Social Gradients, Early Childhood Education and Schools Performing Above the Demographic Expectation: Empirical Insights into Educational Issues

by

Janeli Kotzé

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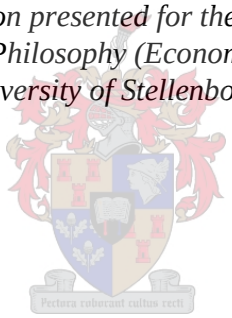

Promoter: Prof. Servaas van der Berg
Faculty of Economic and Management Sciences
Department of Economics

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Chapter 3:

Kotzé. J. (2015). The readiness of the South African education system for a pre-Grade R. South African Journal of Childhood Education. Vol 5(1), p1-28.

Abstract

This dissertation exploits the wide variety of datasets available on the South African education system to consider select education issues. The purpose of this is to contribute relevant empirical research to inform current debates and discussions relating to issues and policies in the South African education system which might be entrenching the inequalities of the past and thereby impeding on future improvement.

The first part of the dissertation provides a new perspective on within country educational inequality among different education systems by comparing data from seven Sub-Saharan countries and sixteen Latin-American countries. When comparing the effect of socio-economic status (SES) on education across countries, researchers have always been faced with a trade-off between the accuracy of the SES measure within countries and the comparability of the measure across countries. This has often caused measures of SES to be incorrectly used to compare relative wealth across different countries and contexts. This chapter sets forth a new methodology to adjust the traditional measures of SES and make them more comparable across countries and surveys. Furthermore, the comparable SES measure is applied to compare children in equally impoverished circumstances across countries, sub-samples and datasets to more accurately identify the most disadvantaged children across the world. More specifically this method will be applied to the SACMEQ (Sub-Saharan Africa) and SERCE (Latin America) education datasets to compare the educational outcomes of those students living under the $3.10 a day poverty line. Most strikingly, the comparison shows that Ugandan and Mozambican children living under the $3.10 a day poverty line achieve much higher educational outcomes than similarly poor children in middle-income countries such as South Africa and the Dominican Republic.

Investment in Early Childhood Development (ECD) has the prospect of cultivating extraordinary potential within individuals and can assist in bridging the social equity gap from a very young age. Over the past decade Grade R has been the strongest policy lever used by the Department of Basic Education to early learning. The National Development Plan has, however, called for universal access to two years of early childhood development prior to entering Grade 1. Chapter three explores the merits of this proposal given the specific South African context. More specifically, this analysis intends to bring new information to bear on three matters. The first relates to the demand-side and aims to identifying participation trends among four- and five-year-olds. Moreover, an attempt is made to obtain a profile of those learners not attending any form of preschooling currently.

The second objective is to consider the supply-side and aims to understand the policy space in which pre-Grade R will function, the quality and quantity of infrastructure already in place, and the expertise of ECD practitioners. Finally, the implementation of a universally accessible pre-Grade R within a constrained system and the requirements for ensuring that it will have a significant impact on those children most in need are discussed.

Drawing on three uniquely constructed datasets using the 2012-2014 Universal Annual National Assessments (U-ANAs), the 2013 Verification ANA (V-ANA) and the 2011 School Monitoring Survey, the fourth chapter investigates the prevalence and performance of poor schools which manage to perform above the demographic expectation. Overall it is evident that only 5% of all Quintile 1 – 3 schools, serving only 4% of the learner population in Quintile 1 – 3 schools, manage to perform at an acceptable level. The study estimates that poor learners who attend these above average schools, gain up to a year of additional learning relative to their peers in weak performing schools. Finally the study shows that strong school management and governance and supportive bureaucratic accountability are associated with the higher performance observed in these schools.

Opsomming

Hierdie tesis maak gebruik van die wye verskeidenheid van datastelle wat beskikbaar is aangaande die Suid-Afrikaanse onderwysstelsel, om spesifieke kwessies met betrekking tot die onderwyskrisis te ondersoek. Die doel is om met behulp van relevante empiriese navorsing 'n bydra te lewer tot die huidige gesprekke oor die kwessies en beleidvorming in die Suid-Afrikaanse onderwysstelsel wat die ongelykhede van die verlede verder vaslê, en sodoende vooruitgang belemmer.

Die eerste gedeelte van die tesis lewer 'n nuwe perspektief oor die ongelykhede in opvoedkundige uitkomstes wat bestaan in lande, deur die ongelykhede van sewe Sub-Sahara lande en sestien Latyn-Amerikaanse lande met mekaar te vergelyk. In die vergelyking van die verhouding tussen sosio-ekonomiese status (SES) en leerder-prestasie, het navorsers nog altyd met die keuse gesit tussen 'n meer akkurate meting van SES of 'n meer vergelykbare meting van SES. Hierdie keuse het gewoonlik gelei tot die ontoepaslike gebruik van SES om relatiewe rykdom te vergelyk tussen verskillende lande. Hierdie hoofstuk stel 'n nuwe metode voor om die tradisionele meting van SES aan te pas sodat dit beide 'n meer akkurate meting van rykdom binne in 'n land sal verskaf, en meer vergelykbaar tussen lande sal wees. Die nuwe meting word toegepas om kinders te vergelyk wat van ewe verarmde omstandighede afkomstig is, maar in verskillende lande woon. Verder kan die meting ook gebruik word om kinders in verskillende datastelle met mekaar te vergelyk. Sodoende kan die mees gemarginaliseerde kinders in die wêreld geïdentifiseer word. Meer spesifiek word hierdie metode toegepas op die SACMEQ (Sub-Sahara Afrika) en SERCE (Latyn Amerika) datastelle om die opvoedkundige uitkomstes van die leerders wat onder die $3.10 'n dag broodlyn lewe te vergelyk. Die mees treffendste wat hier gevind is, is dat leerders wat onder die $3.10 'n dag broodlyn lewe in laer inkomste lande soos Uganda en Mosambiek, beter vaar as leerders van ewe arm omstandighede in middel inkomste lande soos Suid-Afrika en die Dominikaanse Republiek.

Investering in vroeë kinderontwikkeling het die vermoë om uitsonderlike potensiaal in individue te ontgin, en kan 'n belangrike rol speel om die sosiale ongelykheidsgaping van 'n jong ouderdom al te oorbrug. Oor die laaste dekade was Graad R gesien as die sterkste beleidshefboom wat gebruik was deur die Departement van Basiese onderwys om vroeë kinderontwikkeling te beïnvloed. Die Nasionale Ontwikkelingsplan stel egter voor dat alle kinders moet toegang kry tot twee verpligte jare van vroeë kinderontwikkeling voordat hulle Graad 1 betree. Die derde hoofstuk oorweeg die meriete van hierdie voorstel gegewe die spesifieke Suid-Afrikaanse konteks. Meer spesifiek, hierdie analise poog om nuwe inligting na vore te bring rakende drie sake. Die eerste handel oor die vraag-kant en identifiseer die deelname/bywoningskoerse van

vier- en vyf-jariges. 'n Poging word ook aangewend om 'n profiel vas te stel van die kinders wat geen vorm van voorskool bywoon nie. Die tweede doel is om die aanbod-kant te oorweeg, deur 'n beter begrip te kry van die beleidsomgewing waarin Voor-Graad R sal funksioneer, die kwaliteit en hoeveelheid hulpbronne wat daar reeds beskikbaar is, en die bekwaamheid van die voorskoolse opvoeders. Laastens word die implementering van 'n universeel toeganklike Voor-Graad R in 'n beperkte stelsel bespreek, veral met die doel om vas te stel watter vereistes daar is om te verseker dat Voor-Graad R die gewenste impak het op die kinders wat die meeste daarby kan baat.

Deur gebruik gemaak van drie datastelle wat spesifiek saamgestel is uit die 2012-2014 "Annual National Assessments (ANA)", die 2013 "Verification ANA" en die 2011 "School Monitoring Survey", ondersoek die vierde hoofstuk die voorkoms en prestasie van arm skole wat dit regkry om bo verwagtinge te presteer. Dit blyk dat net 5% van alle kwintiel 1 – 3 skole, wat net 4% van die leerders in 1 – 3 skole bedien, dit regkry om teen 'n aanvaarbare vlak te presteer. Hierdie studie beraam dat arm leerders wat hulle in hierdie bo-gemiddelde arm skole bevind tot 'n volle jaar ekstra kan leer relatief tot ewe arm kinders wat swakker skole bywoon. Laastens wys hierdie studie dat sterk leierskap en bestuur in 'n skool, asook ondersteuning deur burokratiese aanspreeklikheid, geassosieer kan word met die beter prestasie in hierdie skole.

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To God alone be all the glory.

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Acronyms

ANA	Annual National Assessment
CEDLAS	Centro de Estudios Distributivos Laborales y Sociales
DBE	Department of Basic Education
DHS	Demographic and Health Survey
DSD	Department of Social Development
ECCE	Early Childhood Care and Education
ECD	Early Childhood Development
ECERS	Early Childhood Environment Rating Scale
E-FAL	English as First Additional Language
EMIS	Education Management Information System
GDP	Gross Domestic Product
GHS	General Household Survey
HL	Home Language
IALS	International Adult Literacy Survey
IIEP	International Institute for Educational Planning
LLECE	Laboratorio Latinoamericano de Evaluacion de la Calidad de la Education
LoLT	Language of Learning and Teaching
LTSM	Learning and Teaching Support Material
LURITS	Learner Unit Record Information and Tracking System
MCA	Multiple Correspondence Analysis
MLA	Monitoring Learning Achievement Project
NELDS	National Early Learning Development Standards
NIDS	National Income Dynamic Study
NDP	National Development Plan
NPC	National Planning Commission
NQF	National Qualifications Framework
NSES	National School Effectiveness Study
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PASEC	Programme d'analyse des systèmes éducatifs de confemen
PCA	Principal Component Analysis
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment
PPP	Purchasing Power Parity
RCT	Randomised Control Trial
REQV	Relative Education Qualification Value
RSA	Republic of South Africa
SALDRU	South African Labour and Development Research Unit
SALSS	South African Living Standards Survey
SACMEQ	Southern and Eastern African Consortium for Monitoring Educational Quality
SEDLAC	Socio-Economic Database for Latin America and Caribbean
SERCE	Segundo Estudio Regional Comparativo Explicativo
SMS	School Monitoring Survey
TIMSS	Trends in International Mathematics and Science Study
UNESCO	United Nations Educational, Scientific and Cultural Organisation

V-ANA	Verification Annual National Assessment
U-ANA	Universal Annual National Assessment

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Chapter 1

Introduction and overview of research questions

> *"Facts are potential forces: more like sticks of dynamite. They can act as a shock to mental inertia, to social complacency and to existing beliefs… Facts are absolutely necessary when one wants to effect social change."* (Malherbe, 1938)

1.1. Introduction

Following South Africa's first democratic elections in 1994, very little nationally representative data was available to shed light on the post-Apartheid realities facing the South African education system. The increased availability of more representative data ever since has therefore been a critical enabling factor to a more comprehensive understanding of the education sector as a whole. Research interest in the South African education system gained momentum as the analysis of these nationally representative datasets exposed the high inequality in educational outcomes among learners from different population groups. This information has subsequently provided policy makers with the necessary information to support their decision making, policy formulation, planning, monitoring and management at all levels of the education system. Education data, and more specifically datasets generated to provide nationally representative statistics, has therefore become indispensable to sound policy making. As aptly stated by Malherbe (1938) at the inaugural meeting of the National Research Council and Board, "Facts are absolutely necessary when one wants to effect social change."

Since the first nationally representative household survey in a unified and democratic South Africa (the 1993 Statistics on Living Standards and Development Study), research focussing on educational attainment, quality of education and the factors associated with higher educational performance in South Africa has burgeoned. This research has brought to light the severe differences in the quality of education provided to the various population groups, as well as the lethargic nature of social change in the sector despite the large redistribution of spending to formerly disadvantaged schools. Moreover, nationally representative data has also exposed the strong convex relationship in South Africa between education and labour market outcomes, and the intergenerational cycle of poverty in which the poor are trapped.

This dissertation focusses on select education issues by exploiting the wide variety of datasets available on the South African education system, some of which have not been used before for analysis. The second chapter combines large-scale international learner assessments with household survey data to construct a measure with which to improve the comparability of social

gradients across various developing countries. The third chapter uses various household surveys within South Africa, in conjunction with a population based audit of Early Childhood Development (ECD) centres, to provide a quantitative overview of the ECD sector, with a specific focus on the capacity of the system to implement an additional reception year. The fourth chapter employs a dataset constructed by matching school-level performance data on national systemic assessments across three years to administrative data, with the aim of identifying and examining schools that are managing to perform above expectations.

1.2. Background on Educational Data in South Africa

The relationship between empirical research and social policy in South Africa began in the 1920s with Dr EG Malherbe's pioneering of the interdisciplinary approach to social science research. The first information-gathering research division within the South African Union Department of Education, was established in 1929 as the National Bureau of Educational and Social Research. This bureau conducted and published the first social science research in South Africa and played a key role in introducing the science of standardised testing of learners. Through the use of data and empirical research, the Bureau redefined the paradigm between research and policy, and continued to influence the education policy-making process until its incorporation into the Human Sciences Research Council (HSRC) in 1969 (Fleisch, 1995).

From the first data-collection exercise for the Carnegie Poor White Study in 1929, until the end of the Apartheid era, education data was mostly collected on sub-samples of the population, specifically along racial lines. This was largely due to the fragmented nature of the governance structures of education, which at that time consisted of seventeen departments of education (Chisholm, 1983; Fleisch, 1995; Pillay, 1984). In 1993 the first nationally representative data was collected on the South African population as a whole by the South African Labour and Development Research Unit (SALDRU) and the World Bank (Case and Deaton, 1999). The South African Living Standards Survey (SALSS) administered a series of community surveys, but also included a literacy and numeracy survey, which showed the severe quality problems plaguing large parts of the education system. It emerged from this research that black learners aged 13-18 had only attained 78%-86% of the years of education attained by their white peers, and that their literacy and numeracy scores respectively were 50%-63% and 36%-47% of white learner levels (Van der Berg, 2007). Using this data, Case and Deaton (1997) showed that, at the dawn of South Africa's democracy, black learners required an additional ten years of schooling to bring them on par with their white counterparts, if the quality of that learning were to remain unchanged.

Since democratisation, South Africa has started to participate in a range of cross-national achievement studies. In 1995 South Africa participated in the Trends in International

Mathematics and Science Study (TIMSS), testing 4 491 Grade 8 learners from 114 schools. Given the international comparability of the assessments, they revealed South African learners' weak educational performance relative to their peers in other (mostly developed) countries. South Africa's Grade 8 learners ranked last out of the 41 countries that participated in the study in both the mathematics and science test. Since 1995, South Africa has participated in most[1] of the TIMSS assessments at the secondary school level and in 2011 (although now testing South Africa's Grade 9 learners) learners still performed significantly lower than even their peers in Botswana (Reddy, 2005). The 1999 Monitoring Learning Achievement Project was the first assessment to shed light on the cognitive ability levels of learners in primary school and showed that at a Grade 4 level South African learners performed by far the lowest of the twelve participating African countries in numeracy, and in literacy ranked third from the bottom. In 2000 South Africa started participating in the Grade 6 evaluations conducted by the Southern and Eastern African Consortium for Monitoring Educational Quality (SACMEQ) and in 2006 also in the Grade 4 literacy assessments as part of the Progress in International Reading Literacy Study (PIRLS). Both these assessments have only confirmed the same trends exposed by TIMSS and the Monitoring Learning Achievement Project.

In 2003 South Africa introduced systemic testing to its collection of available data. The first Systemic Evaluations tested Grade 3 learners with the purpose of benchmarking learner performance and promoting accountability in the education system (RSA DBE, 2001). The evaluations included the assessment of numeracy, literacy and life skills, and 5% of the Grade 3 population (or roughly 51 000 learners) participated. In 2007, also assessing Grade 3 learners, the Systemic Evaluations tested approximately 54 000 learners across the country. Systemic testing in South Africa was further expanded by the introduction of the Annual National Assessments (ANAs) in 2011, which for the first time administered standardised tests in most of the primary grades and in one secondary grade to all learners. The ANAs entailed standardised literacy and numeracy tests written nationally by all learners in Grades 1 to 6 and Grade 9. The introduction of the ANAs was a major contribution to the education policy landscape in South Africa, as these assessments allow a more credible comparison of primary school performances on the basis of an objective measure.

Since the amalgamation of the seventeen different departments of education that existed under the Apartheid regime, major advances have also been made in collecting relevant and quality administrative data to promote evidence-based planning. The establishment of the Education Management Information System (EMIS) in 1995 greatly aided in this regard and played a key

[1] South Africa did not participate in the 2007 TIMSS.

role in the development of mechanisms for accountability, monitoring and evaluation (Van Wyk, 2015). Over the past two decades the collection of administrative data expanded to include the School Register of Needs Survey (SRN), the SNAP surveys, the School Monitoring Survey, the Annual School Survey and the Masterlist of schools.[2]

More recently, the emergence of Randomised Control Trial studies has added to the arsenal of empirical data available to South Africa policy makers. The purpose of RCTs is to determine the impact of a particular policy on learner performance, as well as the cost effectiveness of the policy. The benefit to RCTs is two-fold, in that they firstly identify the causal relationship between an implemented intervention and learning outcomes, but secondly, that they also allow policy-makers to determine the potential constraints to efficiency when implementing the policy at scale. Although RCT's do not hold the answer to solving South Africa's inequality riddle, they will be playing an increasingly more important role in informed policy-making in the years to come.

The availability of more information has assisted greatly in education policy making by providing both researchers and decision makers with relevant and accessible information. Researchers have been engaging with these datasets to gain a better understanding of which factors need to change in order for systemic change to result. It has become evident that the redistribution of physical and financial resources has not had a commensurate impact on learner performance, and that there are other, less observable constraints prohibiting the efficient use of these resources. Furthermore, this research has also exposed the interrelated nature between educational quality and labour market success, as well as the intergenerational consequences of low quality education.

This thesis will contribute to the current literature on using empirical research to influence policy making in the education sector by exploiting the information available in a wide variety of datasets. The first issue entails the development of a more accurate and comparable measure of wealth among children across different countries and different international assessments (addressed in Chapter 2). The purpose of this measure is to estimate, and subsequently compare, the nature of the relationship between the socio-economic status of a learner and the educational performance of the learner across different contexts. The second issue dealt with concerns the South African education system's readiness to implement an additional reception year amid a resource constrained environment (see Chapter 3). Without proper preparation and planning, the rapid expansion of an additional school grade can result in a loss of quality in the service delivered. For this reason, it is essential to understand the current resource constraints and

[2] For a more in-depth discussion of the availability of administrative data in the education sector, please see Van Wyk (2015).

develop the required systems in preparation of implementing a pre-Grade R year. The third issue considers poor schools that manage to perform at an acceptable level (see Chapter 4). The objective of this research is to determine the number of poor schools that are managing to overcome their socio-economic disadvantage and to find the school level factors that are associated with their performance.

