First-time enrolments (FTEN) and graduations

	First-time enrolments (FTEN)							*Graduations*						
Year	**All**	**<20**	**20-24**	**25-29**	**30-34**	**35-39**	**40+**	**All**	**<20**	**20-24**	**25-29**	**30-34**	**35-39**	**40+**
2004	13 229	2 530	2 851	1 605	1 979	1 764	2 476	10 506	4	2 139	1 413	2 292	2 266	2 388
2005	12 258	2 807	3 503	1 643	1 445	1 259	1 596	7 626	5	2 285	958	1 253	1 326	1 795
2006	9 469	2 837	2 990	1 605	835	573	628	7 188	3	2 883	1 144	882	962	1 314
2007	10 950	3 769	3 325	1 430	1 048	701	678	6 413	7	2 994	1 006	751	702	953
2008	12 807	4 124	3 702	1 634	1 194	1 054	1 098	6 159	9	3 210	1 060	685	556	637
2009	16 553	5 502	4 669	2 382	1 532	1 161	1 307	6 953	12	3 395	1 327	672	627	921
2010	18 832	5 614	5 308	3 065	1 955	1 336	1 554	8 284	15	4 058	1 703	868	684	956
2011	28 947	7 058	8 344	5 982	3 364	2 191	2 009	10 540	17	5 047	2 475	1 057	777	1 167
2012	29 737	7 316	7 919	6 300	3 551	2 401	2 250	13 153	34	6 142	3 367	1 421	966	1 223
2013	26 503	8 331	7 923	4 340	2 507	1 714	1 687	15 655	35	6 851	4 131	1 919	1 236	1 484

(b) Share of first-time enrolments (FTEN) and graduations (%)

	First-time enrolments (FTEN)						*Graduations*					
Year	**<20**	**20-24**	**25-29**	**30-34**	**35-39**	**40+**	**<20**	**20-24**	**25-29**	**30-34**	**35-39**	**40+**
2004	19.1	21.6	12.1	15.0	13.3	18.7	0.0	20.4	13.4	21.8	21.6	22.7
2005	22.9	28.6	13.4	11.8	10.3	13.0	0.1	30.0	12.6	16.4	17.4	23.5
2006	30.0	31.6	17.0	8.8	6.1	6.6	0.0	40.1	15.9	12.3	13.4	18.3
2007	34.4	30.4	13.1	9.6	6.4	6.2	0.1	46.7	15.7	11.7	10.9	14.9
2008	32.2	28.9	12.8	9.3	8.2	8.6	0.2	52.1	17.2	11.1	9.0	10.4
2009	33.2	28.2	14.4	9.3	7.0	7.9	0.2	48.8	19.1	9.7	9.0	13.2
2010	29.8	28.2	16.3	10.4	7.1	8.3	0.2	49.0	20.6	10.5	8.3	11.5
2011	24.4	28.8	20.7	11.6	7.6	6.9	0.2	47.9	23.5	10.0	7.4	11.1
2012	24.6	26.6	21.2	11.9	8.1	7.6	0.3	46.7	25.6	10.8	7.3	9.3
2013	31.4	29.9	16.4	9.5	6.5	6.4	0.2	43.8	26.4	12.3	7.9	9.5

NOTES: Figures represent the estimated (a) numbers and (b) shares of first-time enrolments (FTEN) and graduations in undergraduate and postgraduate ITE programmes by age cohort.

Table F.31: Estimated average annual growth (%) in FTEN and graduations in ITE programmes by age cohort

(a) ITE programmes

	First-time enrolments (FTEN)						*Graduations*					
Period	**<20**	**20-24**	**25-29**	**30-34**	**35-39**	**40+**	**<20**	**20-24**	**25-29**	**30-34**	**35-39**	**40+**
2000 - 2004	60.3*	31.6***	−2.9	−11.1	−8.7	−6.3	7.0	19.6*	−1.5	1.3	10.6*	10.2**
2004 - 2008	13.6***	4.8	−1.0	−12.5	−14.9	−22.0	23.7**	11.4***	−5.1	−25.4**	−29.2***	−27.9***
2008 - 2013	14.0***	18.2**	27.4*	21.3*	15.7*	12.2*	32.7***	18.0***	32.9***	24.2***	16.7***	16.3***
2004 - 2013	15.3***	14.0***	18.2**	11.2	8.2	4.6	30.9***	13.7***	15.7**	0.4	−5.1	−4.3

(b) Non-ITE undergraduate degree and postgraduate diploma/certificate programmes

	First-time enrolments (FTEN)						*Graduations*					
Period	**<20**	**20-24**	**25-29**	**30-34**	**35-39**	**40+**	**<20**	**20-24**	**25-29**	**30-34**	**35-39**	**40+**
2000 - 2004	3.8	−0.1	0.3	4.9	3.4	4.9	4.7**	5.3**	−2.5	−2.3*	−2.7	1.2
2004 - 2008	1.7	1.2	1.3	5.0	4.1	2.8	3.1**	6.4***	3.4**	−0.2	0.2	2.7*
2008 - 2013	1.7	3.8***	7.7**	6.9**	9.7***	10.3***	−0.3	5.8***	9.9***	8.9***	9.0***	8.8***
2004 - 2013	2.6***	2.9***	4.7**	6.5***	7.8***	7.6**	0.7	5.6***	6.9***	5.7**	6.3**	7.4***

NOTES: Figures represent the percentage average annual growth rates in FTEN and graduations for each age cohort over the indicated periods and were estimated using the least-squares methodology described in Appendix G. * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.32: Completion rates (%) for various ITE programme cohorts (2004 - 2013)

(a) Undergraduate ITE programmes

	Cumulative Completion Rate (%) for each ITE cohort									
Time[a]	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
1	5.4	6.6	4.5	0.7	1.5	0.6	0.8	1.7	0.4	0.2
2	8.9	8.8	7.1	1.9	3.4	1.4	1.5	3.4	0.8	—
3	12.2	15.7	10.4	4.4	6.0	3.2	3.1	6.1	—	—
4	29.7	37.4	31.0	32.0	32.5	33.1	25.4	—	—	—
5	33.2	43.1	35.7	38.9	40.7	45.5	—	—	—	—
6	34.9	45.4	37.8	43.0	44.6	—	—	—	—	—
7	35.7	46.8	39.0	45.7	—	—	—	—	—	—
8	36.2	47.6	40.1	—	—	—	—	—	—	—
9	36.6	48.3	—	—	—	—	—	—	—	—
10	37.0	—	—	—	—	—	—	—	—	—

(b) Postgraduate ITE programmes

	Cumulative Completion Rate (%) for each ITE cohort									
Time[a]	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
1	29.3	32.5	34.7	31.7	31.5	30.3	31.0	32.0	39.3	31.7
2	41.0	49.9	53.2	55.0	58.1	57.1	58.3	60.0	71.3	—
3	44.3	55.6	61.2	63.6	64.9	70.2	71.1	75.3	—	—
4	45.6	57.8	65.7	67.9	70.1	75.4	78.8	—	—	—
5	46.3	59.5	68.7	70.7	72.6	78.9	—	—	—	—
6	46.7	60.4	72.4	72.6	74.4	—	—	—	—	—
7	46.9	61.1	73.1	74.0	—	—	—	—	—	—
8	47.2	61.6	74.0	—	—	—	—	—	—	—
9	47.3	62.1	—	—	—	—	—	—	—	—
10	47.5	—	—	—	—	—	—	—	—	—

NOTES: [a]Number of years following cohort's commencement ($t = 1$ in commencement year). Figures represent the estimated cumulative completion rates for various undergraduate and postgraduate ITE programme commencement cohorts.