1.3. Chapter 2: Comparing Social Gradients across International Assessments

The strong positive relationship between educational outcomes and wealth status has become one of the great regularities of our time, with the inequalities in learner educational outcomes reflecting the inequalities in their social status. If this social gradient is steep (and often convex in developing counties), the affluent will have far better educational outcomes than the poor. Combined with convex returns to education and low economic growth, social mobility will be stagnant and the poor are likely to remain in poverty (Van der Berg, 2015).

This phenomenon is not only prevalent in South Africa but is the case in most developing countries (Cruces, et al., 2014; Gregorio & Lee, 2002; Rolleston, et al., 2013). Comparing social gradients across countries is therefore useful in that it provides a framework with which to review countries' experiences with the objective of understanding practices and innovations and of encouraging frank debate. For accurate country comparisons, it is necessary to have a comparative measure of both wealth and educational outcomes. With the burgeoning of international learner assessments, comparative measures of educational outcomes have become readily available. However, a comparative measure of wealth is still lacking (Chudgar, et al., 2012).

Asset indices have become a very convenient method for measuring household wealth in the absence of household income or expenditure data (Filmer and Pritchett, 2001). In the field of economics of education specifically, asset indices have proven to be immensely useful since the collection of household income data is prohibitively impractical in the context of educational datasets (Caro and Cortes, 2012). The traditional measure of Socio-economic Status (SES), however, does not allow for an accurate comparison of learners living under equally impoverished conditions in different countries. With the increased interest in measuring and comparing educational quality across countries, it has become imperative to construct an SES measure that is both an accurate measure, given the context of the learners tested, and comparable across the different countries (Buchmann, 2002; Fuller and Clark, 1994).

Chapter two of the dissertation proposes a new methodology for adjusting the traditional measure of SES to be more comparable across countries and surveys. The new methodology is

devised by compiling a unique dataset that makes use of both international standardised learner assessments and country-specific household surveys. This new method is used specifically to compare the SACMEQ III (Sub-Saharan Africa) and SERCE[3] (Latin America) datasets, as both evaluate sixth grade students in mathematics and they were conducted quite soon after each other. Information on household expenditure for each of the countries is obtained from household surveys that were conducted close to the time in which the learner assessments were conducted (2006/2007).

When constructing an asset index for a specific country, the latent asset-based SES assigns a unique weight to each of the various possessions. However, if the asset index is constructed for a combined sample of countries, the same weights are applied for the same possessions in all of the countries. In this case the assumption is made that a bicycle, for instance, conveys the same information on underlying wealth in a household in Mozambique as it does in the United States. While this assumption might still hold for countries with relatively similar wealth distributions, it will not be accurate in a sample of countries with vastly different economic structures (Filmer and Pritchett, 2001; Harttgen and Vollmer, 2011). This problem increases when countries are compared across different surveys with a different set of asset questions. This is particularly the case when comparing developing countries, which participated in different international assessments that may not have asked similar questions about assets in the household, e.g. the SACMEQ assessments, PASEC (Francophone Africa) or SERCE.

To obtain an accurate SES measure within a country, one needs to derive country-specific weights. However, this comes at the cost of not being able to compare the SES measure across countries. The second chapter contributes to the literature on the international comparison of social gradients in education by proposing a method to address this trade-off. This is achieved by deriving a method for constructing a wealth indicator that takes into account both the accuracy and the comparability of the commonly used asset index.[4] To address the problem of accuracy, this method uses asset indices that have been constructed for each country specifically. Addressing the problem of comparability, the method links the country-specific asset index distribution to the national household expenditure distribution in the country in order to simulate household expenditure for each wealth percentile. Expenditure per capita, denoted in international dollars (converted at purchasing power parity (PPP) rates), then serves as a common yardstick with which to compare country-specific SES across different countries.

[3] Segundo Estudio Regional Comparativo Explicativo

[4] A method similar to this was devised by Harttgen and Vollmer (2011) in order to link asset indices in the Demographic and Health Survey data to a national income distribution. Their method however, is not suitable for the purposes of the current study as it is unable to account for children of a specific age group, and specifically children not at school.

The method entails three simple steps. First an asset index is created for each country to be included in the comparison, after which the learner distribution is ranked from poorest to wealthiest on the basis of this index. Secondly, households with school-going children of a similar age to those who participated in the test are ranked from poorest to wealthiest on the basis of their per capita consumption as measured by a national household survey. Finally, learners from the n^{th} percentile in the asset index distribution are assigned the per capita household consumption value of households from the n^{th} percentile in the consumption distribution. To make these per capita consumption values internationally comparable, they are denoted as purchasing power parity dollars (PPP $).

Using data from studies that convert the SACMEQ and SERCE performance levels to be comparable across the surveys, the research that follows compares social gradients (now with a common scale on both axes) across Sub-Saharan Africa and Latin America. A notable result that emerges from this comparison is the remarkably good performance of Kenya and Tanzania relative to other higher-income countries such as South Africa, Uruguay and Costa Rica. For given levels of per capita consumption, Kenya and Tanzania not only outperform these countries on average numeracy outcome but also manage to provide a larger number of students living below the $3.10 per day poverty line with a sufficient level of mathematical skill. Furthermore, 24% of Kenyan children living under the $3.10 poverty line and 26% of similarly poor learners in Tanzania have reached a level of mathematical skill where they can be described as "Competent" and "Mathematically Skilled".[5] This performance is exceptional when compared to only 11% of poor learners in Brazil, 7% in Peru and merely 2% in South Africa.

1.4. Chapter 3: The Readiness of the South African Education System for Pre-Grade R

The human capital model regards skill formation as a life cycle process, where the later attainment of skills builds on the foundations laid down earlier. This essentially means that the productivity of the investment made at one stage in a person's life is enhanced by the levels of skills obtained earlier (Cunha et al., 2006; Heckman et al., 2006; Heckman and Masterov, 2004). This model is of particular relevance in the school context, where the assumption is made that learners entering a school in Grade 1 have acquired the necessary skills earlier in their life to learn optimally during their school career. The human capital model therefore advocates investment in ECD, as this provides children with the foundational skills necessary to attain future skills productively throughout their lifetime (Currie, 2000; Heckman et al., 2006).

[5] SACMEQ differentiates among eight competency levels on the basis of the difficulty of the questions and the specific skills required to give a correct response.

This model is particularly fitting to the South African context, where the ability gaps between poor and affluent learners are already prevalent by Grade 1. Given the hierarchical nature of skill attainment, these learning gaps only expand, with poor learners not having sound enough foundational skills to allow them to acquire future skills effectively (Spaull and Kotzé, 2015). The argument for public investment in ECD therefore stems from the rationale that it is more effective to invest in early childhood development to equalise the initial endowment levels between poor and affluent children than to try to remediate the learning gaps at later stages in life (Cunha et al., 2006; Currie, 2000).

The South African government recognises the importance of investing in ECD and over the past decade there has been a strong focus on ensuring universal access to Grade R. The increased investment, however, has not been met with a commensurate level of impact for specifically poorer learners, as the rapid roll-out has placed great strains on the quality of provision. As a result Grade R is currently extending the advantage of more affluent schools rather than combating the present inequalities (Van der Berg et al., 2013). The National Development Plan (NDP), however, is proposing universal access to *two years* of ECD prior to entering Grade 1 (NPC, 2013). Albeit being a noble proposal, this policy will only have the intended outcomes if the services delivered are of a sufficient quality. For this to be the case the resources necessary to implement a programme of this nature and scale have to be available and of an adequate quality.

Comprehensive, nationally representative data on the provisioning of ECD services has, however, been limited in South Africa and as a result very little empirical research has been conducted to influence sound policy making (Atmore et al., 2012). Both the General Household Survey (GHS) and the National Income Dynamic Study (NIDS) include some questions on the participation of 0 – 4 years olds in early childhood education but, given that early childhood development is not their sole focus, neither dataset allows for the rigorous analysis of the impact of attending early childhood education or the supply of ECD services. These datasets are, however, useful for determining participation trends over different age groups and across years.

In the year 2000 a nation-wide ECD audit was conducted which, for the first time in South Africa, provided policy makers with information on the nature and extent of ECD provisioning across the country. In the decade to follow this audit, data was only collected on sub-samples of the population, as for instance in the 2009 ECD Audit conducted by the Western Cape Department of Social Development. In 2013 a national audit was conducted of ECD centres in South Africa. This audit serves as the most recent and comprehensive nationally representative data on ECD service delivery in South Africa. Using this dataset, chapter three of this dissertation interrogates the

current conditions in both registered and unregistered centres and considers the state of the resources available from the perspective of implementing a universally accessible pre-Grade R.

Making use of nationally representative datasets, this chapter considers critically the readiness of the South African education system to implement a policy of this magnitude and scale. More specifically, this analysis brings new information to bear on three matters. The first relates to the demand side and aims to identify participation trends among four- and five-year-olds. The second objective focusses on the supply side and aims to understand the environment in which pre-Grade R will function, the quality and quantity of infrastructure already in place, and the expertise of ECD practitioners. The final matter considers the institutional requirements to the implementation of a universally accessible pre-Grade R within a constrained system, specifically focussing on ensuring that the implementation will have a significant impact on those children most in need.

Overall the research provides a quantitative contribution to the current conditions in ECD centres with regard to both their physical and human resources. The evidence presented is used to inform directly the current discussion on the feasibility of introducing a pre-Grade R year. Moreover, this research explores the registration status of centres, which provides further insights into ECD centres' access to funding. What emerges from the analysis is the inconsistency of the implementation of the minimum norms and standards for ECD provisioning and the low adherence to these standards (with regard to both physical and human resources) in some of the provinces. These inconsistencies have a large impact on the registration status of ECD centres, which in turn influences their access to funding. The current funding structures are therefore failing those centres that are serving the most vulnerable children. The final discussion considers the conditionally registered and the unregistered centres to determine the constraints they face to becoming registered. This discussion highlights the deficiencies in the current administrative system that prevent the system from facilitating the provision of quality ECD services on a large scale.

1.5. Chapter 4: Challenging the Odds: School Performing Above Expectations

The social gradients discussed in chapter two have established that in most developing countries the educational outcomes of the affluent are better than those of the poor. In a country like South Africa, with a very steep social gradient, high academic achievement in poor schools is highly unusual. There are, however, some poor schools that manage to overcome their socio-economic disadvantage and deliver educational outcomes that are above the demographic expectation. Drawing on a uniquely constructed dataset, chapter four contributes a quantitative overview of schools that are performing above the demographic expectation, informing a predominantly

qualitative-based discourse in South Africa. Evidence is presented on the prevalence of these schools across the country, their accessibility to the larger majority of the learner population, and the learning benefits of attending a school of this nature. Finally, in an exploratory analysis of the constructed datasets, the common factors associated with these schools are identified and discussed.

The strong convex returns to education in South Africa imply that school choice is of the utmost importance. The school a learner attends largely determines the possibility of entering university and subsequently participation in the formal labour market. The inequities in school quality therefore augment the inequality of the labour market. Given this trend, many more motivated parents with the necessary resources have made every effort to send their children to more expensive, higher quality schools in the more affluent neighbourhoods. This option, however, is not feasible for addressing the systemic failure of the dysfunctional institutions serving the poor.

Notwithstanding, some schools in poorer areas are managing to overcome their socio-economic disadvantage and provide their learners with a sufficient quality of education. Given a relatively comprehensive understanding of issues that contribute to the weak learner outcomes in poor schools within the South African literature, this chapter sets out to identify the lessons to be learnt from these "above average" schools. Using the unique population-based dataset, this chapter contributes to the literature by placing these schools in a national context. Owing to a lack of standardised, population-based performance data in primary schools in South Africa, it has only ever been possible to study better performing poor schools by selecting a few schools using subjective measures. The ANAs, however, allow the identification of these schools across South Africa, through an objective, nationally standardised measure.

It emanates from this research that only 5% of all Quintile 1 – 3 schools, which serve only 4% of the total learner population in such schools, manage to perform at a level which is broadly acceptable. In some provinces there are fewer than ten Quintile 1 – 3 schools that can be considered as providing their learners with an acceptable level of education. Using a value-added model approach, the study further estimates that poor learners who attend these above-average schools gain up to a year of additional learning relative to their peers at weak-performing schools. The robustness of the findings are verified by controlling for selection bias, measurement error and any potential bias stemming from attrition. Finally, by estimating the relationship between the performance among poor schools and various parameters, some common factors emerged as being associated with the performance in these schools. More specifically, the research shows that strong school management and governance, and supportive bureaucratic accountability are correlated with the higher learner performance observed in these schools.

1.6. Conclusion

The availability of nationally representative data on both schooling and educational outcomes in South Africa has expanded immensely over the past two decades. This expansion has enabled researchers and policy makers to gain a much more accurate and comprehensive understanding of school performance. Massive strides have also been made with regard to understanding the complex dynamics of the South African education system, which in turn has led to more efficient and targeted policy making. The availability of accurate data has also allowed policy makers to identify under-performing schools and take remedial action when required (Van der Berg, 2007). This dissertation contributes to the literature using empirical research to promote evidence-based policy making, by using a wide variety of datasets to consider certain issues in the education sector.

This dissertation sets out to examine the following research questions:

Chapter 2:

- 2.1. Is it possible to construct a measure of wealth that is comparable across different countries and different data sets, yet accurate in measuring the wealth distribution within a country?

Chapter 3:

- 3.1. What are the current participation rates of four-year olds in ECD programmes?
- 3.2. What is the capacity of the current system with relation to infrastructural capacity, material capacity and knowledge capacity?
- 3.3. Are the government structures responsible for delivering ECD of a sufficient quality and strength?

Chapter 4:

- 4.1. How many schools are there in South Africa that perform at an acceptable level and how accessible are they to the greater majority of poor learners?
- 4.2. What are the benefits for a poor learner of attending a Quintile 1 – 3 school that performs at an acceptable level?
- 4.3. Which factors contribute to the outcomes in these above-average, poor schools?

Chapter 2

A new methodology for investigating cognitive performance differentials by socio-economic status across international assessments.

2.1. Introduction

Comparing students that live under equally impoverished conditions, but under different education systems is complicated and has often been undertaken with inaccurate measures. The main reason for the use of these inaccurate measures has been the trade-off that researchers face when constructing a measure of Socio-economic Status (SES): a more accurate measure of SES within a country requires country-specific weights to be derived, but this comes at the cost of comparing the socio-economic measure across countries, datasets and time. This trade-off has largely resulted in the incorrect usage of measures of SES to compare relative wealth across different countries and contexts, and consequently the risk exists that unsound conclusions are drawn about the relationship between SES and various outcome measures. This chapter proposes and defends a wealth[6] measure that is comparable across countries and surveys, and that enables a more accurate identification of the most marginalised children across the world in terms of poverty and educational quality.

Asset indices have become the generally accepted measure of SES in the absence of household income or expenditure data (Filmer and Pritchett, 2001). In the field of economics of education, asset indices have proven very useful in determining a student's socio-economic conditions, as it is much more viable to ask a child which items the household has in their home, than what the monthly household income or expenditure is. Using similar methods to Filmer and Pritchett (2001), this information has commonly been used to derive socio-economic gradients and to compare these gradients across countries to gain a sense of the efficiency with which an education system converts socio-economic inputs into educational outcomes. Although the large body of literature on asset indices has contributed to a more accurate measurement of SES, some potential biases still exist due to differences in asset prices and the supply of assets in different

[6] In this dissertation SES and wealth are used synonymously, as wealth is often interpreted as merely material possessions and excludes the non-materials elements of wealth such as parental education.

contexts. Does ownership of a bicycle convey the same information on underlying wealth of a household in Mozambique as it does in the United States? Or a radio?

The weakness of the asset index, therefore, lies in its comparability across regions, countries and datasets (Buchmann, 2002; Filmer & Pritchett, 2001; Fuller & Clark, 1994; Harttgen & Vollmer, 2011). This weakness has mainly been dealt with either by ignoring the problem, or by alleviating the problem by means of a general cross-country asset index. Both these 'solutions' lead to unreliable conclusions and biased estimates, which could have dire consequences in countries where SES has large explanatory power with regard to educational quality. In order to make more valid cross-country comparisons of the relationship between SES and educational outcomes, the traditional asset-based measure of SES needs to be adapted.

This chapter sets out to construct a more comparable measure of SES by simulating household expenditure[7] for each household on a country's asset index distribution. Consumption per capita, denoted in international dollars, then serves as the common yardstick with which to compare wealth across countries and datasets. Using this measure the relationship between SES and educational outcomes is compared across regions, countries and datasets. More valuably, this measure enables the comparison of the efficiency of education systems in sub-Saharan African countries and Latin-American countries, by looking at the quality of educational outcomes for children living under the $3.10-a-day poverty line.

2.2. Asset Indices as Measures of Wealth

Since the landmark paper by Filmer and Pritchett (2001), asset indices have become a popular proxy for income or expenditure measures in the economic, demographic and sociological literature. This is based on two assumptions. The first assumption is that the latent trait underlying the possession of a range of assets, along with a set of housing characteristics, is a good approximation of a household's wealth. The second assumption is that the ranking of households when using this index, is correlated to the ranking of households when using the household-size-adjusted expenditures, in this way making it an accurate proxy for SES. Since the advent of the asset index approach, a large body of literature has developed around the appropriateness of this proxy, the construction of such an index, and the application of the index in a vast array of empirical studies.

The main evidence for assessing the appropriateness of asset indices as a proxy for expenditure measures derives from the comparison of household rankings by household-size-adjusted

[7] In this chapter, household expenditure is measured using consumption data. For this reason the terms expenditure and consumption are used interchangeably.

expenditures and an asset index, using data that captured information on both measures. Filmer and Pritchett (2001) compared these rankings by using data from three household surveys from poor countries and found a strong correlation between their indices and monthly expenditure. Similarly Wagstaff and Watanabe (2003) found little difference in the socio-economic inequalities in child malnutrition whether an asset index or expenditure data was used. Using the 1996 South African census data, Steward and Simelane (2005:22) found the asset index and household income to be a "valid measure of socio-economic status".

Not all studies find such strong correlations, though. Montgomery et al. (2000) found a positive, yet weak association between an asset index and expenditures. Sahn and Stifel (2003) found varying results in different countries, but support the view that an asset index does an "equal or better job" than expenditure at stratifying the population. Rutstein and Johnson (2004: 12) state that an asset index is not a "straight proxy for per-member expenditures", based on data from Guatemala. They conclude, however, that asset indices are useful as they are able to capture a different dimension of SES. Filmer and Scott (2012) endorse this view when comparing results across eleven surveys from developing countries. They found strong evidence that per capita expenditures and asset indices do not deliver similar rankings of households according to SES, with rank correlation coefficients ranging from 0.39 in Zambia to 0.84 in Brazil.[8] However, they did find that the economic gradients in outcomes are similar regardless of whether per capita expenditure or an asset index is used. In a systematic review of seventeen studies, using 36 datasets, Howe et al. (2009) provide evidence that even though the correlation between the two measures is rather weak, wealth indices with a greater number and wider range of variables also tend to be more closely related to per capita expenditures. Even though there are opposing views on the appropriateness of an asset index as a proxy for SES, most analysts are inclined to admit that, given the effort required to collect household expenditure data and the potential measurement error present in the data, asset indices have become very useful.

In the decade and a half that they have been in use, asset indices as a proxy for SES have been applied in a wide variety of fields. Filmer and Pritchett (2001) originally applied an asset index to inequality in schooling outcomes, but since then the tool has been applied to health outcomes (Bollen et al., 2002; Chuma and Molyneux, 2008; Filmer, 2005; Gwatkin, et al., 2000; Lindelow, 2006; Njau, et al., 2006; Schellenberg, et al., 2003), child health outcomes (Fay, et al., 2005; Montgomery, et al., 2000; Sahn and Stifel, 2003; Sastry, 2004; Tarozzi and Mahajan, 2005; Wagstaff and Watanabe, 2003), early childhood development (Ghuman, et al., 2005; Paxson and Schady, 2005), and further studies of educational inequalities (Case, et al., 2004; Caro and Cortes,

[8] In South Africa the rank correlation coefficient is 0.67.

2012; Das, et al., 2004; Taylor and Yu, 2009). Furthermore, extensive research has also been conducted in using asset indices to study trends and determinants of poverty and inequality (Booysen, et al., 2008; Harttgen, et al., 2013; Harttgen and Klasen, 2012; Harttgen and Vollmer, 2011; Michelson, et al., 2013; Stifel and Christiaensen, 2007; Sahn and Stifel, 2000).

2.3. Methodology and Data

2.3.1. The method

An asset index is a unidimensional composite indicator of a set of assets that reflects the underlying wealth of a household. Following the method proposed by Filmer and Pritchett (2001), suppose a set of *N* variables, a_{ij} to a_{Nj}, represents the ownership of *N* assets by each household *j,* then the asset index can be represented as a function of a set of underlying variables a_{ij}.

$$A_i = f(a_{ij}) = f(a_{1j}, \dots, a_{Nj}) \qquad (1)$$

The asset index for each household can then be expressed as a linear combination of the set of assets a_{ij}, where v_{ij} are the weights assigned to the underlying variables a_{ij}.

$$A_j = (v_{1j}a_{1j} + v_{2j}a_{2j} + \cdots + v_{Nj}a_{Nj}) \qquad (2)$$

These weights are calculated on the basis of the variance and covariance of the variables a_{ij}, using methods such as factor analysis, principal component analysis (PCA) or multiple correspondence analysis (MCA). Regardless of the method used, however, the construction of an asset index involves attributing unique weights to each of the various possessions (a_{ij}) on the basis of the amount of common information the asset contributes in relation to the latent variable (in this case wealth).

When constructing an asset index across various countries, the same process is followed, given the common information across all countries. Equation (2) is therefore adjusted and A_{jc} is the asset index for household *j* in country *c* and averaged as follows:

$$A_{jc} = \left(v_{1jc}a_{1jc} + v_{2jc}a_{2jc} + \cdots + v_{Njc}a_{Njc}\right) \qquad (3)$$

$$\mathbf{A} = \mathbf{v}\,\mathbf{a} \qquad (4)$$

From equation 3 it is evident that the weights v_{ijc} will only vary by country if an asset index is constructed for each country individually. If an asset index is constructed for a combined sample of countries, the implicit assumption is that the same possessions will carry the same weights in different countries, regardless of the different contexts. While this assumption may be plausible

for countries at roughly similar economic development levels, it may not be as accurate for countries with greatly varying economic structures (Filmer & Pritchett, 2001; Harttgen & Vollmer, 2011). For instance, ownership of a radio in Malawi is associated with a completely different percentile in the expenditure distribution than ownership of a radio in Finland, but may also convey very different information about the underlying wealth of the household concerned. In constructing two separate indices for urban and rural Kenya, Chuma and Molyneux (2009) demonstrate the large variation in wealth rankings when comparing a generic asset index with a context-specific index. Clearly, the value of an asset-based measure is compromised when it is used in cross-country analysis or even across different contexts within the same country, although this chapter is concerned more with the first and bigger of these problems.

The discussion above suggests that, to obtain the most accurate SES measure within a country, country-specific weights need to be derived. This, however, comes at the cost of the comparability of the SES measure across the countries. In order to circumvent this trade-off, this chapter proposes a method with which to construct a wealth indicator that takes into account both the accuracy and the comparability of the commonly used asset index. To improve the accuracy of the measure of SES, this method uses asset indices that have been constructed using country-specific weights. To overcome the problem of comparability, the method links the asset index distribution to the national consumption distribution in order to simulate household consumption for each wealth percentile. Consumption per capita, denoted in international dollars (converted at purchasing power parity (PPP) rates), then serves as a common yardstick with which to compare country-specific asset indices across different countries.

The method is deceptively simple and can be executed in three steps:

1. A context-specific asset index (A_c) is derived for each country that is to be included in the comparison, e.g. for countries participating in a school-based international evaluation such as SACMEQ, SERCE[9] or PISA[10]. The students are then ranked from poorest to wealthiest according to this index.
2. Households with school-going children of a similar age to those who participated in the test are ranked from poorest to wealthiest on the basis of their per capita consumption (C_c) as measured by a national household survey.
3. The final step of the method relies on the assumption that the rankings in both distributions will be similar. That is that students from the n^{th} percentile in the asset index distribution will also be in households that are in the n^{th} percentile in the consumption

[9] Segundo Estudio Regional Comparativo Explicativo
[10] Programme for International Student Assessment

distribution. This means that a student from the n^{th} percentile in the SES distribution can be allocated the per capita household consumption value of the student from the n^{th} percentile in the consumption distribution. To make these per capita consumption values internationally comparable, they are converted to be denoted in purchasing power parity dollars (PPP $).

The traditional asset-based SES will therefore become an adjusted SES, measured in a per capita consumption metric. The result is therefore a single, internationally comparable measure of SES and can be applied to every international evaluation for which an asset index can be derived and for which a household survey containing per capita consumption is available. Moreover, this new wealth indicator will enable the comparison of equally poor students under different education systems. For example, the level of literacy of a child in a household that earns less than $3.10 per capita per day in Malawi can be compared with the level of literacy of a child who is equally poor in Peru.

Although the adjusted SES makes the traditional measure of SES internationally comparable, one is still faced with the problem of comparing achievement scores across tests. In 2001, Barro and Lee compared the achievement scores of TIMSS[11] and IALS[12] in their groundbreaking paper. They did not, however, specifically adjust these scores for the differences between them. Since this pioneering paper, various researchers have adapted this method and currently there are about four different methods used for compiling a global dataset of educational quality (Angrist, et al., 2013b; Hanushek & Woessman, 2009; Gustafsson, 2012). This chapter will make use of the dataset constructed by Gustafsson (2012), where achievement scores across international and regional achievement tests are calibrated using a non-linear programming aproach.

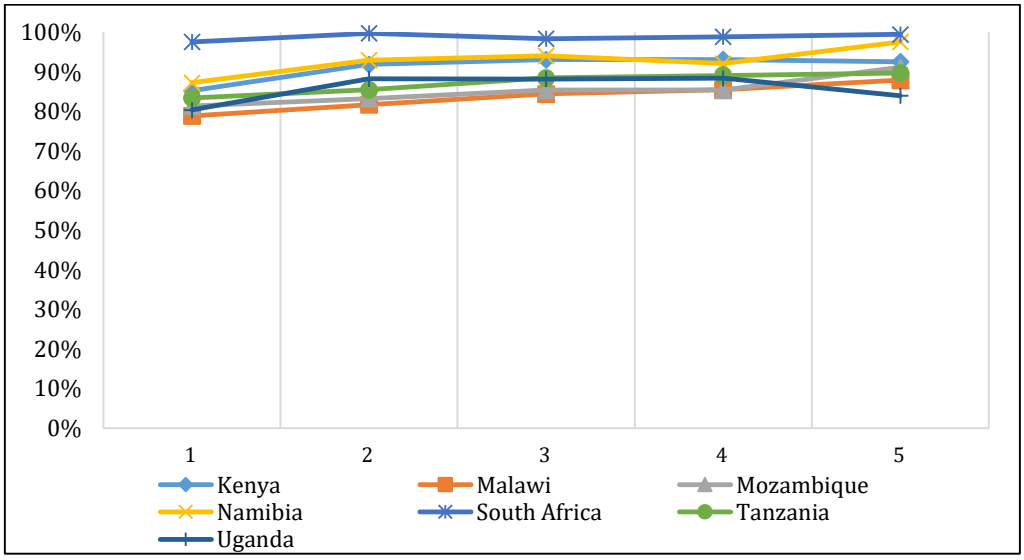
This method is based on the assumption that the per capita consumption distribution is comparable to the SES distribution. For this reason the consumption distribution is calculated only for those households that have at least one member between the age of eleven and fifteen years old. This age range corresponds to the age range of learners who participated in the SACMEQ assessments and will therefore reflect the household consumption distributions that corresponds most closely to the SES distributions. Furthermore, to make the consumption distributions comparable across the countries, household consumption is shown as PPP $ using the World Bank Indicators Gross Domestic Product Deflator (GDP Deflator) and the 2007 Purchasing Power Parity (PPP) values.[13] Given that the data in the household surveys were not

[11] Trends in Mathematics and Science Study
[12] International Adult Literacy Survey
[13] The World Bank Indicators used were accessed on the 16th of May 2016

all collected in the same year necessarily, the per capita consumption values are first deflated to reflect 2007 prices, and then converted to be denoted in the International Dollar (PPP $).

To increase the accuracy of a comparable SES measure, the social gradients are adjusted to account for those children who are not in school. Although access to schooling has increased significantly, it is evident from figure 1 that a 100% attendance rate is not yet a reality for the poorest households in the majority of Sub-Saharan Africa. Figure 1 also shows that there is very little difference between countries with regard to attendance rates in primary schooling. However, it is expected that the gradients will be much steeper and much more differentiated for data collected in the higher school grades. The social gradients are adjusted by calculating the percentage of eleven- to fifteen-year-olds who are currently not in school at each percentile of the household survey.[14] The assumption is then made that students who are not in school in this age group would have performed at the same level as the lowest performing 5th percentile had they written the SACMEQ tests. This is still a rather optimistic assumption as students who drop out of school before the sixth grade are unlikely to be literate or numerate.

Figure 1: Percentage of 11- to 15-year-olds currently in school by income quintile



Source: 2005/06 KIHBS of Kenya, the 2004 IHS2 of Malawi, the 2008/09 IOF of Mozambique, the 2009/2010 NIES of Namibia, the 2008 NIDS of South Africa, the 2007 Household Budget Survey of Tanzania, and the 2009/2010 UGNP of Uganda. **Notes:** The percentage of 11-15 year olds stated that they are currently attending school.

2.3.2. Data

This method will be used to compare the SACMEQ III (Sub-Saharan Africa) and SERCE (Latin America) datasets as both evaluate sixth grade students in mathematics and they were conducted

[14] Various methods can be used in making this adjustment. Taylor and Spaull (2015) makes use of Grade 6 survival rates. Although a more accurate measure, the household survey data used in this chapter does not allow the calculation of Grade 6 survival rates. For this reason, the age group 11 – 15 year olds is used in this chapter.

quite soon after each other. SACMEQ is a consortium of education ministries, policy makers and researchers that, in conjunction with UNESCO's International Institute for Educational Planning (IIEP), aims to improve the research capacity and technical skills of educational planners in participating countries in Southern and Eastern Africa (Moloi and Strauss, 2005:12). SACMEQ III was administered in 2007 and collected data from about 61 000 learners, 8 000 teachers and 2 800 school principals (SACMEQ, 2014).

SERCE (Segundo Estudio Regional Comparativo Explicativo) was conducted by LLECE (the Laboratorio Latinoamericano de Evaluacion de la Calidad de la Education) among sixteen Latin-American countries. Similar to SACMEQ, extensive background information was collected and both third grade and sixth grade students were assessed in mathematics, reading, writing and natural sciences. SERCE was conducted in 2006 and 95 288 sixth grade students were assessed (UNESCO, 2008). These surveys collect extensive background information on the schooling and home environments of students and, in addition, test students and teachers in both numeracy and literacy (Ross et al., 2005; Hungi et al., 2010).

International student assessments are generally constructed to discriminate between performance around an international mean. The performance of Sub-Saharan and some Latin-American countries on these achievement tests, however, is so far below the mean performance of the Organization for Economic Development (OECD) countries that their scores cease to be meaningful if they are tested on some of the other international test programmes. For this reason tests such as SACMEQ and SERCE are very useful, as they are constructed specifically to match the context and standards of the region. Both these datasets also contain information on home possessions, with which country-specific asset indices can be constructed. Furthermore, both assessments assessed Grade 6 learners in numeracy and language at around the same time period (2006/2007), which makes them highly comparable. To be able to compare the SACMEQ and SERCE scores across the different testing programmes, this chapter will make use of a dataset constructed by Gustafsson (2012) as mentioned above. Gustafsson (2012) uses a nonlinear programming approach to transform countries' average achievement scores in international testing programmes to a single normalised scale. The approach he takes is similar to Hanushek and Woesmann's (2009) approach, but is adjusted to include achievement scores from the regional testing programmes.

The household surveys used to estimate the expenditure distribution for SACMEQ countries were the 2005/06 Kenya Integrated Household Budget Survey, the 2004 Second Integrated Household Survey of Malawi, the 2008/09 IOF (Inquérito sobre Orçamento Familiar) of Mozambique, the 2009/2010 Namibian Household Income and Expenditure Survey, the 2008 National Income

Dynamics Study in South Africa, the 2007 Household Budget Survey of Tanzania and the 2009/2010 Uganda National Panel Survey. As household survey data is generally not collected annually, for each country the household survey conducted closest to the 2007 SAQMEC data collection was chosen.

The SEDLAC (Socio-Economic Database for Latin America and the Caribbean) database was used to estimate the income distribution[15] of the Latin-American countries. The database, developed by Centro de Estudios Distributivos Laborales y Sociales (CEDLAS) and the World Bank's Latin American and Caribbean Poverty Group, contains income data for 25 Latin American countries, fourteen[16] of which also participated in SERCE. The data was drawn from the household surveys in each country for the years 2005 to 2007. By linking the income distributions in these household surveys to the asset index distribution in the SACMEQ and SERCE data, it is possible to analyse socio-economic gradients for cognitive outcomes for seven African countries and fourteen Latin-American countries.

2.3.3. The Assumptions

The proposed method rests on the assumption that the ranking of households within the asset index will be similar to the ranking of households within the expenditure distribution. As referred to earlier, several studies have shown that a relatively high correlation exists between the asset index and the expenditure data, although there is consensus that the two measures do not produce an exactly similar rank order. In linking the Demographic and Health Survey (DHS) asset indices with simulated income distributions, Harttgen and Vollmer (2011) assumed that although household rankings between the two measures are not identical, they are similar enough to be matched.

Filmer and Pritchett (2001) found correlation coefficients of between 0.43 and 0.64 when comparing the asset index and expenditures data in three developing countries. They also found general agreement among the households ranked in the poorest 40% by both measures. More importantly, they found that the differences in schooling outcomes between the richest and poorest quintiles were mostly the same between the two measures. Sahn and Stifel (2003) examined twelve household survey datasets from ten countries and found the correlation between the household rankings to be above 0.70 in two of the datasets, to be between 0.51 and 0.70 for four of the datasets and for all of the rankings to be at least above 0.39. Steward and

[15] The conventional notion has been to use household consumption has a measure for long-run wealth, because it is easier to measure in rural areas, and due to consumption smoothing provides a more accurate measure of long-run wealth. However, data on household consumption expenditures in Latin America was not easily available, therefore the use of household income.

[16] These fourteen are: Argentina, Brazil, Chile, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Peru and Uruguay

Simelane (2005) found similar rank correlations when validating the asset index as a proxy for household expenditure using the 1996 South African Census data. Ferguson, et al. (2003) compared household rankings that were based on household expenditure data with two differently constructed asset indices. In Peru they found a rank correlation of 0.73 between household expenditure and each of the asset indices, whereas in Greece and Pakistan the correlation was slightly lower at 0.65 and 0.53. Filmer and Scott (2012) undertook a very comprehensive evaluation of the correlation between per capita expenditures and various asset indices. They found that the rank correlation between per capita expenditures and asset indices varied from about 0.39 in Zambia to about 0.72 in Brazil. However, they found some differences in the ranking of households, especially in the lowest population quintile. They concluded that, on average, household rankings are related, and that these rankings are always statistically significant. However, the correlations between household rankings constructed using either per capita expenditure data or asset indices are not systematically high. Nonetheless, they have shown that the gradient of the educational outcomes of the asset index is largely similar to that for the educational outcomes using per capita expenditures.

To evaluate the validity of the assumption for use in this chapter, asset indices were constructed from the asset data available in each of the household surveys.[17] Given that information is available on both the asset index and the per capita expenditure for the same households, it is possible to compare the household rankings using either an asset index or per capita expenditure. As the main interest here is the similarity of the household rankings using either of these methods, the resultant distributions and percentiles were tested using the Spearman rank correlation (table 1). The rank correlations for the per capita expenditure data range from 0.44 in Malawi to 0.66 in Mozambique and Uganda. For South Africa, the correlation is 0.63, which is similar to the correlation that Steward and Simelane (2005) found using the 1996 Census data.

Table 1: Spearman rank correlation

		Malawi	Mozambique	Namibia	South Africa	Uganda
Per Capita Consumption	***Distribution***	0.44	0.66	0.63	0.63	0.63
	Percentiles	0.44	0.57	0.63	0.63	0.63

Source: 2004 IHS2 of Malawi, 2008/09 IOF of Mozambique, 2009/2010 NIES of Namibia, 2008 NIDS of South Africa, and the 2009/2010 UGNP of Uganda. **Notes:** Asset indices were constructed from asset data available in household surveys. Each variable was categorised in 100 percentiles to test the rank correlation at percentile level as well.

The value of an asset index, however, lies in its ability to approximate a wealth measure where household expenditure data is lacking. Although a perfect rank correlation between asset indices and household expenditure measures does not exist, once aggregation has been applied, the

[17] Information on asset ownership was available in all the Sub-Saharan household surveys, except Kenya.

patterns of educational outcomes have been found to be largely the same at different points in the distribution irrespective of the measure of wealth used (Filmer & Pritchett, 2001). Figure 11 in 2.7 Chapter Appendix depicts the gradients for both SES and the standardised log of consumption per capita, against educational attainment. Although the gradients are not a perfect match, the similarities are striking. For the reasons mentioned above, this chapter will accept the assumption that the household rankings between asset indices and household consumption are similar enough to compare.

2.4. Comparing Social Gradients across Contexts

In most international education datasets, information is collected on students' (or their households') possessions at home. This provides researchers with a wealth of information with which to compare socio-economic gradients across countries, but owing to the problem of comparability, comparisons have either been made incorrectly or avoided completely. Ross and Zuze (2004) compared socio-economic gradients and student achievement across the SACMEQ countries in the 2004 IIEP newsletter. These gradients, however, were constructed using common weights for the assets in all the countries, thereby gaining in comparability but compromising measurement accuracy. In the PISA 2012 Excellence through Equity Report, socio-economic gradients are compared using an adjusted wealth index (OECD, 2013:35). Although the index is transformed to allow each country to be centred on its own mean, the accuracy of the measure is still deficient, as it cannot take into account the country-specific possessions.