Table F.33: Estimated % of ITE programme completers who graduate within t years (2004 - 2013)

(a) Undergraduate ITE programmes

	Estimated % of total completers for each ITE cohort										**Weighted**
Time[a]	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**Average**[b]
1	14.5	13.3	10.4	1.4	3.0	1.0	1.8	3.5	0.7	0.5	3.5
2	23.9	17.8	16.3	3.6	6.5	2.5	3.5	7.0	1.7	—	6.6
3	32.5	31.7	24.1	8.4	11.5	5.6	7.3	12.5	—	—	12.0
4	79.5	75.3	71.7	60.6	62.0	58.2	60.8	—	—	—	63.3
5	88.9	86.8	82.4	73.8	77.7	80.0	—	—	—	—	78.8
6	93.3	91.5	87.3	81.5	85.2	—	—	—	—	—	84.9
7	95.5	94.2	90.1	86.7	—	—	—	—	—	—	88.0
8	96.7	95.9	92.7	—	—	—	—	—	—	—	91.6
9	97.9	97.4	—	—	—	—	—	—	—	—	95.9
10	98.8	—	—	—	—	—	—	—	—	—	97.5

(b) Postgraduate ITE programmes

	Estimated % of total completers for each ITE cohort										**Weighted**
Time[a]	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**Average**[b]
1	61.6	51.8	45.8	41.4	40.8	36.0	35.5	35.8	41.5	37.8	42.5
2	86.0	79.7	70.2	71.7	75.4	68.0	66.8	67.0	75.2	—	73.0
3	93.0	88.7	80.8	83.1	84.1	83.7	81.5	84.1	—	—	85.1
4	95.7	92.2	86.7	88.7	90.9	89.8	90.2	—	—	—	90.8
5	97.1	94.9	90.7	92.3	94.2	94.0	—	—	—	—	93.9
6	98.0	96.3	95.6	94.8	96.5	—	—	—	—	—	96.1
7	98.5	97.4	96.5	96.6	—	—	—	—	—	—	96.9
8	99.0	98.3	97.6	—	—	—	—	—	—	—	98.2
9	99.3	99.1	—	—	—	—	—	—	—	—	98.9
10	99.7	—	—	—	—	—	—	—	—	—	99.3

NOTES: [a]Number of years following cohort's commencement (i.e. the enrolment horizon). Figures represent the estimated percentage of all ultimate completers in a cohort who graduate within a certain number of years after commencing with their programmes. In other words, each cell presents the estimated CCR for the year and cohort in question as a percentage of the estimated total CCR for that cohort. [b]Cohort-weighted average CCR in year t with weights corresponding to the number of individuals in the respective commencement cohorts. Missing cells (CCRs) are imputed using log-linear least-squared regressions on the existing data.

Table F.34: 5-year completion rates (%) for undergraduate ITE programmes (2004 - 2009)

	Commencement ITE cohort					
Group	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
All HEIs	33.2	43.1	35.7	38.9	40.7	45.5
Unisa	16.2	17.2	13.1	13.4	14.6	21.6
Contact HEIs	35.7	49.5	41.4	48.6	51.8	59.1
	Gender					
Male	27.2	33.8	28.3	33.7	37.9	39.5
Female	35.6	46.6	38.5	41.1	41.8	47.7
	Race					
Black	26.7	38.5	31.3	35.8	37.5	42.6
Coloured	39.5	40.5	29.1	34.5	34.0	43.0
Indian	25.4	31.5	34.7	38.5	43.4	45.0
White	49.1	53.2	46.5	45.8	49.7	54.2
	Home Language					
Afrikaans	60.4	55.9	56.5	54.1	57.5	55.2
English	34.7	37.5	37.7	40.4	47.2	48.8
African	47.8	39.2	31.0	34.6	35.1	43.0
	Province of enrolment (Contact HEIs)					
WC	66.3	60.0	40.3	43.6	39.7	63.8
EC	40.5	66.4	31.8	61.7	70.4	62.5
FS	39.6	49.7	62.5	54.9	64.7	62.1
KZN	34.3	46.0	37.5	57.1	66.3	66.3
NW	82.2	73.9	75.2	63.0	62.6	61.9
GAU	21.5	39.7	44.7	36.7	35.6	46.8
LIM	4.3	11.4	31.9	55.6	54.8	67.9
	Age cohort at commencement					
<20	47.3	50.6	45.3	46.6	48.2	54.8
21 - 24	31.1	38.7	30.8	34.6	39.1	44.1
25 - 29	30.5	28.1	24.1	32.0	34.0	36.8
30 - 34	25.6	38.7	30.3	32.5	30.5	35.9
25 - 39	24.1	45.1	34.0	32.1	33.4	37.0
40+	25.9	43.9	34.5	27.0	28.5	31.2

NOTES: Figures represent the estimated percentage of undergraduate ITE students who complete their programmes within 5 years of commencement. All completion rates reported are thus cumulative completion rates. The 2004 and 2009 cohorts respectively represent the first and the last groups of students for whom 5-year CCRs can be estimated using the 2004 - 2013 aggregate HEMIS data.