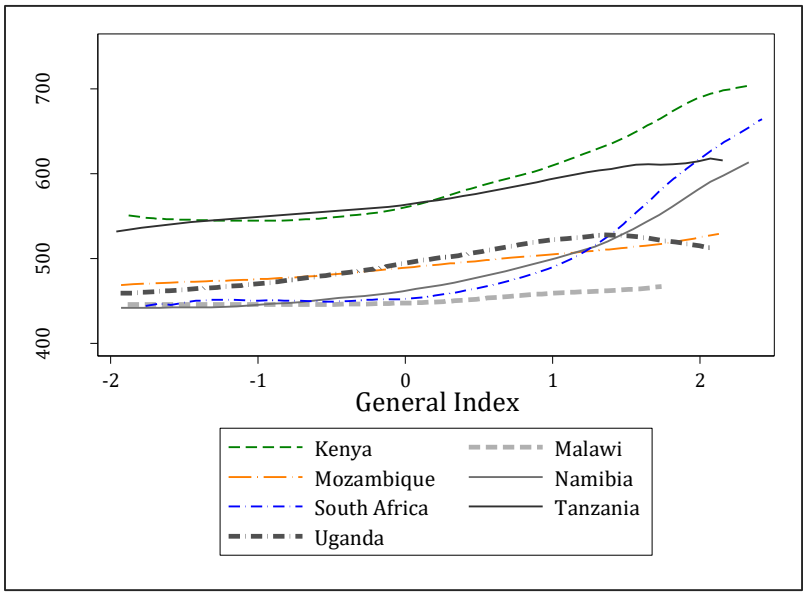
The problem with using general SES measures in cross-country comparisons as they have been used previously is that they provide inaccurate gradients and biased estimated effects. A lot of valuable data is also lost when country-specific assets are not included, which results in inefficient estimators. The adjusted SES indicator suggested in this chapter aims to improve the accuracy with which these gradients are estimated and will be applied in three different settings, first when comparing socio-economic gradients across different countries within a dataset; secondly, when comparing socio-economic gradients among different sub-samples where the asset prices and availability vary between the groups; and, lastly, when comparing socio-economic gradients across different countries in different datasets.

2.4.1. Comparisons across countries

The proposed wealth indicator allows for a more flexible, yet more accurate comparison of socio-economic gradients across countries. Figures 2 to 4 illustrate the difference in socio-economic gradients, depending on the method with which the measure was constructed. Figure 2 depicts the customary approach of computing a general SES measure across countries. As similar weights

are applied to the same assets in these countries, the SES of all the countries is arranged around a mean of zero across all the countries, with a standard deviation of one. In figure 3 country-specific weights are applied to the socio-economic gradient, which allows for differentiation between countries regarding country wealth. Using figure 3, however, is problematic in that the comparison is conducted using different yardsticks and forcing them onto the same scale. Put differently, the mean for each country is set at zero and the standard deviation at one, which implies that the horizontal axis does not reflect the same wealth levels across countries. In order to generate a comparable yardstick, it is therefore necessary to equate the country-specific SES measure to per capita expenditure. Figure 4 illustrates this result and provides a much more accurate depiction of differences in the socio-economic gradients between the Sub-Saharan countries. Indicated in figure 4 are the $1.90 and $3.10 poverty lines, which elucidate the failure of the education systems for many of the world's poorest.

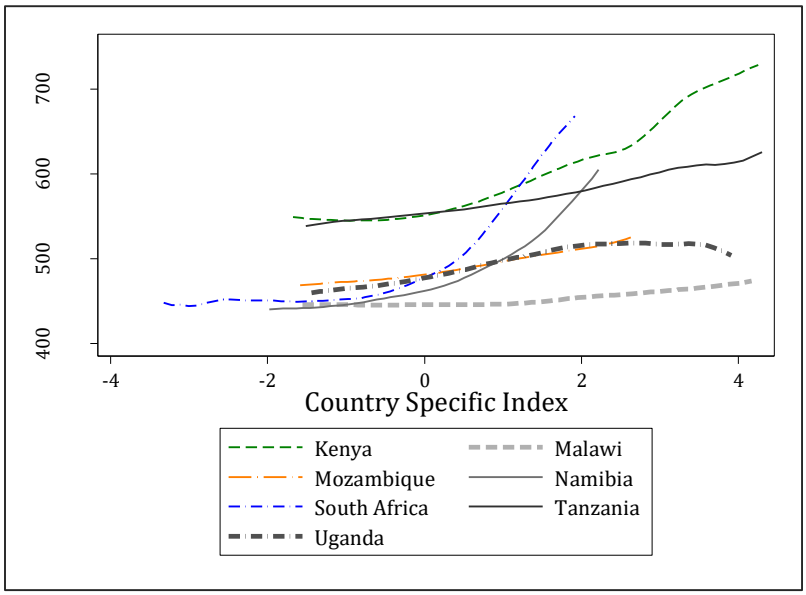
Figure 2: General SACMEQ-wide measure of SES[18]



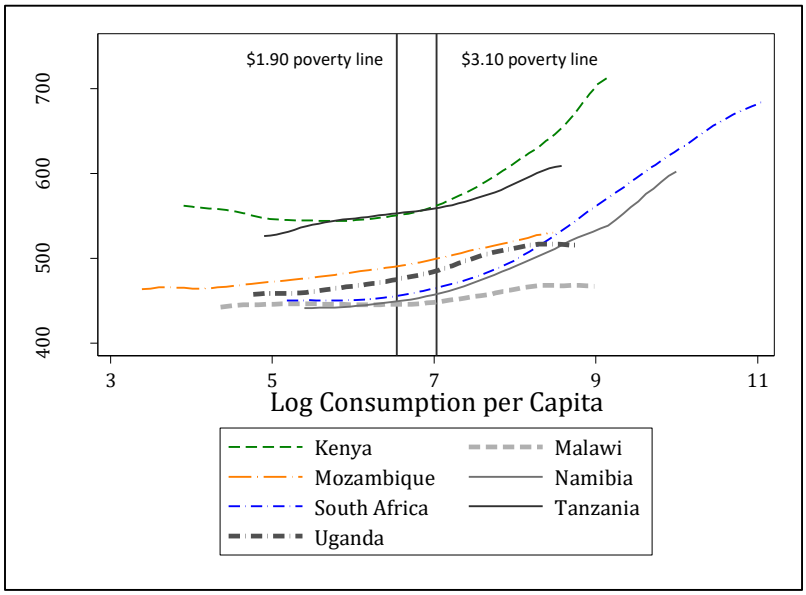
Source: SACMEQ III. **Notes:** General measure of SES, adjusted for children who are not in school. Local polynomial regression was used to graph the gradients.

[18] The Cronbach alpha for the general asset index is 0.82.

Figure 3: Country-specific measure of SES[19]



Source: SACMEQ III. **Notes:** General measure of SES, adjusted for children who are not in school. Local polynomial regression was used to graph the gradients.



Source: SACMEQ III and the 2005/06 KIHBS of Kenya, the 2004 IHS2 of Malawi, the 2008/09 IOF of Mozambique, the 2009/2010 NIES of Namibia, the 2008 NIDS of South Africa, the 2007 Household Budget Survey of Tanzania, and the 2009/2010 UGNP of Uganda. **Notes:** General measure of SES, adjusted for children who are not in school. Consumption per capita is denoted in PPP $. Local polynomial regression was used to graph the gradients.

[19] The Cronbach's alpha for the country specific indices are as follows: Kenya (0.79), Malawi (0.74), Mozambique (0.82), Namibia (0.79), South Africa (0.76), Tanzania (0.77) and Uganda (0.76).

The figures above provide one with a concrete sense of the difference the various methods make. Using the general measure of SES (figure 2) would have resulted in the conclusion that the wealthiest students in Kenya and South Africa are equally well-off, and that the performance gap between them is about half a standard deviation, whereas the performance gap between the poorest students is about a full standard deviation. Drawing conclusions from using country-specific measures of SES, and forcing them on the same scale (figure 3), would have one thinking that Kenya's wealthiest students are far wealthier than South Africa's wealthiest students and that at a certain level of wealth South Africa manages to outperform Kenya. Figure 4, however, shows that both these conclusions are invalid. The more accurate representation of the socio-economic gradients shows that Kenya outperforms South Africa at all levels of wealth. Moreover, it shows that the performance gap actually widens from about one standard deviation for those students living under $3.10 a day to about one-and-a-half standard deviations between the wealthiest students in Kenya and their counterparts in South Africa.

Figure 4 gives a more accurate (and sobering) perspective of the relative wealth and performance between the countries. Interestingly, Kenya and Tanzania outperform the other countries at all levels of SES, even the wealthy, top-performing students in South Africa. At the poverty lines, Kenya and Tanzania perform equally well, but wealthier Kenyan learners outperform wealthier Tanzanian learners. Malawi, on the other hand, consistently performs the worst and shows little difference in test scores between the poorest and wealthiest students in the country. Both South Africa and Namibia have steep socio-economic gradients, with a relatively well-performing upper class. Children in South Africa and Namibia who fall under the $3.10 per day poverty line, however, are outperformed by equally poor students in Mozambique and Uganda and perform at about the same level as children from Malawi. This is quite striking since South Africa has a GDP per capita that is twenty-five times that of Malawi, sixteen times that of Mozambique and one-and-a-half times that of Namibia (see table 4 in 2.7 Chapter Appendix for a full table of GDP per capita for each country).

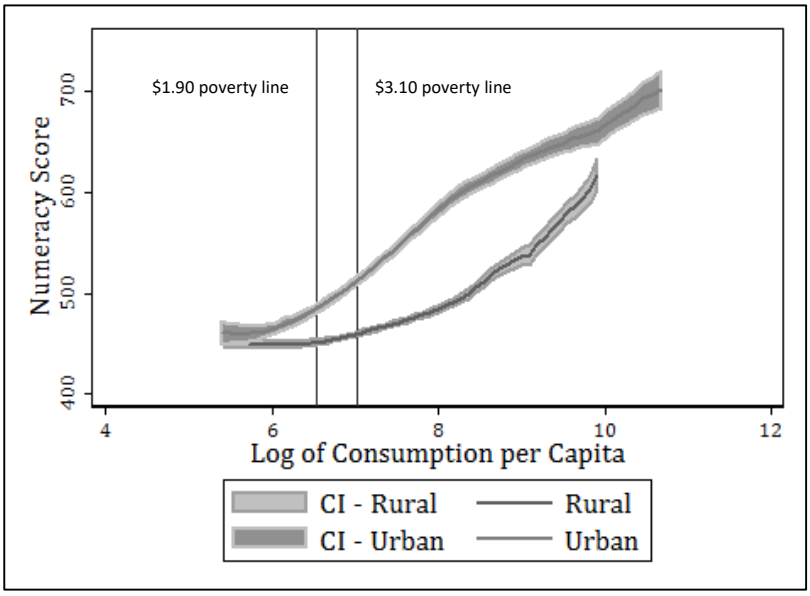
2.4.2. Comparison across sub-samples within a country

The proposed method is not only useful for the comparison between countries, but can also be applied to different sub-samples within a country. This is particularly useful in the design of social protection policies, which generally differentiate between urban and rural areas owing to their contextual differences such as infrastructure and livelihoods. Often asset indices are used in these circumstances to proxy the wealth of different sub-groups; however, given the contextual differences in these areas, it is necessary to adjust the asset index to be sensitive to these

differences. Asset prices and asset availability often differ among urban and rural settings, which implies that different assets will carry different weights in the construction of an asset index.[20]

The proposed method is applied to the South African[21] context to show the difference in educational outcomes for learners who are equally poor, but who live either in an urban or in a rural area. Figure 5 illustrates the separate socio-economic gradients for education outcomes in urban and rural areas. In the South African context there are large discrepancies in the quality of learning and teaching between urban and rural schools. As expected, urban students, have on average, better educational outcomes than their equally poor rural counterparts. Interestingly though, the poorest rural children do not perform much worse than their urban peers, but a significant difference emerges as per capita consumption increases.

Figure 5: Comparable measure of SES across sub-samples within a country



Source: SACMEQ II and the 2008 NIDS of South Africa. **Notes:** General measure of SES, adjusted for children who are not in school. Consumption per capita is denoted in PPP $. CI refers to the Confidence Interval.

It is possible to gain a more in-depth understanding of the heterogeneity in the quality of schooling in different contexts by sub-dividing student achievement scores into skill levels. SACMEQ differentiates between eight competency levels on the basis of the difficulty of the questions and the specific skills required to give a correct response.[22] These competency levels have the advantage of providing a more concrete understanding of student capabilities, rather

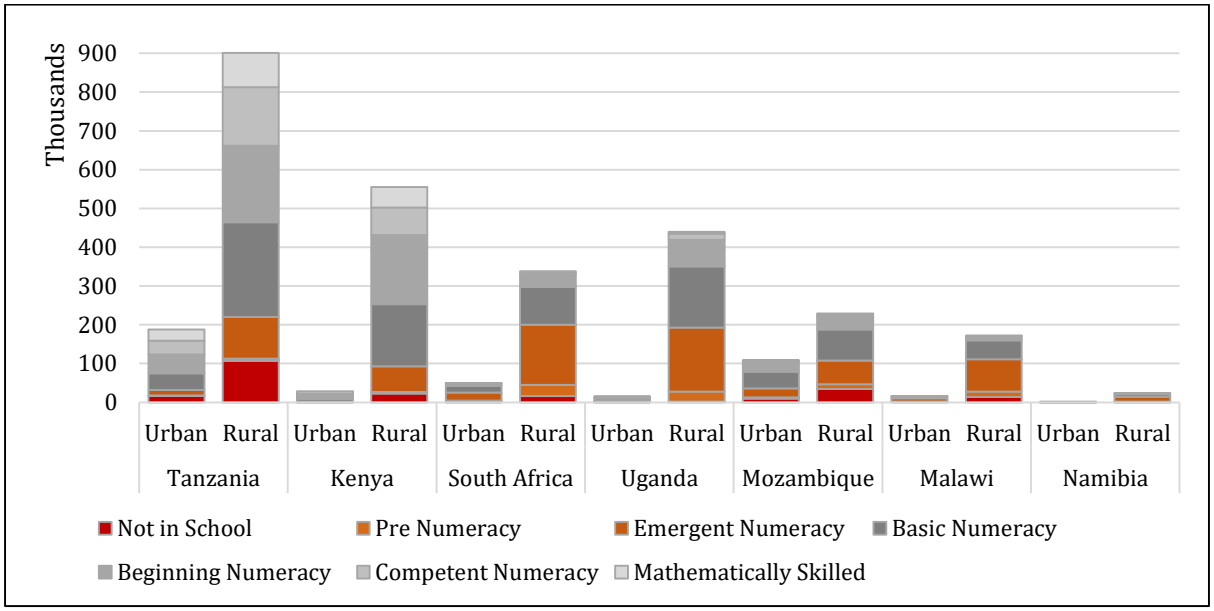
[20] The different income distributions between the urban and rural sub-samples are shown in figure 12 of 2.7 Chapter Appendix. The urban and rural sub-samples were only shown for the Sub-Saharan countries, as there are too few rural observations in the surveys in Latin-American countries.

[21] The socio-economic gradients from the other Sub-Saharan countries are shown in figure 13.

[22] Owing to the small number of observations in the top three categories, they were grouped into one category; 'Mathematically Skilled'. This chapter therefore makes use of six categories.

than just a relative performance score. Figure 6 shows the number of students living under the $3.10 per day poverty line in each context, per competency level. The stark difference between the quality of performance in Kenya and the rest of the SACMEQ countries is once again apparent. Even though Kenya is a low-income country and has a poverty headcount rate of one-and-a-half times that of a middle-income country such as South Africa, it still manages to provide a much larger proportion of these students with sufficient mathematical skills. This means that the most marginalised students in Kenya are better placed for participation in a modern labour market than the marginalised students in South Africa. Furthermore, the difference in the quality of educational outcomes between Mozambique and Malawi is quite remarkable. Mozambique has one-and-a-half times the poverty headcount rate of Malawi, but half of Mozambique's poor students are proficient in numeracy, whereas only a small number of students in Malawi function at the same level, despite the fact that the Malawian government has supplied free primary education for the past 20 years.

Figure 6: Number of students living under $3.10 per day per competency level, by urban/rural



Notes: The number of children not in school is calculated for the SACMEQ totals, based on the percentage of children not currently attending school in the household survey data.

2.4.3. Comparing across datasets

In recent years, new research has emerged on the construction of global datasets of educational quality (Angrist, et al., 2013a; Barro and Lee, 2001; Gustafsson, 2012; Hanushek and Woessman, 2009). These datasets attempt to calibrate achievement scores across international student achievement tests (PIRLS, TIMSS and PISA) and regional student achievement tests (SACMEQ, PASEC and SERCE). The foremost reason for this research has been to establish the strength of the relationship between the educational performance and the economic growth within a

country. While this research contributes greatly to identifying the most marginalised students in terms of educational quality, it still lacks a common measure of wealth across all the datasets.

The major benefit of the proposed wealth indicator is that it enables the comparison of educational quality for a given level of wealth and consequently allows the comparison of socio-economic gradients. This combination will therefore contribute to a better understanding of which countries are managing to provide a quality education to learners of varying wealth levels. A comparison of this sort will be particularly interesting between Sub-Saharan Africa and Latin America, as both regions fare relatively poorly in the international assessments and have highly unequal societies. It has never before been possible to compare the learner performance between learners of equal wealth levels across these regions, which makes this method particularly useful. This section will therefore be concerned with comparing these regions by making use of Gustafsson's (2012) recalibrated 2007 SACMEQ and 2006 SERCE achievement scores.

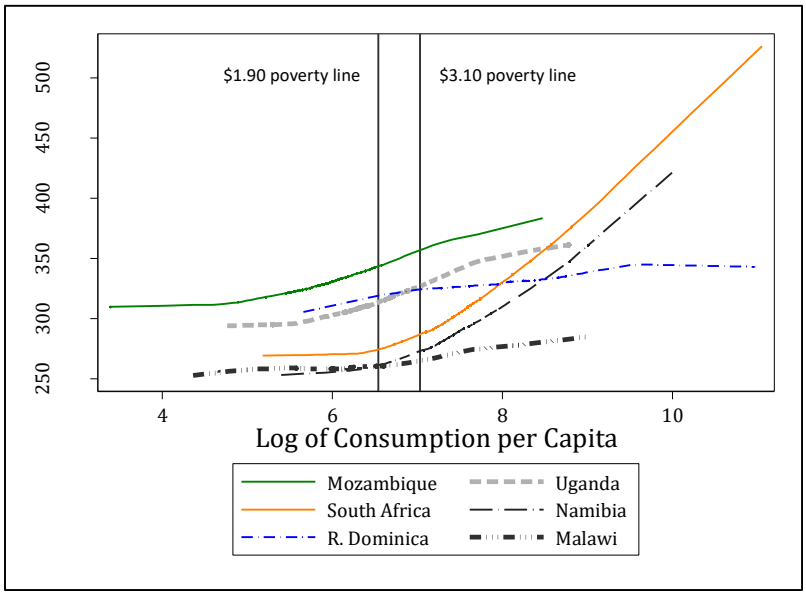
In figure 7 the relationship between the transformed numeracy scores and SES for the six poorest-performing countries is shown. The Latin-American countries seem to have outperformed the Sub-Saharan countries at given levels of poverty, but also remarkably fewer children live under the $3.10 per day poverty line in the Latin-American region. The Dominican Republic was the only Latin-American country among the poorest-performing countries. It is once again rather striking that at equal wealth levels Mozambique and Uganda seem to be much more effective at producing educational outcomes than middle-income countries such as South Africa and the Dominican Republic. Children in households that live under the $3.10 per day poverty line receive an education of a much higher quality in Mozambique and Uganda than in South Africa.

Figure 8 shows the relationship between the numeracy scores and SES for the six best-performing countries in the Latin-American and Sub-Saharan regions. Kenya is the only Sub-Saharan country that managed to make the top six countries and, remarkably, outperforms much wealthier countries such as Uruguay and Costa Rica for given levels of SES. This graph, however, does not take into account the number of students in these countries and, more importantly, the wealth distribution of students in these countries.

Figure 9 shows the number of students living under the $3.10 per day poverty line, per competency level for the eight countries with the largest proportion of students living in poverty. Among these countries, South Africa has the highest proportion of students who are functioning at below-acceptable levels of numeracy (Pre-numeracy and Emergent Numeracy). Brazil, Kenya, Tanzania and Uganda all have a much higher proportion of students living in poverty, but also have a much higher proportion of these students performing at acceptable (Basic Numeracy) to above-average levels (Beginning Numeracy, Competent Numeracy and Mathematically Skilled).

In Kenya, specifically, 30% of poor students (below the $3.10 per day poverty line) perform at acceptable levels and 56% perform at above-average levels of numerical skills. This is quite remarkable when taking into account that Brazil has a GDP per capita that is ten times that of Kenya and South Africa has a GDP per capita that is four times larger than Kenya.[23] Similarly, Uganda has more students living in poverty than South Africa but manages to attain higher levels of numerical competency than South Africa does, despite South Africa having a GDP per capita that is fifteen times that of Uganda. Once again this signifies that poor students in Uganda receive a much higher quality of education than their South African counterparts.

Figure 7: Socio-economic gradient for the six poorest-performing countries across Latin America and Sub-Saharan Africa[24]

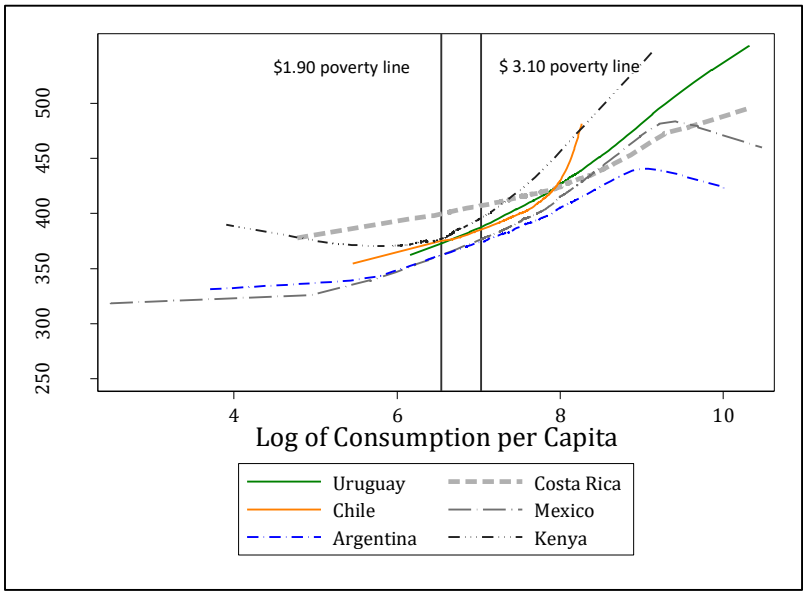


Notes: Social gradients of Sub-Saharan countries adjusted for children not attending school. The adjustment has not been made for the Latin American countries, since the attendance rate for these countries is on average about 97%. For the Republic of Dominica specifically the attendance rate is 98%. Consumption per capita is denoted in PPP $.

[23] Using the 2007 figure for the GDP per capita in current US$ in the World Development Indicators.

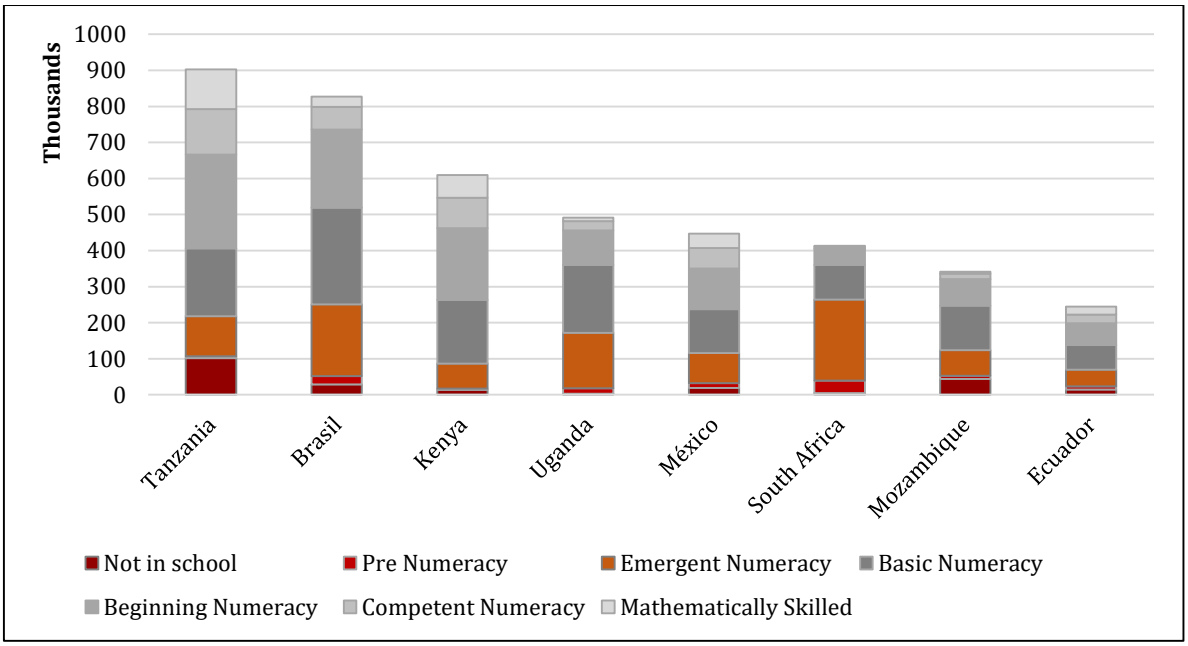
[24] The Cronbach's alpha for the country specific indices are as follows: Malawi (0.74), Mozambique (0.82), Namibia (0.79), South Africa (0.76), Republic of Dominica (0.81) and Uganda (0.76).

Figure 8: Socio-economic gradient for the six best-performing countries across Latin America and Sub-Saharan Africa[25]



Notes: Social gradients of Sub-Saharan countries adjusted for children not attending school. The adjustment has not been made for the Latin American countries, since the attendance rate for these countries is on average about 97%. Consumption per capita is denoted in PPP $. Local polynomial regression was used to graph the gradients.

Figure 9: Number of students living under $3.10 per day, per competency level



Notes: The number of children not in school is calculated by applying the percentage of children not currently attending school in the household survey data to the total number of students in the SACMEQ and SERCE datasets. This was done by restricting the samples to only consider children under the $3.10 a day poverty line.

[25] The Cronbach's alpha for the country specific indices are as follows: Argentina (0.78), Uruguay (0.76), Costa Rica (0.75), Chile (0.74), Mexico (0.80) and Kenya (0.79).

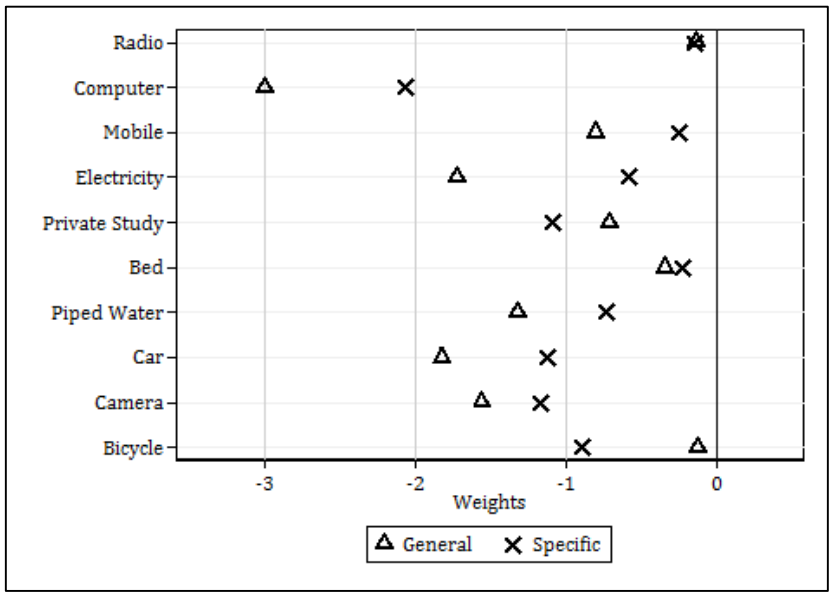
2.5. Sensitivity Checks

2.5.1. The general measure versus the country-specific measure

The method explained above is only valid (and consequently necessary) if the country-specific measure of SES is a better measure than the general measure of SES derived from the weights used across all the countries concerned. For this reason, it is essential to gain a sense of the difference in the two methods regarding the weights allocated to the assets, as well as how the different asset indices are associated with educational attainment. This can be achieved by looking at the difference in the asset indices from three perspectives: first, the difference in weights that are allocated to the various assets; secondly, the difference in the effect on the coefficients and the amount of variation explained in student achievement scores; and thirdly, the extent to which a child's SES classification changes.

In order to assess the difference in the weights allocated to the assets, South Africa in the context of SACMEQ is used as an example.[26] Figure 10 depicts the difference in the weights obtained for a list of assets, by constructing a country-specific asset index relative to constructing a general asset index that includes all the countries. A distinct difference is evident between the two different methods.

Figure 10: The difference in weights obtained



Source: SACMEQ 2007. Own calculations. **Notes:** Weights calculated using MCA first including all SACMEQ countries (General Asset Index) and then for South Africa specifically (Country Specific).

[26] South Africa is used as an example because the large variance in asset ownership in this country makes the asset index more sensitive to changes in the calculation method.

Secondly, it is necessary to take into account the effect the two different measures will have on 'explaining[27]' student achievement. Table 2 depicts the β coefficients and R^2 when regressing the two different indices on student mathematics performance. Two regressions were run for each country, one assuming a linear functional form and the other a quadratic functional form. It is clear across all the countries that the size of the coefficients on the SES variables differs according to the measure used, but the direction of this difference varies. In countries with very little variation in education performance across different wealth classes, such as Malawi, Mozambique and Uganda, the slope coefficient in the linear functional form does not vary much. However, in countries with a steeper social gradient, the difference in the slope of SES using both the linear and quadratic functional form is much more prominent. This clearly illustrates how the general measure of SES averages the measure over highly unequal and more equal countries, and consequently lead to biased estimates of SES. The R^2 remains constant, regardless of the measure used. Table 2 therefore shows that both measures have the same explanatory power, but that the country-specific measure will provide coefficients that are more accurate.

Table 2: Effect of using a country-specific or general asset index measure in a regression

		Linear Form		Quadratic Form		
		β	R^2	β	β^2	R^2
Kenya	*General*	20.744***	0.201	24.180***	8.556***	0.206
	Specific	16.762***	0.203	12.829***	4.132***	0.207
Malawi	*General*	2.970	0.023	6.667*	3.638	0.024
	Specific	2.454	0.023	0.628	1.695	0.025
Mozambique	*General*	6.929***	0.107	10.634***	6.152***	0.111
	Specific	6.262***	0.107	4.081	6.009***	0.112
Namibia	*General*	16.096***	0.255	15.277***	12.300***	0.273
	Specific	15.921***	0.255	16.312***	11.793***	0.274
South Africa	*General*	34.223***	0.359	9.498***	25.410***	0.393
	Specific	27.265***	0.360	41.330***	16.525***	0.396
Tanzania	*General*	17.232***	0.129	15.973***	-1.64	0.129
	Specific	10.600***	0.126	11.672***	-0.813	0.127
Uganda	*General*	12.239***	0.126	18.423***	1.648	0.127
	Specific	12.058***	0.124	13.028***	-0.83	0.124

Notes: Controlling for various student and family background variables.
* p<.1; ** p<.05; *** p<.01

Lastly, table 5 in 2.7 Chapter Appendix explores the stability of the household rankings across the wealth quintiles. Household rankings remain relatively stable and the small percentages of households that do move are unlikely to move more than one quintile. Figure 13 in 2.7 Chapter Appendix illustrates the differences in the socio-economic gradients in each country, depending

[27] 'Explaining' in this context should not be interpreted as causal, but rather as the amount of variance in student performance explained by the two different measures of SES. In normal OLS regressions, SES is merely associated with student performance and nothing can be concluded about a causal relationship.

on the asset index used. In the countries where SES does not seem to explain a large amount of the variation in student achievement scores, the difference is not very large. Nonetheless, in more unequal societies, where SES does have more explanatory power in student achievement scores, the differences are more obvious.

On the basis of these three evaluations, it seems that whether one constructs an asset index using the general method or the country-specific method does make a difference. Most significantly, it is clear that the β-coefficients change according to the method used, which adds to the argument for constructing country-specific asset indices.

2.5.2. MCA, PCA or polychoric PCA

As a further check to the viability of the comparable SES measure, its sensitivity to the method of constructing the asset index is tested. Asset indices can be constructed to include the same assets, but by means of multiple correspondence analysis (MCA), principal component analysis (PCA) or polychoric PCA (PPCA).[28] As a first evaluation, the relative rankings of children after these three methods have been applied are assessed using Spearman rank correlations. Secondly, both overall quintile misclassification and misclassification in the 1st quintile are looked at and, lastly, the β coefficients, R^2 and the social gradients are examined using the different asset indices.

In the literature, PCA is the most common method of constructing an asset index. PCA, however, is based on the assumption that the indicator variables are normally distributed and is therefore only appropriate when continuous variables are included in the index. MCA, on the other hand, makes fewer assumptions about the underlying distributions of the indicator variables and is therefore more suited to the inclusion of discrete or categorical variables (Booysen, et al., 2008). Polychoric PCA is designed specifically to include categorical variables by assuming that discrete data are observed values of an underlying continuous variable. Consequently, the PPCA method is suited for both continuous and categorical variables (Moser & Felton, 2007). Although these methods are technically more correct, this section sets out to establish the difference they make to the estimation of the social gradients.

The Spearman rank correlations and the quintile misclassification show little difference whether the comparable measure of SES was constructed using MCA, PCA or PPCA. Children's rankings on the comparable measure of SES that was constructed using MCA are compared to their rankings when the comparable measure of SES was constructed by means of PCA and PPCA. The Spearman correlations are uniformly high, ranging from 0.957 to 0.986 (table 3). Both the PCA and PPCA do an equally good job of classifying observations. The overall quintile misclassification is relatively

[28] For simplification purposes, the sensitivity analysis is only done on the Sub-Saharan countries.

low (table 6 in the Chapter Appendix), ranging from 10.7% in Mozambique (MCA vs PCA) to 23% in Namibia (MCA vs Polychoric PCA). Misclassification in the poorest quintile varies between 4.5% in Kenya (MCA vs PCA) and 17.1% in South Africa (MCA vs PCA). Furthermore, the social gradients do not show any significant difference regarding the method used to construct the asset index. Although some variation occurs in the β-coefficients, the explained variance and the turning points of the quadratic effects remain relatively stable (table 7 in the Chapter Appendix).

Table 3: Spearman rank correlations using MCA, PCA or PPCA

Country	MCA vs PPCA	MCA vs PCA
Kenya	0.973	0.967
Malawi	0.961	0.956
Mozambique	0.986	0.986
Namibia	0.979	0.974
South Africa	0.974	0.976
Tanzania	0.955	0.961
Uganda	0.962	0.974

Notes: Spearman rank correlations for the comparable measure constructed using MCA, PCA and PPCA

2.6. Conclusion

Socio-economic status plays an essential role in the prediction of student test scores and its explanatory power and functional form are often compared across countries. As no credible method exists for comparing SES across different contexts, comparisons made are often inaccurate as researchers have had to choose between either the accuracy of a measure within countries or the comparability of the measures across countries. Furthermore, no method exists for comparing SES across different datasets, which has meant that comparisons between certain countries and regions have been impossible.

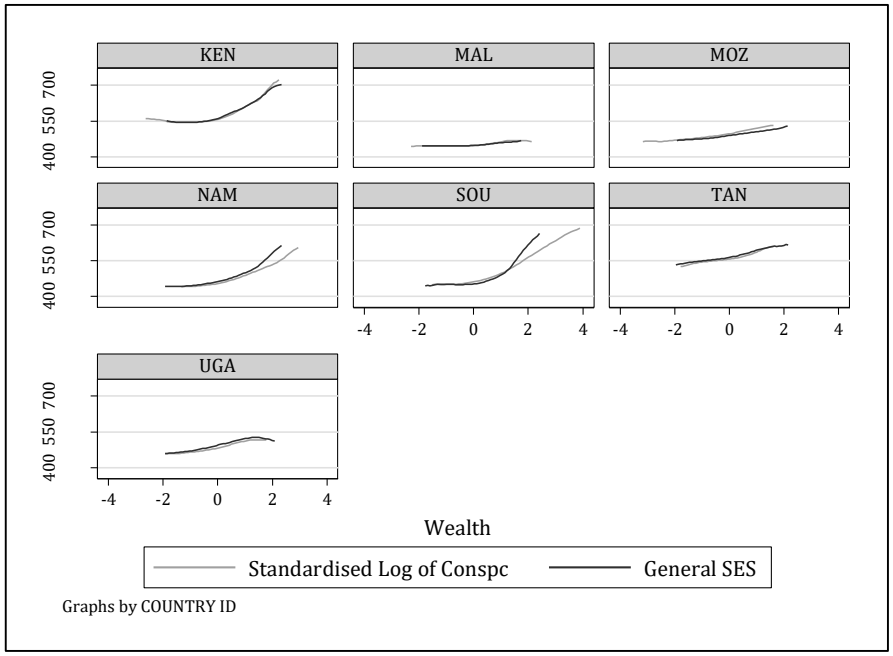
The method proposed in this chapter aims to alleviate these problems. In linking country-specific asset indices to a common yardstick of per capita consumption, an adjusted SES measure was constructed. This measure now allows the comparison of socio-economic gradients among countries, sub-samples and datasets. The strength of this method lies in its ability to compare SES across different datasets with different asset lists, as this has not been possible previously. This means that the direction and strength of the association between wealth and educational outcomes in different countries and settings can now be compared.