Table F.35: 3-year completion rates (%) for postgraduate ITE programmes (2004 - 2011)

	Commencement ITE cohort							
Group	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
All HEIs	44.3	55.6	61.2	63.6	64.9	70.2	71.1	75.3
Unisa	56.2	52.4	52.1	53.4	51.8	61.4	60.8	71.1
Contact HEIs	42.1	56.9	66.7	71.2	74.6	77.7	81.9	80.5
	Gender							
Male	39.8	49.4	53.2	54.5	58.1	62.2	62.9	69.7
Female	46.2	58.7	65.3	68.0	67.7	73.8	74.9	78.4
	Race							
Black	32.9	39.9	53.3	51.3	53.1	60.9	64.3	71.3
Coloured	64.5	68.4	59.3	77.5	72.7	82.1	79.6	75.8
Indian	69.0	61.5	61.9	61.6	68.4	71.0	71.6	78.6
White	72.9	76.0	71.2	74.2	74.0	79.1	80.2	84.7
	Home Language							
Afrikaans	72.8	74.0	67.0	69.0	58.1	71.7	72.8	83.8
English	59.2	63.5	60.1	59.9	65.5	63.6	68.2	79.0
African	32.8	39.1	46.4	42.9	43.6	59.3	58.3	69.6
	Province of enrolment (Contact HEIs)							
WC	74.5	78.0	79.2	77.6	70.5	83.2	83.1	86.6
EC	71.4	80.8	81.1	84.1	88.7	85.1	86.6	86.6
FS	33.4	52.0	33.3	60.2	74.4	75.5	77.4	62.4
KZN	52.8	46.2	76.3	76.3	77.0	62.9	80.4	78.4
NW	26.0	73.1	67.5	60.6	78.7	79.9	74.9	81.9
GAU	71.5	38.5	75.4	70.3	76.2	79.9	78.9	78.0
LIM	66.7	31.2	88.5	44.8	62.5	82.2	89.5	92.9
	Age cohort at commencement							
<20	12.9	28.9	7.2	16.7	—	78.9	—	—
21 - 24	79.1	79.9	74.3	79.5	78.3	82.3	83.0	85.4
25 - 29	49.8	57.2	61.4	62.3	61.3	66.4	69.0	75.9
30 - 34	37.0	47.8	57.0	53.8	55.7	62.8	65.6	66.5
25 - 39	39.6	43.2	53.8	54.8	59.6	62.9	60.5	68.6
40+	33.8	41.7	51.5	56.5	59.7	67.7	66.5	66.6

NOTES: Figures represent the estimated percentage of postgraduate ITE students who complete their programmes within 3 years of commencement. All completion rates reported are thus cumulative completion rates. The 2004 and 2011 cohorts respectively represent the first and the last groups of students for whom 3-year CCRs can be estimated using the 2004 - 2013 aggregate HEMIS data.

Table F.36: Disaggregated completion rates (%) for ITE programmes (2004 - 2013)

Group	*4-year Bachelor's degrees*[a]			*Postgraduate diplomas/certificates*[b]			
	4-year CCR	**5-year CCR**	**6-year CCR**	**1-year CCR**	**2-year CCR**	**3-year CCR**	**4-year CCR**
All HEIs	32.3	38.1	40.9	31.3	52.3	60.4	64.6
Unisa	7.4	14.7	21.3	11.8	38.4	56.3	65.7
Other HEIs	39.3	44.6	46.3	42.4	60.2	62.8	64.1
	Gender			*Gender*			
Male	26.2	32.0	34.4	27.8	46.1	53.4	57.6
Female	34.7	40.4	43.4	32.9	55.2	63.7	67.9
	Race			*Race*			
Black	28.5	33.4	35.7	24.3	39.8	48.4	53.5
Coloured	30.3	35.3	37.3	22.5	69.9	73.7	75.4
Indian	27.6	35.1	40.4	29.1	56.3	67.0	71.7
White	41.6	48.9	52.5	46.1	67.1	75.4	78.9
	Home Language			*Home Language*			
Afrikaans	50.7	56.9	60.1	40.3	65.9	69.4	76.5
English	38.4	40.1	43.8	39.6	57.9	62.9	69.3
African	31.5	35.9	35.8	25.2	38.1	48.1	60.5
	Province of enrolment			*Province of enrolment*			
WC	43.2	47.3	48.6	36.3	75.8	78.0	78.8
EC	47.9	50.7	51.6	73.3	81.4	83.1	83.8
FS	38.0	51.4	55.5	33.5	39.5	42.4	44.4
KZN	40.9	45.7	47.4	46.4	59.6	63.4	65.0
NW	61.5	70.3	73.3	36.9	44.6	47.1	48.1
GAU	29.0	34.2	35.8	51.7	65.8	68.0	69.7
LIM	23.4	32.5	35.2	39.5	55.8	57.9	59.9
	Age at commencement			*Age at commencement*			
<20	39.9	47.5	50.3	4.5	8.2	12.8	24.4
21 - 24	28.5	34.8	38.2	56.8	72.9	79.7	83.0
25 - 29	24.7	29.9	33.1	30.1	50.5	61.6	66.9
30 - 34	26.7	30.6	33.8	22.9	42.2	51.3	56.2
25 - 39	29.3	32.3	34.3	20.5	43.1	50.8	55.2
40+	30.3	31.7	33.0	16.2	44.9	51.1	54.3

NOTES: [a]Figures represent the estimated weighted average cumulative percentage of undergraduate ITE students from the 2004 - 2008 cohorts who had completed their programmes within 4, 5, or 6 years after commencement. The 2004 and 2008 undergraduate ITE cohorts respectively represent the first and the last groups of students for whom 6-year completion rates can be estimated using the 2004 - 2013 aggregate HEMIS data. [b]Figures represent the estimated weighted average cumulative percentage of postgraduate ITE students from the 2004 - 2010 cohorts who had completed their programmes within 1,2,3, and 4 years after commencement. The 2004 and 2010 postgraduate ITE cohorts respectively represent the first and the last groups of students for whom 4-year completion rates can be estimated using the 2004 - 2013 aggregate HEMIS data.

Table F.37: Estimated absolute ITE programme completion rate differentials (pp difference)

	UG ITE Programmes[a]			*PG ITE Programmes*[b]		
	CCR (4)	**CCR (5)**	**CCR (6)**	**CCR (2)**	**CCR (3)**	**CCR (4)**
Unisa	−53.1***	−49.7***	−47.4***	−33.8***	−20.0***	−11.1**
Female	8.5***	8.1***	5.7***	5.8***	7.5***	9.0***
Coloured	0.4	1.2	5.8	9.1***	0.8	8.6
Asian	3.9**	7.6**	9.5***	12.6***	10.2***	13.5***
White	11.3***	16.5***	17.9***	11.3***	14.1***	19.7***
Afrikaans	7.2***	4.3	9.2**	8.8***	2.7	−7.4*
English	6.8***	4.4	8.6***	5.7***	1.1	−8.2**
<20	−1.7*	1.6	6.3***	−15.4	−16.9	−25.2**
25-29	3.3***	1.2	0.3	−7.4***	−6.0***	−7.0***
30-34	4.6***	2.6*	4.2**	−14.2***	−14.0***	−13.5***
35-39	4.3***	3.4*	1.5	−15.5***	−15.5***	−15.4***
40+	4.8***	0.2	−0.8	−16.3***	−19.9***	−20.9***
Observations[c]	7 489	3 647	1 804	6 452	2 394	1 271
Adjusted R^2	0.57	0.55	0.58	0.41	0.35	0.34