The comparable measure of SES was applied to the 2007 SACMEQ and 2006 SERCE datasets and enabled the comparison of educational outcomes for seven Sub-Saharan and fourteen Latin-American countries. From these comparisons it has become clear that in certain wealthier but

more unequal countries, such as South Africa and Brazil, the poorest children are much worse off in terms of the quality of education as reflected in cognitive scores on international tests than the poorest children in much poorer countries. This trend signifies that certain countries manage to convert household resources into educational outcomes much more efficiently.

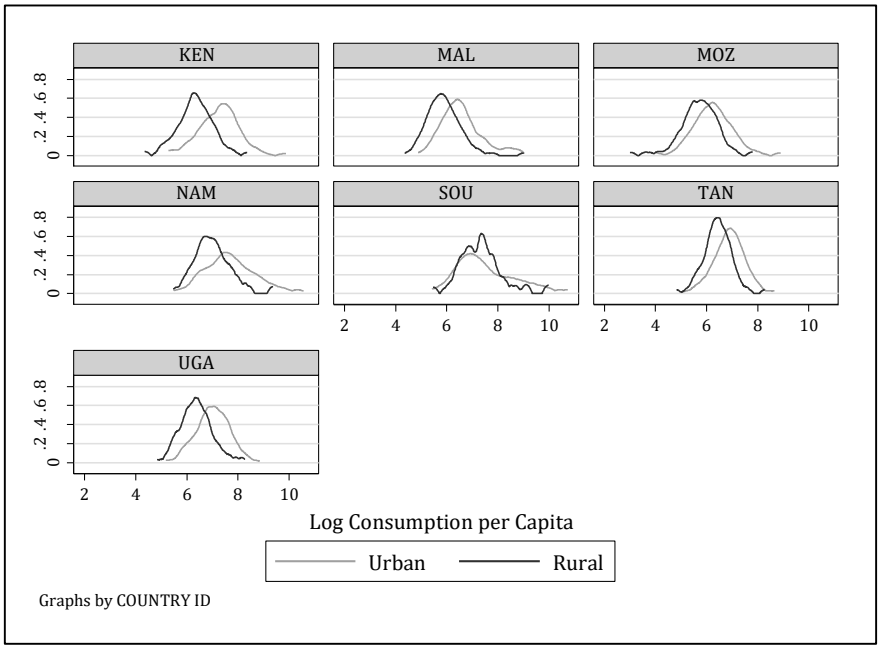
2.7. Chapter Appendix

Figure 11: Social gradients for SES and the standardised log of per capita expenditure



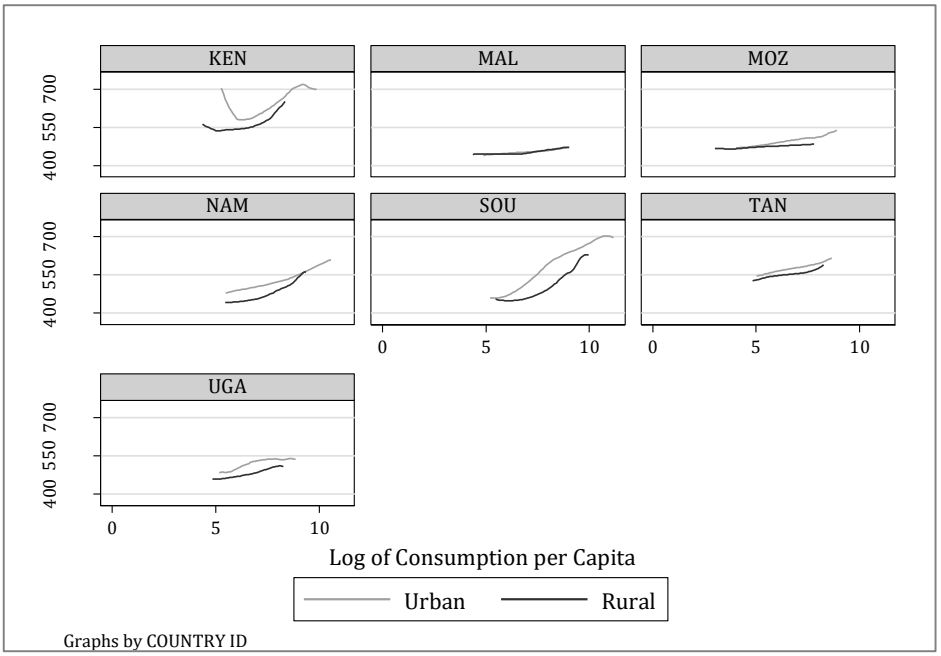
Source: SACMEQ III and the 2005/06 KIHBS of Kenya, the 2004 IHS2 of Malawi, the 2008/09 IOF of Mozambique, the 2009/2010 NIES of Namibia, the 2008 NIDS of South Africa, the 2007 Household Budget Survey of Tanzania, and the 2009/2010 UGNP of Uganda. **Notes:** General measure of SES, adjusted for children who are not in school. Consumption per capita (Conspc) is denoted in PPP $.

Figure 12: Consumption distributions: Urban vs rural sub-samples



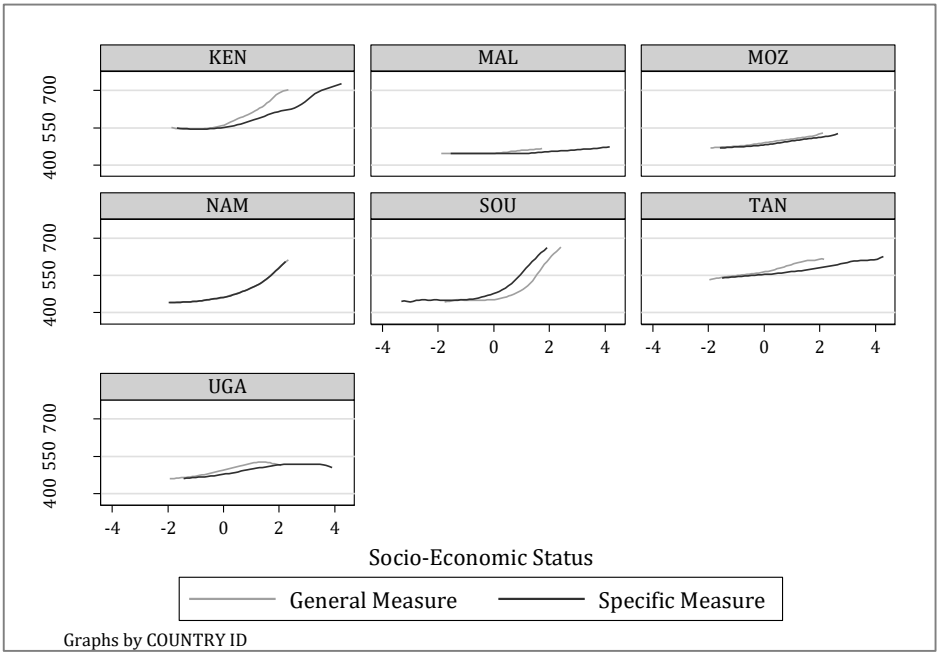
Source: SACMEQ II and the 2005/06 KIHBS of Kenya, the 2004 IHS2 of Malawi, the 2008/09 IOF of Mozambique, the 2009/2010 NIES of Namibia, the 2008 NIDS of South Africa, the 2007 Household Budget Survey of Tanzania, and the 2009/2010 UGNP of Uganda.

Figure 13: Socio-economic gradients for urban and rural samples



Data: SACMEQ III

Figure 14: General measure and the country-specific measure of SES



Data: SACMEQ III

Table 4: GDP per capita and % of GDP spent on education

Country Name	2007 GDP per capita (constant 2005 US$)	% of GDP spent on Education
Argentina	$ 6 195,38	4,9%
Brazil	$ 5 121,03	5,1%
Chile	$ 8 194,14	3,2%
Costa Rica	$ 5 252,06	4,7%
Dominican Republic	$ 4 241,36	2,2%
Ecuador	$ 3 103,64	4,2%
El Salvador	$ 3 012,36	3,1%
Guatemala	$ 2 288,86	3,0%
Honduras	$ 1 524,71	.
Kenya	$ 564,67	7,0%
Malawi	$ 224,50	4,4%
Mexico	$ 8 264,92	4,7%
Mozambique	$ 338,44	6,4%
Namibia	$ 3 937,52	4,6%
Nicaragua	$ 1 239,08	3,8%
Panama	$ 5 389,93	3,5%
Paraguay	$ 1 575,58	2,5%
Peru	$ 3 054,26	5,2%
South Africa	$ 5 630,10	3,3%
Uganda	$ 352,31	2,9%
Venezuela	$ 6 287,03	3,6%

Source: World Bank Indicators

Table 5: Misclassification matrices - general measure vs country specific measure

		Country Specific				
	Kenya	*Quintile 1*	*Quintile 2*	*Quintile 3*	*Quintile 4*	*Quintile 5*
General SES	*Quintile 1*	**95.5%**	4.4%	0.1%	0.0%	0.0%
	Quintile 2	4.5%	**85.9%**	9.6%	0.0%	0.0%
	Quintile 3	0.0%	9.7%	**81.5%**	8.7%	0.0%
	Quintile 4	0.0%	0.0%	8.7%	**86.4%**	5.0%
	Quintile 5	0.0%	0.0%	0.0%	4.9%	**95.0%**
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
	Malawi					
	Quintile 1	**92.1%**	7.8%	0.0%	0.0%	0.0%
	Quintile 2	7.9%	**80.0%**	12.0%	0.0%	0.0%
	Quintile 3	0.0%	12.1%	**76.9%**	11.1%	0.0%
	Quintile 4	0.0%	0.0%	11.0%	**80.0%**	8.8%
	Quintile 5	0.0%	0.0%	0.0%	8.9%	**91.2%**
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
	Mozambique					
	Quintile 1	**90.3%**	9.8%	0.0%	0.0%	0.0%
	Quintile 2	9.7%	**83.4%**	6.9%	0.0%	0.0%
	Quintile 3	0.0%	6.9%	**88.6%**	4.4%	0.0%
	Quintile 4	0.0%	0.0%	4.5%	**90.8%**	4.7%
	Quintile 5	0.0%	0.0%	0.0%	4.8%	**95.3%**
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
	Namibia					
	Quintile 1	**91.7%**	8.3%	0.0%	0.0%	0.0%
	Quintile 2	8.3%	**84.3%**	7.3%	0.0%	0.0%
	Quintile 3	0.0%	7.3%	**86.6%**	6.1%	0.0%
	Quintile 4	0.0%	0.0%	6.1%	**89.0%**	4.9%
	Quintile 5	0.0%	0.0%	0.0%	4.9%	**95.1%**
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
	South Africa					
	Quintile 1	**96.2%**	3.8%	0.0%	0.0%	0.0%
	Quintile 2	3.8%	**89.3%**	6.9%	0.0%	0.0%
	Quintile 3	0.0%	6.9%	**86.7%**	6.4%	0.0%
	Quintile 4	0.0%	0.0%	6.4%	**89.5%**	4.1%
	Quintile 5	0.0%	0.0%	0.0%	4.1%	**95.9%**
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
	Uganda					
	Quintile 1	**94.6%**	5.2%	0.2%	0.0%	0.0%
	Quintile 2	5.4%	**87.8%**	6.7%	0.0%	0.0%
	Quintile 3	0.0%	7.0%	**84.8%**	8.4%	0.0%
	Quintile 4	0.0%	0.0%	8.3%	**85.7%**	6.1%
	Quintile 5	0.0%	0.0%	0.0%	6.0%	**93.9%**
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6: Quintile misclassification

	Polychoric PCA		PCA	
	% overall	*% 1st quintile*	*% overall*	*% 1st quintile*
Kenya	23.9%	12.2%	21.3%	11.6%
Malawi	28.6%	17.0%	28.2%	15.0%
Mozambique	16.4%	14.3%	16.1%	11.6%
Namibia	20.8%	13.9%	23.4%	17.0%
South Africa	22.1%	13.9%	18.2%	0.2%
Tanzania	28.5%	17.8%	26.6%	15.8%
Uganda	26.6%	15.7%	22.4%	13.2%

Notes: Quintile misclassification for the comparable measure constructed using MCA, PCA and PPCA

Table 7: Effect on coefficients in a regression when using MCA, PCA, PPCA

	Per Capita Expenditure						Per Capita Expenditure^2						R^2			Observations			Turning Points		
	MCA		PPCA		PCA		MCA		PPCA		PCA		MCA	PPCA	PCA	MCA	PPCA	PCA	MCA	PPCA	PCA
Kenya	-80.831	***	-35.750		-38.497		7.859	***	4.152	**	4.287	**	0.205	0.201	0.199	4433	4433	4433	5.14	4.31	4.49
Malawi	-15.768		-6.874		-15.732		1.497		0.716		1.563		0.024	0.023	0.024	2780	2780	2780	5.27	4.80	5.03
Mozambique	-35.509	**	-11.765		-29.727	*	3.796	***	1.778		3.154	**	0.111	0.111	0.109	3343	3322	3322	4.68	3.31	4.71
Namibia	-79.650	***	-65.855	***	-25.089		6.664	***	5.548	***	2.706	**	0.277	0.269	0.257	6397	6397	6397	5.98	5.94	4.64
South Africa	-63.140	***	-49.980	***	-64.594	***	6.057	***	4.901	***	5.877	***	0.398	0.381	0.380	9051	9051	9051	5.21	5.10	5.50
Tanzania	20.698		40.626		-22.834		-0.190		-1.698		3.104		0.128	0.130	0.128	4193	4193	4193	54.47	11.96	3.68
Uganda	-40.566		-16.216		-21.464		4.317	**	2.279		2.758		0.123	0.121	0.122	5301	5283	5283	4.70	3.56	3.89

Notes: Controlling for various student and family background variables. * p<.1; ** p<.05; *** p<.01

Chapter 3

The readiness of the South African education system for pre-Grade R

3.1. Introduction

Early childhood is a period during which development, in all its dimensions, is needed to cultivate the inherent potential present within individuals. The fleetingness of this critical period, however, means that there is a distinct risk that the potential will be left untapped, resulting in a permanent loss in the ability to accumulate human capital effectively. The National Development Plan, which was released in 2012, recognises this and makes early childhood development "a top priority among the measures to improve the quality of education and long-term prospects of future generations" (NPC, 2013:71). The policy instrument put forward by the National Planning Commission (NPC) to improve early childhood development is to make two years of preschool education accessible to all children. The success of this policy, however, is fully dependent on the effectiveness of service delivery, as well as the sustainability and scalability of the policy. This second chapter in the overall thesis considers critically the readiness of the South African education system to implement a policy of this magnitude and scale, by evaluating the current conditions of the physical and human resources in the sector and of the institutional structures governing the sector.

The past decade has seen a policy shift towards harnessing the benefits of the critical period of early childhood. Since 2001, there has been a drive towards making one year of preschool education (formally known as 'Grade R') universally accessible in South Africa and ever since then a rapid national expansion of Grade R provisioning has taken place. This expansion, however, has further extended the advantage of more affluent schools and has produced "virtually no measurable impact for the poorest three school quintiles" (Van der Berg et al, 2013:2). Internationally it has also been observed that despite the expansion in services to young children, the majority still lack access to *quality* ECD services. Britto et al (2014:245), in the context of four[29] low and middle income countries, ascribes this to "poor system-level coordination, and sometimes to the chaotic and unsystematic approaches used to scale up programs".

The NDP proposes the introduction of a universally accessible pre-Grade R, so that at least 75% of South Africa's four- and five-year-olds can participate in formal early childhood care and education (ECCE) by 2024. For this additional year of preschool education to have the intended

[29] Cambodia, Kenya, Loa People's Democratic Republic and Peru

benefits for child development, it is crucial to have a strong quality focus on the implementation of this year. Since it is the capacity or ability of the system that will determine the quality of services delivered, a comprehensive understanding of the current systemic binding constraints to delivering a high-quality, well-functioning pre-Grade R is required. Despite the large body of research in South Africa on ECD, local research does not provide much empirical insight into the current context in which the additional year of preschool will be rolled out or the demand for such a service. Identifying the binding constraints in the ECD sector can therefore help to provide an understanding of the requirements for ensuring more effective service delivery, which will result in skill formation among four year-olds.

The analysis in this chapter intends to address three issues specifically. At first the increased demand for ECD services over the past decade is considered by examining the ECD participation trends of four- and five-year-olds in South Africa. The second issue relates to the supply-side capacity of the current ECD system and aims to understand the quantity and the quality[30] of resources in the environment in which ECD operates. More specifically, the question is asked: "What is the capacity of the current system with relation to infrastructural capacity, material capacity and knowledge capacity?" The final issue considered is the governance structures in the ECD sector and investigates the strength of the current institutional structures in supporting ECD centres.

3.2. Early Childhood Development in South Africa

Studies in the fields of nutrition, health, neuroscience, economics, psychology, cognition and education unequivocally agree that cognitive and non-cognitive stimulation in early life is critical to the development of a person's full potential. The human capital model argues that the development of key neural pathways during early childhood follows hierarchical rules, in the sense that later attainment of skills builds on foundations laid down earlier. This model regards skill formation as a life cycle process, where the productivity of the investment made at one stage is enhanced by the levels of skills a person has already obtained in earlier stages (Cunha et al., 2006; Heckman and Masterov, 2004; Heckman et al., 2006). In essence, during this critical period, children are taught the skill of learning. As conceptualised by Heckman and Masterov (2004:3): "Skill begets skill, and learning begets more learning". Early childhood education is therefore an integral part of basic education and subsequently later success in life, as the skills formed during

[30] Quality in the context of this chapter constitutes both the quality of measurable characteristics such as the infrastructure and availability of LTSM, but moreover also quality in terms of opportunities to learn. The ability of ECD practitioners to lay firm foundations among learners to enable skill formation to take place later on in life relates to quality in terms of opportunities to learn.

this period are necessary for the attainment of future skills (Cunha et al., 2006; Currie, 2000; Heckman et al., 2006).

In fact, this critical period of skill development also means that the lack of development of certain cognitive and non-cognitive functions during this time can have permanent detrimental effects (Heckman et al., 2006). Consequently, the lack of investment in the early years of a child's life can result in the need for remedial help later in life, at which stage it will be costlier and less effective. The rational of public investment in early childhood education therefore is the fact that it is more effective for a government to equalise initial endowments through ECD programmes than to compensate for differences in outcomes later in life (Cunha et al., 2006; Currie, 2000).

In South Africa this argument is of utmost importance. The inequalities in the South African education system are incontestable, with ability gaps between children from different socio-economic backgrounds already opening up at the early ages. By September in Grade 1 the performance gap between children attending Quintile 5 schools and children attending Quintile 1 to 3 schools in the 2014 ANAs was 0.52 standard deviations in mathematics and 0.64 standard deviations in home language (HL). This roughly equates to a gap of about a year-and-a-half's learning already present at the start of formal schooling (Hill et al., 2007; Spaull and Kotzé, 2015).[31] Given the hierarchical nature of learning, this gap is bound to widen continuously as the children of the poor will be unable to gain as much from schooling as the children of the wealthy.