NOTES: [a]Columns respectively show estimation results using 4-year, 5-year, and 6-year completion ratesamong all 2004 - 2010, 2004 - 2009, and 2004 - 2008 undergraduate ITE cohorts. [b]Columns respectively show estimation results using 2-year, 3-year, and 4-year completion rates among the 2004 - 2013, 2004-2012, and 2004-2011 postgraduate ITE cohorts. [c]Each observation included in the regression(s) corresponds to a distinct ITE cohort as constituted by unique combinations of the following time-invariant variables in aggregate HEMIS: *gender*, *race*, *HEI type*, *qualification type*, *home language*, *age at commencement*, and *year of program commencement*. All regressions are estimated using weighted least squares with weights equal to the size of the respective cohorts in terms of total initial enrolment in the commencement year. Regressions include additional controls for the *commencement year*, *qualification type,* and *HEI* (not shown). Estimates represent the percentage point differences relative to the respective reference categories. Reference categories are: *Institution type* (Contact HEIs); *Race* (Black); *Home language* (African languages); *Gender* (Male); *HEI type (traditional universities); Age cohort at commencement* (20 - 24). *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

Table F.38: Estimated relative ITE programme completion rate differentials (% difference)

	UG ITE Programmes[a]			*PG ITE Programmes*[b]		
	CCR (4)	**CCR (5)**	**CCR (6)**	**CCR (2)**	**CCR (3)**	**CCR (4)**
Unisa	−91.0***	−75.4***	−71.9***	−44.0***	−27.5***	−16.1**
Female	26.8***	20.1***	13.9***	11.6***	14.1***	15.7***
Coloured	7.6	8.2	25.6**	16.1***	0.9	15.0
Asian	24.2***	28.0***	47.1***	23.4***	16.9***	25.2***
White	45.3***	54.9***	75.6***	20.3***	24.0***	37.3***
Afrikaans	17.2***	3.7	11.3	19.0***	4.8	−12.8*
English	19.3***	8.3	17.1**	14.5***	3.3	−13.1**
<20	−6.8***	−0.1	9.6**	−21.7	−26.9	−40.0
25-29	8.7**	−1.2	−9.5	−10.0***	−8.2***	−8.9***
30-34	13.6***	0.8	0.7	−22.4***	−20.5***	−18.2***
35-39	14.5***	4.3	−10.1	−24.4***	−22.6***	−20.5***
40+	16.1***	−7.9	−20.1*	−25.0***	−29.0***	−28.2***
Observations[3]	7 489	3 647	1 804	6 452	2 394	1 271
Log-likelihood	= 569 993	= 345 453	= 174 553	= 272 572	= 117 457	−62 518

NOTES: [a]Columns respectively show estimation results using 4-year, 5-year, and 6-year completion rates among all 2004 - 2010, 2004 - 2009, and 2004 - 2008 undergraduate ITE cohorts. [b]Columns respectively show estimation results using 2-year, 3-year, and 4-year completion rates among the 2004 - 2013, 2004-2012, and 2004-2011 postgraduate ITE cohorts. [c]Each observation included in the regression(s) corresponds to a distinct ITE cohort as constituted by unique combinations of the following time-invariant variables in aggregate HEMIS: *gender*, *race*, *HEI type*, *qualification type*, *home language*, *age at commencement*, and *year of program commencement*. All regressions are estimated using weighted poisson regression (see Cameron and Trivedi (2009:558 - 562)) with weights equal to the size of the respective cohorts in terms of total initial enrolment in the commencement year. Regressions include additional controls for the *commencement year*, *qualification type,* and *HEI type* (not shown). All coefficients represent estimated percentage differences relative to the respective reference categories. Reference categories are: *Institution type* (Contact HEIs); *Race* (Black); *Home language* (African languages); *Gender* (Male); *HEI type (traditional universities); Age cohort at commencement* (20 - 24). *Significant at the 10% level **Significant at the 5% level *** Significant at the 1% level. Significance levels are based on robust standard errors.

G Chapter 4: Methodology

G.1 Calculating growth rates[2]

G.1.1 Total growth

Total growth is calculated via the standard formula as

$$\%\Delta Y_{t-0} = \frac{(Y_t - Y_0)}{Y_0} \times \frac{100}{1}$$

where $\%\Delta Y_{t-0}$ is the percentage change in the dependent variable, Y, between periods 0 and t, and Y_t and Y_0 are the values taken by Y at the end of periods t and 0, respectively, for all $t > 0$.

G.1.2 Average annual growth rate

There are several way of calculating the average growth rate of a series over a particular period. The approach used throughout this chapter is to estimate the average annual least-squares growth rate by fitting a simple linear regression trend line to the logarithmic value of the dependent variable over the period in question. This approach is based on the compound growth fomula:

$$Y_t = Y_0 (1 + r)^t \tag{4}$$

where r is the compound growth rate and Y_t and Y_0 are the values of the dependent variable, Y, at the end of periods t and 0, respectively, for all $t > 0$. Taking logs of this expression yields

$$\ln Y_t \quad = \quad \ln Y_0 + t \ln (1 + r) \tag{5}$$

Letting $\alpha = \ln Y_0$ and $\beta = \ln (1 + r)$ and including an additive contemporaneous error term, ε_t, expression (5) reduces to an estimable function

$$\ln Y_t = \alpha + \beta t + \varepsilon_t \tag{6}$$

Estimating this equation via ordinary least squares will yield an estimate of the compound growth rate that can be expressed as

$$\left(e^{\hat{\beta}} - 1\right) \times \frac{100}{1} \quad = \quad \frac{Y_t - Y_0}{Y_0} \times \frac{100}{1} = \%\triangle Y \tag{7}$$

Since least-squares growth rates consider all of the data points in a series, they are less sensitive to the end-points chosen than standard compound growth rate formulas that consider only the starting point and end point of a data series (Pritchett, 2000:5).

[2] See Gujarati (2003:178 - 181)

G.2 Estimating completion rates

G.2.1 Defining marginal and cumulative completion rates

The marginal completion rate (MCR) for any programme commencement cohort, c, in year t is equal to the percentage of individuals from cohort c who successfully complete their programmes in year t. The cumulative completion rate (CCR) for any programme commencement cohort, c, in year t is equal to the cumulative percentage of all individuals from cohort c who have successfully completed their programmes between the commencement year and the end of year t.

G.2.2 Formally defining MCR, CCR, AMCR, ACCR, and TACCR

The marginal completion rate in year t for any commencement cohort c, $\forall\ c \leq t$, is calculated as

$$MCR_{c,t} = \frac{G_{c,t}}{N_{c,t=c}} \times \frac{100}{1}$$

where $G_{c,t}$ is the number of graduations for commencement cohort c in year t and $N_{c,t=c}$ is the total enrolment for (i.e. the size of) cohort c in year $t = c$ (i.e. the total initial enrolment in the commencement year).

The cumulative completion rate (CCR) after T years for any commencement cohort c, where $c \leq T$, is simply the sum of all the respective MCRs for the cohort up to that point and is calculated as

$$\begin{aligned} CCR_{c,T} &= \sum_{t=1}^{T} MCR_{c,t} \\ &= \frac{1}{N_{c,t=c}} \sum_{t=1}^{T} G_{c,t} \times \frac{100}{1} \end{aligned}$$

The total cumulative completion rate (TCCR) for any commencement cohort, c, is the CCR for the year beyond which no further individuals from the cohort complete their programmes,i.e.

$$TCCR = CCR_{c,T} \quad \text{iff} \quad MCR_{c,r} = 0\ \forall\ r > T$$

In some instances, it may be useful to estimate the average CRs for two or more cohorts. The average marginal completion rate (AMCR) in year t for any group of commencement cohorts in the set $[c, C]$, $c \leq C \leq t$, is calculated as

$$AMCR_{C,t} = \sum_{c=1}^{C} MCR_{c,t} \cdot W_c$$

where the cohort weight,W_c, is equal to the size of cohort c expressed as a proportion of the initial total enrolment for all cohorts $c \in C$ such that

$$W_c = \frac{N_{c,t=c}}{\sum_{c=1}^{C} N_{c,t=c}} \ni \sum_{c=1}^{C} W_c = 1$$

The average cumulative completion rate (ACCR) after T years for any set of cohorts, $[c, C]$, where $c \leq C \leq T$, is simply the sum of all the respective AMCRs for those cohorts up to that point and is calculated as

$$\begin{aligned} ACCR_{C,T} &= \sum_{t=1}^{T} AMCR_{c,t} \\ &= \sum_{t=1}^{T}\sum_{c=1}^{C} MCR_{c,t} \cdot W_c \end{aligned}$$

Lastly, the total average cumulative completion rate (TACCR) for any set of cohorts, $[c, C]$, $c \leq C \leq T$, is the ACCR for the year beyond which no further individuals from the cohort complete their programmes,i.e.

$$TACCR = ACCR_{c,T} \quad \text{iff} \quad AMCR_{c,r} = 0 \; \forall \; r > T$$

G.3 Projecting ITE graduate numbers

G.3.1 Estimating the number of graduates in any year based on FTEN and marginal completion rates (MCR)

		Commencement Cohort						
Time	**Year**	$\boldsymbol{t-\tau}$	$\boldsymbol{\cdots}$	$\boldsymbol{t-4}$	$\boldsymbol{t-3}$	$\boldsymbol{t-2}$	$\boldsymbol{t-1}$	$\boldsymbol{t}$
$\tau+1$	$t-\tau$	$G_{t-\tau,1}$	$\cdots$	$-$	$-$	$-$	$-$	$-$
$\vdots$	$\vdots$	$\vdots$	$\cdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
5	$t-4$	$G_{t-\tau,2}$	$\cdots$	$G_{t-4,1}$	$-$	$-$	$-$	$-$
4	$t-3$	$G_{t-\tau,3}$	$\cdots$	$G_{t-4,2}$	$G_{t-3,1}$	$-$	$-$	$-$
3	$t-2$	$G_{t-\tau,4}$	$\cdots$	$G_{t-4,3}$	$G_{t-3,2}$	$G_{t-2,1}$	$-$	$-$
2	$t-1$	$G_{t-\tau,5}$	$\cdots$	$G_{t-4,4}$	$G_{t-3,3}$	$G_{t-2,2}$	$G_{t-1,1}$	$-$
1	t	$G_{t-\tau,6}$	$\cdots$	$G_{t-4,5}$	$G_{t-3,4}$	$G_{t-2,3}$	$G_{t-1,2}$	$G_{t,1}$

The number of students who graduate in year t is given by the sum of all graduations for each of the commencement cohorts, $c \in [t-\tau, t]$, who are still enrolled in year t:

$$\begin{aligned} G_t &= G_{t,1} + G_{t-1,2} + \ldots + G_{t-\tau,\tau+1} \\ &= \sum_{i=1}^{\tau+1} G_{t+1-i,i} \end{aligned} \tag{8}$$

where $G_{c,t-c+1}$ is the number of graduations for commencement cohort c after $t-c+1$ years and $t-\tau$ denotes the oldest commencement cohort still enrolled in year t, $\tau \geq 0$. As explained above, the number of individuals from any given commencement cohort, c, who graduate in year t is a function of the number of FTEN in the cohort commencement year and the cohort-specific marginal completion rate after $t-c+1$ years:

$$G_{c,t} = MCR_{c,t-c+1} \cdot N_c$$

where N_c is the total enrolment for cohort c in year c (i.e. the total initial enrolment in the commencement year) which, in principal, should be equal to the number of FTEN among cohort c in year c. The expression

can thus be rewritten as

$$G_{c,t} = MCR_{c,t-c+1} \cdot FTEN_c \tag{9}$$

Substituting equation (9) into (15) yields

$$\begin{aligned} G_t &= MCR_{t,1} \cdot FTEN_t + MCR_{t-1,2} \cdot FTEN_{t-2} + \ldots + MCR_{t-\tau,\tau+1} \cdot FTEN_{t-\tau} \\ &= \sum_{i=1}^{\tau+1} MCR_{t+1-i,i} \cdot FTEN_{t+1-i} \end{aligned} \tag{10}$$

G.3.2 Projecting ITE graduations

Given equation (17) , it is possible to estimate the number of graduates in any year if two sets of quantities are known: (1) the numbers of FTEN for all commencement cohorts who are still enrolled and (2) the marginal completion rate schedules for all of the commencement cohorts who are still enrolled.

The number of graduations in year $t+1$, for example, can be expressed as

$$\begin{aligned} G_{t+1} &= MCR_{t+1,1} \cdot FTEN_{t+1} + MCR_{t,2} \cdot FTEN_t + \ldots + MCR_{t-\tau,\tau} \cdot FTEN_{t-\tau} \\ &= \sum_{i=-1}^{\tau} MCR_{t-i,t+1} \cdot FTEN_{t-i} \end{aligned} \tag{11}$$

This expression contains two sets of unknown quantities: the number of FTEN in year $t+1$ and the MCRs for commencement cohorts $t-\tau$ to $t+1$. However, by making two assumptions, these quantities can be estimated.