The large majority of South African children are from low socio-economic backgrounds and live in households with adults who have very low literacy levels. Typically, children from these homes are seldom exposed to books or regular literacy practices such as storybook reading and consequently receive significantly less linguistic input (Pretorius, 2014). As certain emergent literacy practices are particularly effective in supporting development of children's higher cognitive functions, the lack of regular literacy practices could potentially have lasting pernicious effects on their development. Given the lack of development of these critical skills during early childhood, remedial help later on in children's lives will prove to be prohibitively costly and highly ineffective. The result is that many South African children enter formal schooling with their developmental potential significantly compromised, thereby making investment in ECD potentially the most cost-efficient fiscal expenditure and one that will directly affect the equality gaps in South Africa.

Evidence to support this theory is widespread, with investment in early childhood education found to benefit a child's cognitive, linguistic, social and emotional development. This evidence is

[31] This assumes that in Grade 1, 0.4 standard deviation equates to a year's worth of learning.

mostly from Western Europe (Hall et al., 2013; Sylva et al., 2013; Sylva et al., 2014) and North America (Barnett, 1985; Heckman et al., 2010; Schweinhart et al., 2005). Although the encouraging results from these countries might lead to high expectations about similar programmes in other settings, the verdict is still open as to their effectiveness in developing countries. There is a growing literature regarding the benefits of preschool attendance in developing countries, although studies in Africa are scant and empirical evidence from developing countries mostly comes from Latin-American literature (Baker-Hemmingham and Boo, 2010; Behrman et al., 2004; Berlinski et al., 2009; Berlinski et al., 2008). The three studies conducted in Ethiopia, Mozambique and Botswana all showed positive effects on cognitive ability and school readiness, but some of these results should also be interpreted with some caution owing to small sample size (Martinez et al., 2012; Taiwo and Tyolo, 2002; Woldehanna, 2011; Woldehanna and Gebremedhin, 2012).

Empirical evidence on the educational benefits of ECD in South Africa is hard to come by. Lidell and Rae (2001) found that cognitive ability and school readiness are significant predictors of later school progress.[32] Naudé et al. (2003) investigated the language development and subsequent readiness to learn of preschoolers in the Griqua community. They found that lack of language development was associated with "impaired knowledge-acquisition processes" (Naudé et al., 2003:273). Both these studies used very small and particular samples, which rendered their findings externally invalid. The only two larger-scale studies that have been conducted in South Africa are the evaluation of the Sobambisana Programme and the evaluation of Grade R. The evaluation of the Sobambisana Programme made use of a quasi-experimental design to determine the effect of the programme on school readiness.[33] Biersteker et al. (2012) found that the cognitive development of children in community playgroups improved if attendance was high and the focus was on skills required in school. Van der Berg et al. (2013) evaluated the impact of the Grade R programme in South Africa and found a net positive impact of Grade R on learning outcomes in the country, but the impact in the more impoverished schools was negligible. The authors concluded that "[c]urrently Grade R further extends the advantage of more affluent schools, rather than acting to reduce inequalities" (Van der Berg et al., 2013:79)

This final evaluation raises the quality imperative. Merely attending a preschool does not necessarily mean that children will develop the required skills to prepare them for future learning. Often preschools lack the infrastructural, material and knowledge capacity to stimulate children cognitively and non-cognitively, and therefore rather function as child-minding facilities.

[32] They conducted this study among 150 preschoolers in a rural community in KwaZulu-Natal.

[33] Sobambisana is a component of the Ilifa Labantwana ECD programme and attempted to develop a local evidence base for interventions aimed at improving ECD in South Africa.

International research unanimously agrees that high-quality preschools produce medium- to large gains in cognitive and social skills, whereas poor-quality preschools produce very little or no gains (Currie, 2000).

Recognised indicators of quality at preschool level include physical resources, curriculum choices, school ethos and school management. The most vital element of quality teaching and learning, however, remains the teacher (Christie, 2008; Wood, 2004). Teachers need to understand the developmental realities of children in preschools, and especially appreciate that *what* children learn is as important as *how* children learn (Excell and Linington, 2011). The risk in South Africa currently is that, given the low levels of ability and knowledge of ECD practitioners, Grade R and pre-Grade R will merely take on the form of a watered-down Grade 1, with teachers who are not aware of the importance of play and other non-cognitive skill development. This lack of ability and expertise will inevitably result in a pre-Grade R which is essentially a downward extension of the primary school curriculum, rather than having an inspiring, play-based, curriculum specifically designed for the developmental needs of four year olds.

The quality of ECD services delivered in South Africa will be determined by the quality of the institutional structures governing them. Governance has been identified as an essential component of effective service delivery because it enables the allocation of responsibility for services, ensures more coherent policy making and reduces information asymmetry between the multitude of stakeholders across all levels of government (Britto et al., 2014). Furthermore, it can also determine the extent to which services meet quality standards, are affordable, meet local demand and achieve equity goals (Neuman, 2005). In the absence of strong governance, low-quality provisioning of preschool is inevitable and will result in minimal learning gains. If this is the case, educational inequalities are likely to continue, with consequences also for human capital and earnings inequalities.

3.3. Available Datasets

High-quality, nationally representative data on ECD has been scarce in South Africa. Both the National Income Dynamic Study (NIDS) and the General Household Survey (GHS) include some questions on ECD participation. While these questions do not lend themselves to rigorous analysis, they are useful in analysing the trends of ECD participation over different ages and years. In 2013 an audit was conducted of ECD centres in South Africa, which provided new insights into

the current condition of ECD centres.[34] This audit was analysed to gain a better understanding of the supply side of ECD provisioning (see Section 3.3.3 below).

The 2013 Verification Annual National Assessment (V-ANA) background questionnaires asked more detailed questions about learners' exposure to preschool before formally entering Grade 1. Unfortunately, the weak framing of these questions led to inconsistent and contradictory responses to some of the questions. The first question asked the learners whether they had attended Grade R, Educare, a day mother, another preschool or if they did not know.[35] The option 'Did not attend' was not provided, which left those children who had not participated in any early childhood education without an answering option. As only 5% of responses were recorded as missing values, it is unclear how these children answered the question. The follow-up questions asked about the respective duration of attendance at each of the institutions (Grade R, Educare, day mother), but the responses between institutions were not restricted and are therefore not mutually exclusive.[36] This meant that some learners stated that they had attended Educare for three years, attended a day mother for three years and attended Grade R for three years, all by the time that they were seven years old. For this reason, the 2013 V-ANA data is not used in this analysis.

3.3.1. National Income Dynamics Study (NIDS)

The NIDS is a nationally representative, longitudinal survey of individuals and their households that live in South Africa. The survey focuses specifically on the dimensions of the well-being of South Africans over time. The first wave collected data from 7 305 households in 2008, with the second and third waves of data collection returning to these households in 2010 and 2012. Over these three years, 2 056 households had four-year-olds as part of the household.[37] The NIDS questionnaire contains a section that was administered to the mother/caregiver of a child in her care who were younger than fourteen years old. This is the only household survey in South Africa that makes the distinction in the enrolment categories between primary school, Grade R and

[34] In this chapter, 'ECD centres' comprise all preschools, crèches, day care and Educare facilities.

[35] 'Educare' has become the popular term for a preschool or a crèche. As the name suggests, it incorporates the 'education' and 'care' of young children.

[36] Question 2 (Q2) asked learners which institution they had attended before going to Grade1; Q3 asked how long they had attended Grade R; Q4 asked learners how long they had attended Educare; and Q5 asked how long they had been with a day mother. These last three questions were not mutually exclusive, and learners were not restricted to filling in only the category that corresponded to Q2. Consequently, some learners stated that they had attended Grade R in Q2, but in Q3 stated that they had not attended any Grade R.

[37] In 2008 there were 594 households, with 666 households in 2010, and 796 households in 2012. Although designed as a panel study, this study only considers the households in the 2012 data to get the most recent estimates.

preschool. This is greatly beneficial to analysing the participation trends, since Grade R and other preschool activities have only been formally separated since 2000.

3.3.2. General Household Survey (GHS)

The GHS is an annual data-collection exercise that started in 2002 and is based on a Statistics South Africa survey of about 25 000 households and 95 000 individuals. Unlike the NIDS, the GHS is not longitudinal as it does not follow the same households over time, but nevertheless it does provide one with a sense of the changes in the national participation rates over time. The question on preschool attendance in the GHS only recently started to differentiate between primary, Grade R and preschool. Additionally, a change was made in the questions asked to parents about the preschool attendance of their children in 2009. Up until 2008, a question was asked of all members in the household regarding which educational institution they were attending, whereas from 2009 the parents of children of four years old and younger were asked whether their children attended an ECD program, and the parents of children of five years and older were asked about which educational institution their children were attending. These changes in the phrasing of the questions complicates the comparison of the national trend in participation rates over time.

3.3.3. 2013 ECD Audit

In 2013 an audit of ECD centres in South Africa was commissioned by the Department of Social Development (DSD), with the goal of gathering reliable information on the provisioning of ECD services and programmes across the country. Although a total of 19 971 ECD centres were visited, only 17 846 ECD centres were audited. The 2 125 ECD centres not audited were centres where the questionnaires could not be administered because access was denied (395); the centre was closed (935); the centre could not be found (153); the centre was not aware of its registration status; or the centre appeared in the system more than once. Of the audited centres, 8 032 reported being fully registered with the DSD, 1 922 were conditionally registered and 7 892 were not registered (EPRI, 2014). It is, however, necessary to realise that the limitation of the ECD audit lies in the self-reporting of ECD practitioners and therefore the responses on qualification – or on salaries received – might be biased.[38] Given the sampling method, it is also likely that a large number of unregistered centres were not included in the audit. Regardless of its many weaknesses, this audit remains the most recent and comprehensive nationally representative data on ECD centres in South Africa.

[38] Unfortunately, the sample of ECD practitioners in the Quarterly Labour Force Survey is too small to use for determining their qualifications and average salaries credibly.

3.4. The Demand for ECD Services

Over the past decade demand for ECD services has burgeoned as the growing proportion of females participating in the workplace has created an increased demand for child care (Festus, et al., 2015). To gain a better understanding of the current demand[39] for ECD services, as well as the potential demand for pre-Grade R services specifically, participation rates of four- and five year olds are considered in this section. Currently, very little data is available on this specific age group and the data that is available has not been thoroughly investigated. As a consequence, relatively little is known about this age group. A universally accessible pre-Grade R would require a vast scale-up of current resources (both human and infrastructure) and therefore an understanding of the recent trends in ECD participation among this age group, as well as the profile of children who are not yet participating, could provide an indication of the magnitude of the task at hand.

3.4.1. Participation rates

Over the last decade, the main ECD policy priority in South Africa has been providing Grade R to all children of five- to six years old. This policy was implemented in 2001, with the target of making Grade R compulsory for all children of the appropriate age by 2010. The target was then extended to 2014 and, by the end of 2012, 75% of Grade 1 children who were enrolled in public schools for the first time had attended Grade R (Van der Berg et al., 2013). According to the latest statistics of the Department of Basic Education (DBE), enrolment in Grade R more than doubled from about 300 000 in 2003 to 779 370 in 2013 (RSA DBE, 2015). All things considered, coverage and access have expanded greatly and this has been the case particularly in poorer schools.

The first trend that is useful to consider is the progression of general participation of four-year-olds in any ECD programme over the past ten years. Figure 15 uses the GHS data to compare the overall net enrolment rates of children in any institution of education or early childhood care over the period 2003 to 2013. It shows that there has been an increase in participation rates in all the age groups, with the largest increase being among four-year-olds (38 percentage points). In 2013, 64% of four-year-olds and 81% of five-year-olds attended an educational institution. This increase could partly be ascribed to the national drive over the past few years in promoting ECD services, as well as to the opening of more ECD centres (EPRI, 2014).

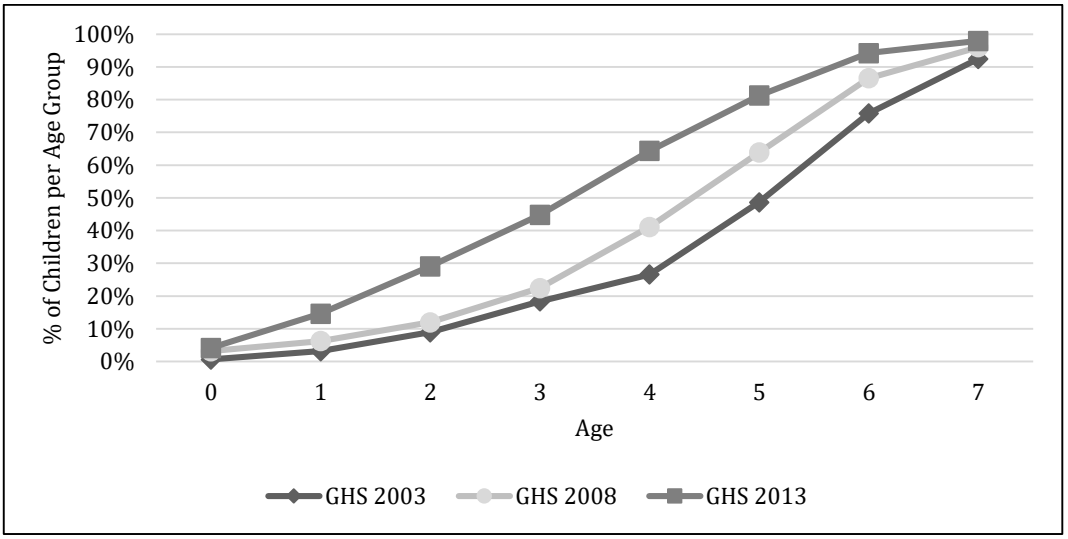
The NIDS data enables one to decompose current participation rates further, as the questions on the educational institution that children currently attend include an additional category of early

[39] Given the supply-side constraints that will be discussed in the following section, the number of children enrolled in ECD in South Africa should be regarded as the equilibrium outcome of demand and supply, rather than the demand itself. Regardless, the participation rate does give an indication of the proportion of learners aged four who are not currently enrolled, and who will potentially start participating if a universal pre-Grade R becomes compulsory.

childhood care, namely 'day mother/gogo'. This category is of great importance in the South African context as this form of child care is popular among the poor that live in rural areas and in informal settlements. The concern with this mode of early childhood care is the ability of the caretakers to provide sufficient nutrition and appropriate cognitive stimulation, given that it is generally an illiterate grandmother who provides these services.

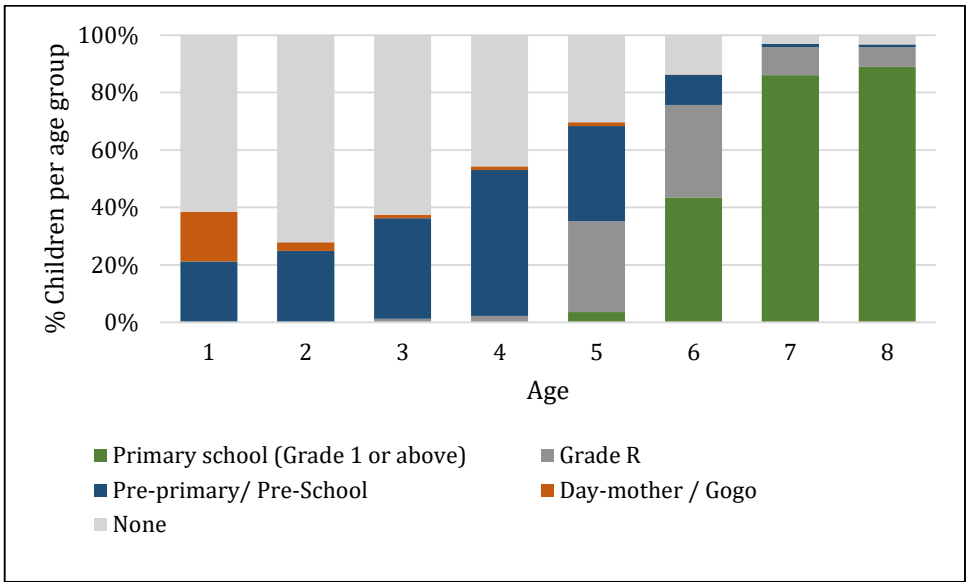
Another advantage of the NIDS dataset is that it contains information on the month in which a child was born. This enables one to determine the age of a child at the start of the year, which allows for a more accurate comparison of equally aged children. Figure 16 shows participation in the different forms of early childhood care per age group. In 2012, only a small percentage of children were in the care of day mothers and mostly during their first year. By age three, about half of the children were attending some form of preschool (either pre-primary or Educare) and the other half had received no early childhood care in an institution outside of the home. By age four, about a third of the children were participating in a formal Grade R, another third in preschool and the other third still were not participating in early childhood care and education outside of the home. Owing to the entry-age requirements, children who were born in the first six months of the year have the choice of entering Grade R either during the year they turn five or in the year they turn six. This explains the trend in Grade R participation. By age seven and eight, 96% of the children were attending formal schooling.

Figure 15: Overall enrolment rates of children in any education institution



Source: 2003, 2008 and 2013 General Household Surveys. **Notes:** The categories that were considered in the calculations are primary schools, Grade R, pre-schools, crèches and ECD centres.

Figure 16: Pre-school choices in 2012



Source: National Income Dynamic Study, waves 1 – 3. **Notes:** Age is the age of the child on the 1st of January 2012.

The phrasing of the questions regarding which educational institution a child attended in the 2012 NIDS dataset and the 2013 GHS dataset are similar enough to compare the different samples.[40] There is no statistically significant difference between the estimates for four-year-olds attending some form of preschool, with the NIDS estimate being 51% and the GHS estimate being 54%. The NIDS data, however, estimates that 45% of four-year-olds were not attending any ECD programme, whereas the GHS data estimates this figure to be quite a bit lower at 28%. The discrepancy between these two figures comes from the definition of an ECD programme used by the GHS that captures more children (ten percentage points) attending Grade R than the NIDS dataset does. Regardless, one can say with some certainty that half of South African four-year-olds are currently participating in early childhood care and education.