Assumption 1: FTEN changes linearly over time such that FTEN in year $t+1$ can be approximated by FTEN in year t plus some constant

$$\hat{FTEN}_{t+1} = FTEN_t + r \tag{12}$$

$$\therefore \hat{FTEN}_{t+i} = FTEN_t + ir \; \forall \; i \geq 0 \tag{13}$$

where r is some estimable constant (via least-squares estimation)

Assumption 2: The marginal completion rates schedule is constant across commencement cohorts such that

$$MCR_{t+1,i} = MCR_{t,i} = \ldots = MCR_{t-\tau,i} = MCR_i \; \forall \; i \geq t-\tau \tag{14}$$

Using (12) and (14), equation (11) reduces to an estimable quantity:

$$\begin{aligned} \hat{G}_{t+1} &= MCR_1 \cdot \hat{FTEN}_{t+1} + MCR_2 \cdot FTEN_t + \ldots + MCR_\tau \cdot FTEN_{t-\tau} \\ &= MCR_1 \cdot (FTEN_t + r) + MCR_2 \cdot (FTEN_{t-1} + r) + \ldots + MCR_\tau \cdot (FTEN_{t-\tau-1} + r) \\ &= \sum_{i=-1}^{\tau} MCR_i \cdot (FTEN_{t-i-1} + r) \end{aligned}$$

The number of students who graduate in year t is given by the sum of all graduations for each of the com-

mencement cohorts who are still enrolled in year t:

$$\begin{aligned} G_t &= G_{t,t} + G_{t-1,t} + \ldots + G_{t-\tau,t} \\ &= \sum_{i=0}^{\tau} G_{t-i,t} \end{aligned} \tag{15}$$

where $G_{c,t}$ is the number of graduations for commencement cohort c in year t and $t-\tau$ denotes the oldest commencement cohort still enrolled in year t, $\tau \geq 0$. As explained above, the number of individuals from any given commencement cohort, c, who graduate in year t is a function of the number of FTEN in the cohort commencement year and the cohort-specific marginal completion rate after $t-c+1$ years:

$$G_{c,t} = MCR_{c,t-c+1} \cdot N_c$$

where N_c is the total enrolment for cohort c in year c (i.e. the total initial enrolment in the commencement year) which, in principal, should be equal to the number of FTEN among cohort c in year c. The expression can thus be rewritten as

$$G_{c,t} = MCR_{c,t-c+1} \cdot FTEN_c \tag{16}$$

Substituting equation (16) into (15) yields

$$\begin{aligned} G_t &= MCR_{t,1} \cdot FTEN_t + MCR_{t-1,2} \cdot FTEN_{t-1} + \ldots + MCR_{t-\tau,\tau} \cdot FTEN_{t-\tau} \\ &= \sum_{i=0}^{\tau} MCR_{t-i,t-(t-i)+1} \cdot FTEN_{t-i} \end{aligned} \tag{17}$$

G.3.3 Projecting ITE graduations

Given equation (17) , it is possible to estimate the number of graduates in any year if two sets of quantities are known: (1) the numbers of FTEN for all commencement cohorts who are still enrolled and (2) the marginal completion rate schedules for all of the commencement cohorts who are still enrolled.

The number of graduations in year $t+1$, for example, can be expressed as

$$\begin{aligned} G_{t+1} &= MCR_{t+1,1} \cdot FTEN_{t+1} + MCR_{t,2} \cdot FTEN_t + \ldots + MCR_{t-\tau,\tau} \cdot FTEN_{t-\tau} \\ &= \sum_{i=-1}^{\tau} MCR_{t-i,t+1} \cdot FTEN_{t-i} \end{aligned} \tag{18}$$

This expression contains two sets of unknown quantities: the number of FTEN in year $t+1$ and the MCRs for commencement cohorts $t-\tau$ to $t+1$. However, by making two assumptions, these quantities can be estimated.

Assumption 1: FTEN changes linearly over time such that FTEN in year $t+1$ can be approximated by FTEN in year t plus some constant

$$\hat{FTEN}_{t+1} = FTEN_t + r \tag{19}$$

$$\therefore \hat{FTEN}_{t+i} = FTEN_t + ir \;\forall\; i \geq 0 \tag{20}$$

where r is some estimable constant (via least-squares estimation)

Assumption 2: The marginal completion rates schedule is constant across commencement cohorts such that

$$MCR_{t+1,i} = MCR_{t,i} = \ldots = MCR_{t-\tau,i} = MCR_i \; \forall \; i \geq t - \tau \tag{21}$$

Using (19) and (21), equation (18) reduces to an estimable quantity:

$$\begin{aligned}
\hat{G}_{t+1} &= MCR_1 \cdot \hat{FTEN}_{t+1} + MCR_2 \cdot FTEN_t + \ldots + MCR_\tau \cdot FTEN_{t-\tau} \\
&= MCR_1 \cdot (FTEN_t + r) + MCR_2 \cdot (FTEN_{t-1} + r) + \ldots + MCR_\tau \cdot (FTEN_{t-\tau-1} + r) \\
&= \sum_{i=-1}^{\tau} MCR_i \cdot (FTEN_{t-i-1} + r)
\end{aligned}$$

H Chapter 4: Variable Definitions, Classifications, and supplementary tables

H.1 Variable/group definitions

H.1.1 First-time enrolments (FTEN)

A large part of the focus in this chapter is on the number of individuals who enter teacher training programmes at HEIs for the first time. While some of these individuals will have been new entrants to the public HE system at the time of registration, others may previously have been registered for other undergraduate or postgraduate academic programmes at university. In this chapter, first-time enrolments (FTEN) thus include all individuals enrolling in specific academic programmes for the first time, regardless of whether or not they are first-time entrants to the public HE system. This has important practical implications, as it implies that FTEN must include what HEMIS defines as *first-time entering students* and as *entering students*.[3] DOE (2014:GLOSSARY) defines these two groups of students as follows:

> "A *first-time entering undergraduate or prediplomate student* is (a) effectively registered in the collection period for an undergraduate or prediplomate course and (b) in the past has not been effectively registered in any higher education course at the institution or any other higher education institution. A *first-time entering postgraduate or postdiplomate* student is (a) effectively registered in the collection period for a postgraduate or postdiploma course and (b) in the past has not been effectively registered for a postgraduate or postdiploma course at the institution or at any other higher education institution."
>
> "An *entering undergraduate or prediplomate student* is (a) effectively registered in the reporting period for an undergraduate qualification, (b) has been effectively registered at some time in the past at the institution for some higher education course, but (c) is now effectively registered for a qualification which he/she has not followed at any time in the past at the institution. An *entering postgraduate or postdiplomate student* is (a) effectively registered in the reporting period for a postgraduate degree or postgraduate diploma or postdiploma diploma, (b) has been effectively registered at some time in the past at the institution for some higher education course, but (b) is following a qualification for which he/she has not been effectively registered at any time in the past at the institution."

H.1.2 *Year of attendance* and *qualification commencement year (QCY)*[4]

The HEDA version of HEMIS includes information on each student's *year of attendance* (HEMIS element number 572). This derived variable is calculated as the calendar year in which a student is enrolled for a qualification, minus the year in which they commenced the qualification at the HEI, plus 1. The presence of

[3] Some students who transfer between HEIs may be entering new programmes at the institutions to which they transfer. However, as it is not possible to distinguish between such students and those who transfer and continue with programmes for which they were previously enrolled in the aggregate HEMIS data, the category of *transfer students* is excluded from the definition of FTEN in this chapter.

[4] See http://41.72.139.116/Valpac_Help/Ded_001_010.htm#E009

both the *year of attendance* and the *calendar year* in which a student is enrolled for a qualification means that it is possible to derive the original qualification commencement year (QCY) as:

$$\text{QCY}_{i,q,h} = \text{Current Year}_{i,q,h} - \text{Attendance Year}_{i,q,h} + 1$$

for each individual i, studying towards qualification q at HEI h. The QCY variable thus reflects the year in which an individual first commenced the qualification towards which they are presently studying at the current HEI. In other words, the QCY is individual-, qualification-, and institution-specific. This means that there is at least one distinct group of students for whom the recorded QCY may not equate to the year in which they first started studying towards a qualification: transfer students. If a student commenced with a qualification at one HEI and, after at least one year of studies, transferred to another HEI and continued studying towards the same qualification, their recorded QCY in the records of the new HEI will not be their recorded QCY in the records of the original HEI even if the course credits they acquired at the original HEI were transferred to the new HEI.

H.1.3 Identifying cohorts using the *qualification commencement year* variable

Ignoring the possibility of data reporting and/or capturing errors, the following variable fields in aggregate HEMIS should be invariant over time within each commencement cohort: *commencement year*, *age at commencement*, *gender*, *race/population group*, *home language, HEI*, *province of enrolment*, *qualification type*, and *broad field of study (cesm1)*. Other variable fields, including *entrance category, residential postal code*, and *NSFAS recipiency-status*, may change over time and thus cannot be used when identifying cohorts. Ultimately, cohorts are constituted by each unique combination of the variables in the aforementioned set of time-invariant fields.

H.1.4 Sending region

HEIs capture students' permanent residential addresses when they formally register for academic programmes. To ensure that these addresses reflect where students originally come from, HEMIS explicitly requires that the permanent residential address submitted by HEIs may not be the same as the student's semester or term address (DOE, 2014:DATA ELEMENTS 011 TO 020). The postal codes associated with students' permanent residential addresses is available in aggregate HEMIS and can thus be used to determine the provinces where students come from (i.e. their sending regions).

Table H.1: Availability of permanent residential postal code information for ITE FTEN and graduates (2004 - 2013)

	% of ITE (2004 - 2013)	
	FTEN	**Graduations**
SA resident (Postal code)	96.91	94.95
SA resident (No postal code)	1.38	1.14
Non-SA resident (No postal code)	1.71	3.90

Table H.1 shows that, between 2004 and 2013, residential postal codes were available for approximately 97% of FTEN and 95% of graduations in ITE programmes. The majority of the missing postal code information was for individuals who were either not South African citizens (and therefore had no permanent residents), or individuals whose permanent residences were outside of South Africa.

H.2 Classification tables

Table H.2: Potential classification of various TEQs under the HEMIS qualification type scheme

	HEMIS qualification type	**Teacher Education Qualification(s)**
01	Undergraduate Diploma or Certificate (3 yrs)	National Professional Diploma in Education (NPDE) Further Diploma in Education (FDE) Higher Diploma in Education (HDE) Advanced Certificate in Education (ACE) National Diploma in Education (NDE)
11	Undergraduate Diploma or Certificate (1 or 2 yrs)	Advanced Certificate in Education (ACE) National Professional Diploma in Education (NPDE) Higher Diploma in Education (HDE)
03	Professional First Bachelor's Degree (4 yrs or more)	Bachelor of Education (BEd)
04	Post-graduate Diploma or Certificate	Postgraduate Certificate in Education (PGCE) Further Diploma in Education (FDE) Higher Diploma in Education (HDE) Advanced Certificate in Education (ACE)
05	Post-graduate Bachelor's Degree	Bachelor of Education (BEd)
21	National Certificate	Advanced Certificate in Education (ACE)
22	National Higher Certificate	Advanced Certificate in Education (ACE) National Diploma in Education (NDE)
23	National Diploma	National Professional Diploma in Education (NPDE) National Diploma in Education (NDE) Advanced Certificate in Education (ACE)
24	Post-diploma Diploma	National Professional Diploma in Education (NPDE) Advanced Certificate in Education (ACE) Higher Diploma in Education (HDE)
25	National Higher Diploma	Advanced Certificate in Education (ACE) National Higher Diploma in Education (NHDE) Postgraduate Certificate in Education (PGCE) Bachelor of Education Honours (BEdHons)
26	Baccalaureus Technologiae Degree	Baccalaureus Technologiae in Education (BTech) Bachelor of Education Honours (BEd) Bachelor of Education Honours (BEdHons)
42	Advanced Certificate	Advanced Certificate in Education (ACE)
43	Diploma	National Professional Diploma in Education (NPDE)
45	Bachelor's Degree (360 credits)	Bachelor of Education (BEd)
46	Bachelor's Degree (480 credits)	Bachelor of Education (BEd)
47	Postgraduate Diploma	Postgraduate Certificate in Education (PGCE)

SOURCE: DOE (2008)

Table H.3: Classification of Educational Subject Matter level 2 (CESM2) codes and descriptions for CESM1 = "Education" (07)

CESM2 codes and descriptions before 2010[a]		*CESM2 codes and descriptions from 2010 onwards*[b]	
Code	**Description**	**Code**	**Description**
07.01	Foundations Of Education	07.01	Education, General
07.02	Educational Administration	07.02	Curriculum And Instruction
07.03	Systems Of Education	07.03	Educational Management And Leadership
07.04	Teaching - Subject Matter	07.04	Educational/Instructional Media Design
07.05	Teaching - Programmes	07.05	Educational Assessment, Evaluation And Research
07.06	Teacher Training	07.06	International And Comparative Education
07.07	Counselling And Guidance	07.07	Social And Philosophical Foundations Of Education
07.08	Special Education Programmes	07.08	Special Needs Education
07.09	Community Service	07.09	Counsellor Education And Guidance Services
07.10	Educational Development	07.10	Teaching Education And Professional Development, Specific Levels And Methods
07.11	Educational Evaluation And Research	07.11	Teacher Education And Professional Development, Specific Subject Areas, Early Childhood Development (Ecd) And General Education And Training (Get)
07.12	Educational Technology And Media	07.12	Teacher Education And Professional Development, Specific Subject Areas,Further Education And Training (Fet)
07.99	Other Education (Specify)	07.99	Education, Other

SOURCE: [a] Erens *et al.* (1982:34 - 36). [b] DOE (2008:14 - 16).

H.3 CESM and fractional counts

Tables H.4 and H.5 provide a hypothetical illustration of how the classification of specific HE qualifications under the CESM scheme gives rise to fractional counts and how the structure of the aggregate HEMIS data differs from the unit-record structure of original HEMIS. The table shows data for 5 hypothetical students, 3 of whom are enrolled for teacher education qualification (TEQ) programmes. Only one of these students graduates with a TEQ in the period under consideration. However, the aggregate HEMIS data contains no identifiable information on the unit-records. The only available information with which to identify TEQs comes from the CESM1 field. To estimate the number of enrolments and graduates in TEQs from the aggregate HEMIS data, one therefore sums all of the fractional counts associated with a CESM1 value of 07 (Education):

$$\begin{aligned} \text{Estimated Enrolments}_{TEQ} &= 0.5 + 0.\dot{3} + 1 + 0.5 + 0.5 = 2.8\dot{3} < \text{Actual Enrolments}_{TEQ} \\ \text{Estimated Graduates}_{TEQ} &= 0 + 0.\dot{3} + 1 + 0.5 + 0 = 1.8\dot{3} > \text{Actual Graduates}_{TEQ} \end{aligned}$$

In the present hypothetical example, this approach underestimates the number of enrolments in TEQ programmes and overestimates the number of TEQ graduates. While these discrepancies may seem trivial, it is worth noting that only 5 unit-records are being considered here. For the period 2004 - 2013, each year of HEMIS data contains between 740 000 and 980 000 such unit-records. Estimates of TEQ numbers that are based on the factional counts associate with a CESM1 value of o7 (Education) are thus likely to be subject to errors and should be seen as indicative rather than definitive.

Table H.4: Hypothetical example of Qualification names and CESM classifications in original HEMIS

		CESM2 category of specialisation[a]				**Qualification**[b]
Student	**Qualification Name**	**1st area**	**2nd area**	**3rd area**	**4th area**	**Requirement**
1	Bachelor of Education (BEd)	0704	1301	-	-	N
2	Bachelor of Commerce (BComm)	0407	1201	0706	-	F
3	Post Graduate Certificate in Education (PGCE)	0712	-	-	-	F
4	Bachelor of Arts (BA)	1806	0709	-	-	F
5	Bachelor of Education (BEd)	0712	1501	-	-	N

NOTES: [a]HEIs indicate field(s) of specialisation using CESM2 codes (or CESM3 codes after 2010). The full set of CESM2 codes can be seen in DOE (2008) (Also see DOE (2014:Method of counting students - Fractional CESMs)). [b]The *Qualification Requirement* field indicates whether or not a student has fulfilled the requirements of a qualification (i.e. whether or not they graduate). The code "F" indicates that the requirements of the qualification have been fulfilled and the student will be receiving the indicated qualification whereas a code of "N" indicates either that the requirements of the qualification have not been fulfilled or that the requirements of the qualification have been fulfilled but the student is deferring taking the award in order to undertake additional courses (DOE, 2014:DATA ELEMENTS 021 TO 030).

Table H.5: Hypothetical example of CESM classifications and fractional counts for the same unit-records in aggregate HEMIS

Original HEMIS information not included in Aggregate HEMIS[a]		*Information included in Aggregate HEMIS*			
Student	**Qualification Name**	**CESM1**	**CESM1 Description**	**Headcount Enrolments**	**Graduates**
1	Bachelor of Education (BEd)	07	Education	0.5	0
1	Bachelor of Education (BEd)	13	Life Sciences	0.5	0
2	Bachelor of Commerce (BComm)	04	Business, Economics, and Manag...	$0.\dot{3}$	$0.\dot{3}$
2	Bachelor of Commerce (BComm)	12	Law	$0.\dot{3}$	$0.\dot{3}$
2	Bachelor of Commerce (BComm)	07	Education	$0.\dot{3}$	$0.\dot{3}$
3	Post Graduate Certificate in Education (PGCE)	07	Education	1	1
4	Bachelor of Arts (BA)	18	Psychology	0.5	0.5
4	Bachelor of Arts (BA)	07	Education	0.5	0.5
5	Bachelor of Education (BEd)	07	Education	0.5	0
5	Bachelor of Education (BEd)	15	Mathematics and Statistics	0.5	0

NOTES: [a]Information is not available in aggregate HEMIS and is only included here to illustrate how single student unit-records with more than one CESM2 category of specialisation are effectively split into multiple entries (with fractional counts) in aggregate HEMIS.

H.4 How accurate are the HEMIS-based estimates of TEQ enrolments at UNISA?

Finding reliable and comprehensive information on enrolments in TEQ programmes at specific HEIs in South Africa is difficult. Publicly available information tends to be both fragmented and lacking in detail and is rarely reported in a manner that enables comparison of figures from different sources.

Van Zyl and Barnes (2012*b*)'s institutional profile of UNISA for the years 2007 to 2011 is one of very few publicly available reports that can potentially be used to partly assess the accuracy of aggregate HEMIS-based estimates of TEQ enrolments and graduations at UNISA. Crucically, the version of HEMIS on which their analysis is based contains information on the colleges/faculties where UNISA students were enrolled and, as such, could be used to obtain estimates of the annual number of students that were enrolled in UNISA's College of Education (CEDU).[5] As explained in Section 4.2, this information is not available in aggregate HEMIS.

Table H.6 compares the estimates of the total enrolments in education programmes (CESM1 = 7) at UNISA based on aggregate HEMIS with the reported numbers of total enrolments in UNISA's CEDU as presented in (Van Zyl and Barnes, 2012*b*:6) for the period 2007 - 2011. The discrepancies between the two sets of estimates vary in magnitude over the years, ranging in absolute value from less than 1% to more than 5%

It is important to note that the aggregate HEMIS-based estimates of the yearly overall number of enrolments by level of study match the figures presented in (Van Zyl and Barnes, 2012*b*:7). Any differences between the HEMIS-based estimates of total enrolment within UNISA's CEDU and the figures reported by (Van Zyl and Barnes, 2012*b*:6) must thus be attributable to the fractional counts that arise from the way in which UNISA officials classify qualifications under the CESM scheme when reporting to HEMIS. Put differently, the table illustrates that CESM information in aggregate HEMIS does not allow perfect identification of individuals who were enrolled in UNISA's CEDU and, consequently, of individuals who enrolled in TEQ programmes. This highlights the fact that the estimates for UNISA and other HEIs presented in this chapter should be taken as indicative rather than definitive.

Table H.6: Total enrolments in UNISA's College of Education (CEDU) 2006 - 2011

Year	HEMIS estimates[a]	UNISA figures[b]	Difference (%)[c]
2006	25 117	24 590	2.14
2007	25 553	24 566	2.95
2008	34 634	33 974	1.25
2009	43 823	43 323	−1.56
2010	46 939	49 393	−5.19
2011	64 551	64 790	0.37

NOTES: [a] Sum of fractional counts for which CESM1 = 7 (Education) at UNISA based on aggregate HEMIS. [b] Figures extracted from final audited HEMIS data submitted to DHET by UNISA which contains enrolment information by college (Van Zyl and Barnes, 2012*b*:6). Figures for 2006 from [c] Difference between aggregate HEMIS estimates and Van Zyl and Barnes (2012*a*:6) figures, expressed as a percentage of the latter.

[5] It should be noted that there are some internal inconsistencies in the figures reported by Van Zyl and Barnes (2012*a*). For example, the enrolment figures for UNISA's CEDU reported on page 4 of the report are generally somewhat higher than those reported on page 6.