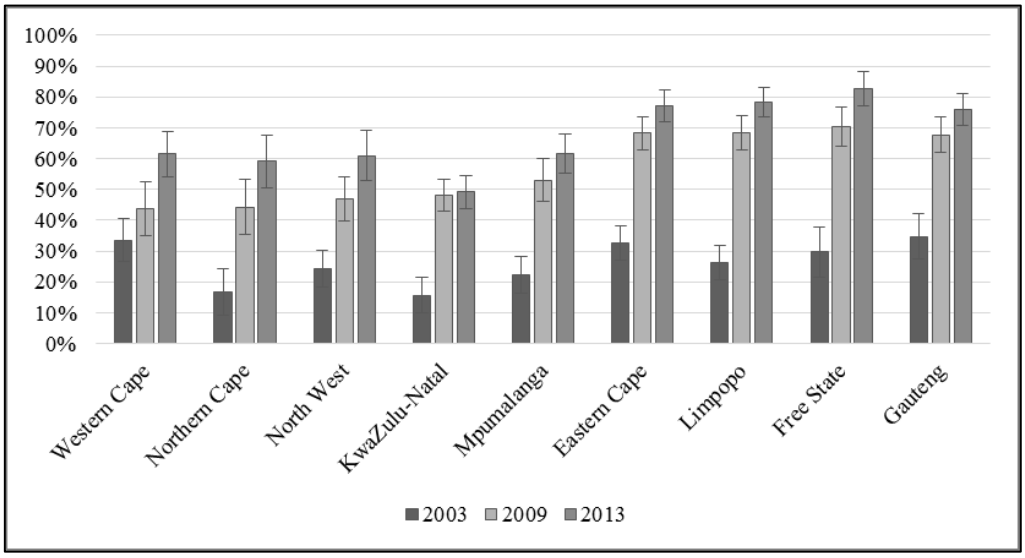
Understanding the trend in ECD participation across the provinces, as well as knowing the spatial distribution of four-year-olds who are currently not participating in ECD, contributes to our understanding of the type of interventions required to achieve higher participation rates. When analysing the participation trends by province (figure 17), it is evident that significant strides have been made in ECD provisioning since 2003. In the majority of provinces participation between 2003 and 2009 rose rapidly, with less dramatic increases between 2009 and 2013. The Free State is the only province that had a consistently significant increase in participation over both the five-year periods. A concern that arises from this analysis, however, is the flattening of

[40] For this comparison, the NIDS ages were calculated for the end of the year.

the participation rates in KwaZulu-Natal over the last five years, as this is the province with the second-largest number of four-year-olds (about 250 000, second after Gauteng).[41] In 2013, 51% of four-year-olds in KwaZulu-Natal did not attend any early childhood care institution at all.

KwaZulu-Natal is also the province with the largest percentage of four-year-olds in "tribal areas"[42] who are not attending ECD (figure 18).[43] Over the ten-year period from 2003 to 2013, a significant increase of about 46 percentage points in ECD participation in tribal areas took place. As 40% of all four-year-olds live in tribal areas, this increase is encouraging. During this period there was also a drop in the number of four-year-olds that lived in formal rural areas and quite a significant increase in the number of four-year-olds in informal urban areas.[44]

Figure 17: ECD Participation among four-year-olds by province



Source: General Household Survey, 2003, 2009 and 2013. **Notes:** ECD participation in 2003 is defined as four-year-olds participating in pre-school, in 2009 it is defined as children who responded that they attend an ECD facility and in 2013 as four-year-olds attending any preschool, nursery school, crèche or Educare centre

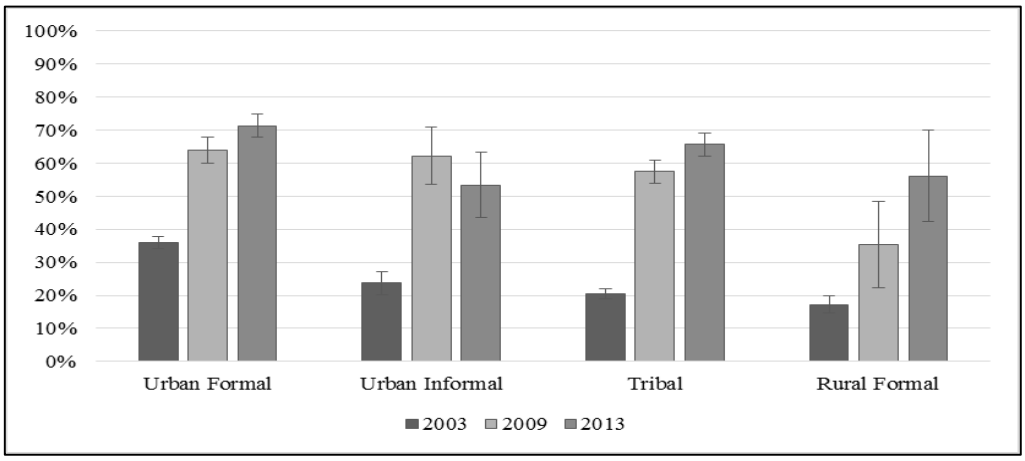
[41] The GHS 2013 data, reveals that there are 247 509 four-year-olds in KwaZulu-Natal, and 218 821 four-year-olds in Gauteng.

[42] "tribal areas" is not a term commonly used in the South African literature, but this is the classification according to GHS and is therefore used in this context.

[43] The sample size of tribal areas in Gauteng is too small to yield any significant information.

[44] The sample of four-year-olds who live in what GHS refers to as "formal rural areas" is only about 3% of the total number of four-year-olds. This may account for the seemingly large fluctuations.

Figure 18: ECD participation of four-year-olds by type of geographical area



Source: General Household Survey, 2003, 2009 and 2013. **Notes:** ECD participation in 2003 is defined as four-year-olds participating in preschool, in 2009 it is defined as children who responded that they attend an ECD facility and in 2013 as four-year-olds attending any preschool, nursery school, crèche or Educare centre.

3.4.2. Factors associated with children participating in ECD

A further step in understanding the complexities of introducing a universally accessible pre-Grade R is to understand the profile of the four-year-olds who are not currently attending any ECD institution.[45] Using the 2013 GHS it is evident that one in every two coloured four-year-olds is not attending ECD centres, whereas only one in every three black four-year-olds and one in every ten white four-year-olds is not attending ECD centres. There is no significant difference between boys and girls, with one in every three of both genders not attending ECD centres. Three-quarters of the children who are not in an ECD programme are receiving the child support grant, which indicates that it is mostly poorer learners who are not currently in an ECD programme. KwaZulu-Natal is the province with the highest percentage of children not attending ECD centres (51%), followed by the Northern Cape (41%), North West (39%), Mpumalanga (39%) and the Western Cape (39%). The Free State is the province with the highest participation rate, with 83% of all four-year-olds currently attending ECD activities.

A logit model was run to identify those factors that are predictors of ECD participation at ages three and four (table 8). A logit, or logistic regression model, calculates the correlations between the explanatory variables and the binary-dependent variable by estimating probabilities using a logistic function. The coefficients on the explanatory variables can therefore be interpreted as the log-likelihood of the specific characteristic to have a success in the dependent variable. The

[45] Table 14 in 3.9 Chapter Appendix lists the percentage of learners by each characteristic who attend an ECD centre.

dependent variable was defined as a 0-1 binary variable if a child attended any educational institution apart from a day mother.

Table 8: Logit model predicting pre-school participation among three- and four-year olds

		Coefficient		s.e.
Age (Ref: Age 3)	Is Aged 4	0.970	***	0.101
Race (Ref: Black)	Is Coloured	-0.843	***	0.285
	Is Indian/Asian	-1.594		1.130
	Is White	-1.369		1.365
Gender (Ref: Boy)	Is a girl	0.032		0.099
Province (Ref: Gauteng)	Lives in the Western Cape	0.049		0.297
	Lives in the Eastern Cape	0.183		0.221
	Lives in the Northern Cape	-0.539	**	0.271
	Lives in the Free State	0.802	***	0.246
	Lives in KwaZulu-Natal	-0.971	***	0.216
	Lives in North West	-0.431	*	0.243
	Lives in Mpumalanga	-0.402	*	0.236
	Lives in Limpopo	0.097		0.235
Area Type (Ref: Urban Formal)	Lives in an Urban Informal Area	-0.497	***	0.206
	Lives in a Tribal Area	0.049		0.209
	Lives in a Rural Formal Area	0.008		0.385
Household Characteristics	Mother does not live at home	0.014		0.125
	Socio-Economic Status	0.442	***	0.107
	Receives a Child Support Grant	-0.723		0.829
	Mother has a job	-0.055		0.134
Highest Education Level in Household (Ref: No Schooling)	Primary School	0.938		1.301
	Secondary School	1.136		1.290
	Matric	1.472		1.295
	Post Matric Diploma	2.133		1.314
	Degree	1.318		1.302
	Post Graduate	0.548		1.719
Perceived Health (Ref: Good)	Fair	-0.224		0.200
	Poor	-1.544	***	0.542
	Constant	-0.962		1.562
	Observations	2529		
	Pseudo R^2	0.113		

Source: Own calculations using 2013 General Household Survey data. **Notes**: Dependent Variable is a 0-1 dummy for children currently attending any education institution apart from a daymother. * p<.1; ** p<.05; *** p<.01

The results confirm what was noted earlier: that four-year-olds are much more likely to attend ECD centres than three-year-olds, coloured children are much less likely to attend any ECD centre and children in KwaZulu-Natal are at a definite disadvantage. Higher SES is strongly associated with ECD participation, although neither parental education nor maternal work status plays a significant role. Finally, if a parent perceives their child to have poor health, the child is also less likely to attend an ECD institution.

The overall explanatory power of these characteristics is relatively low, which suggests that other unobservable factors play a larger role in determining ECD participation. These factors could include parental motivation, access and proximity to a preschool, and affordability of the nearest

preschool. The exclusion of these unobservable factors could result in biased estimates of the other coefficients of the included characteristics, and the magnitude of these coefficients should not be interpreted directly. Although this method does not present any causal conclusions it remains a useful exercise for descriptive purposes. Further analysis and more comprehensive data on these factors are needed in order to draw more concrete conclusions.

Given the supply-side constraints that will be discussed in the following section, the number of children enrolled in ECD in South Africa should be regarded as the equilibrium outcome of demand and supply, rather than the demand itself. Regardless, the participation rates and trends of four-year olds does give an indication of the proportion of learners aged four who are not currently enrolled, and who will potentially start participating if a universal pre-Grade R becomes compulsory. Using both the NIDS and GHS datasets, it is evident that about half of South Africa's four-year olds are not currently attending any form of early childhood development programme. In preparing for universalising a pre-grade R year, it will be necessary to recognise that the current facilities will not have adequate space or resources to accommodate the additional influx of learners.

3.5. Supply of Early Childhood Education Services

In the wake of the rapidly expanding demand for ECD services, the supply side has been under immense pressure to expand at a similar rate. This expansion has been largely unsystematic and haphazard, and has received very little systems-level coordination. As a result, this expansion has largely led to many privately run ECD centres, which have been mostly unregulated over the past decade. Although the DSD has been addressing this issue, the backlog of unregistered centres is still significant and a lot is still unknown about the conditions of ECD centres.

For pre-Grade R to have the intended benefits, the quality of the service delivered will have to be adequate. The quality of services delivered will largely be determined by the quality of the structures governing ECD in South Africa, the quality and capacity of the infrastructural and human resources as well as the funding structures in place to support these services. In the sub-sections below the current condition of each of these elements are critically assessed.

3.5.1. Governance

Weak state guidance often results in poorly regulated centres, compromised learning environments and low staff performance. For this reason, the type of governance structure in place is pivotal in delivering proper early childhood education as it strongly influences the quality and coverage of the services delivered (Bennet, 2008). To deliver an integrated service, strong

governance is imperative as this will ensure that the service is well planned, implemented and coordinated.

The policy environment that regulates the institutions responsible for supplying ECD in South Africa is extremely complex, with various departments responsible for the different aspects of ECD. The recently accepted 'National Integrated Early Childhood Development Policy' (RSA, 2015) stipulates that the Department of Health shall be responsible for providing health and nutrition programmes to pregnant mothers, infants and children of under two years old. This department is also responsible for implementing parenting support programmes and for providing learning opportunities for children of under two years of age. The DSD is responsible for "ensuring the universal availability and adequate quality of, and equitable access to opportunities for learning for children aged 0-5" (RSA, 2015:104). This mandate therefore covers the responsibility of monitoring ECD centres and registering them according to the quality of their facilities. The DBE is to take responsibility for the development of the early-learning curriculum and the implementation of a Grade R and pre-Grade R programme. A large number of other departments are also implicated in the draft policy, but to a lesser extent than the three departments mentioned above (RSA, 2015).

The implementation of a universally accessible pre-Grade R therefore falls under the responsibility of both the DBE and the DSD. This sharing of responsibilities clearly poses challenges in the implementation of a pre-Grade R as it introduces various opportunities for information asymmetry, perverse incentives, inconsistency in policies, fragmentation, abdicating of responsibility and low levels of accountability.

As in the case of Grade R, there is no clear host for pre-Grade R and both primary schools and ECD centres could potentially provide this service. The two environments, however, are vastly different and the nature and quality of pre-Grade R are bound to be influenced by the host institution. Given that primary schools only cater for Grade R, most children who are eligible for pre-Grade R are currently attending ECD centres (73% of four-year-olds that attend an ECD programme). This chapter therefore focuses on the current conditions in ECD centres.

3.5.2. Physical resource challenges

Given the limited funding available to ECD centres to spend on infrastructure, and the lack of support from municipalities, it is necessary to consider the physical resource challenges that ECD centres face. From the 2013 ECD audit, it is clear that 44% of ECD centres were built with the sole purpose of functioning as an ECD centre, 29% operate from houses, and others use the premises

of community halls (4%), primary schools (3%), places of worship (5%) and containers (1%).[46] A further 12% operate from informal structures made of zinc-plates or mud.[47] When considering four-year-olds specifically, 73% of them attend an ECD centre in a community-based establishment, 15% at a home-based centre and only 10% at a school-based institution.

Table 9 shows the percentage of ECD centres per province that suffer from infrastructural inadequacies. KwaZulu-Natal, the Eastern Cape and Limpopo are the three provinces with the largest percentage of ECD centres that lack adequate basic infrastructure. In Limpopo, 70% of ECD centres do not have adequate ablution facilities, while in KwaZulu-Natal, 60% of ECD centres are not connected to electricity. This means that more than half (52%) of ECD centres in KwaZulu-Natal have to cook the children's meals on open fires. In these three provinces, roughly half of ECD centres stated that they require urgent maintenance and repair, roughly a quarter do not meet the minimum requirements for being an ECD centre and about 10% are reported as not safe for children.

Over and above the infrastructural challenges faced by ECD centres, more than half of ECD centres are overcrowded[48] – a problem faced by registered and unregistered centres, both rural and urban. Moreover, many lack basic recreational equipment and resources such as jungle gyms, books, puzzles, tables, chairs and other educational toys. Figure 19 illustrates the differences between provinces, with one in every two ECD centres in North West lacking the basic learning and teaching support material (LTSM), compared to only one in every five centres in the Western Cape and one in every four in Gauteng and the Free State.[49]

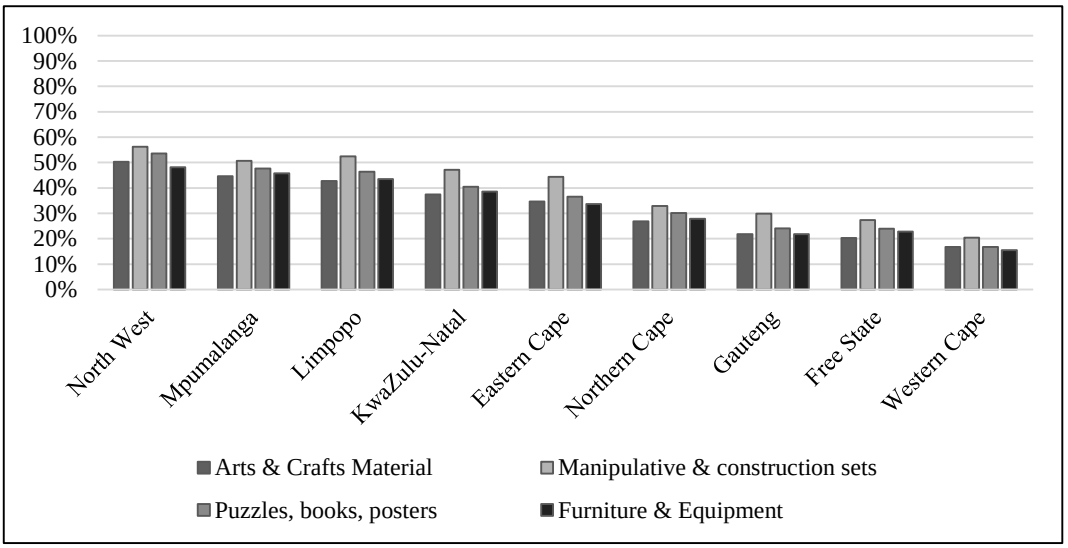
Table 9: Percentage of ECD centres that lack adequate infrastructure

	Inadequate Water	Inadequate Electricity	Inadequate Toilets	Overcrowded
Limpopo	42%	40%	60%	63%
KwaZulu-Natal	36%	60%	39%	64%
Eastern Cape	41%	48%	33%	51%
Northern Cape	15%	39%	20%	65%
Mpumalanga	15%	24%	41%	58%
North West	25%	22%	36%	66%
Free State	5%	18%	14%	55%
Gauteng	2%	9%	9%	55%
Western Cape	2%	4%	2%	40%
National	***20%***	***25%***	***26%***	***57%***

Source: 2013 ECD Audit. **Notes**: Adequate water supply is defined as any water supply from a tap, either inside the centre or on the site; adequate electricity supply is defined as being connected to the electricity mains; and adequate toilets are defined as flushing toilets either connected to the sewerage system or a septic tank, chemical toilets and potties. The options on toilet types were not presented as mutually exclusive, but the percentages should still provide an overall idea regarding the current situation. A centre is deemed overcrowded if there is less than 1.5 m² indoor play space per child enrolled.

[46] The questionnaire had two separate categories for houses and houses with garages; both are included here.
[47] The final 2% of centres stated that they use 'Other Structures' as ECD centres. It is unknown what these structures encompasses.
[48] This is based on the minimum norms and standards which requires 1.5 m² of indoor play space per child, and 2 m² outdoor play space per child.
[49] Basic LTSM is defined as arts and crafts material, puzzles, books and posters, manipulative and construction sets, and furniture and equipment. The provincial differences stated here are statistically significant.

Figure 19: Percentage of ECD centres without adequate LTSM[50]



Source: 2013 ECD Audit. **Notes:** LTSM is rated as inadequate if a centre indicated that there is not enough of the specific material for the number of children attending the centre.

3.5.3. Human resource capacity

ECD practitioners are the single most important factor in ensuring the development of the children in their care. They are in a unique position to provide the fundamental skills and opportunities for children to transition successfully into formal schooling. A high-quality practitioner can enable this learning to take place, regardless of whether a child is from an impoverished or an enriched environment (Howes, et al., 1992). This means that, well-trained, passionate and capable ECD practitioners have the potential to make an invaluable contribution to the basic development of children.

Initially, the minimum requirement for practising as an ECD practitioner was a Basic Certificate: ECD (NQF[51] Level 1). This qualification was intended to provide existing unqualified ECD practitioners with basic training in the needs of the developing child, but has since been replaced (the last teachers were to graduate in 2013). The Further Education and Training Certificate: ECD (NQF Level 4) replaced the Basic Certificate as the required qualification for entry and is equivalent to a Grade 12 qualification (Atmore et al., 2012). The entry requirement for this qualification is a Grade 9 certificate, which makes it accessible to many persons who has not passed Grade 12 and consequently have limited other options of employment. Formally, the

[50] Learning and Teaching Support Material
[51] National Qualifications Framework

Children's Act stipulates that staff working in ECD programmes should have a National Certificate in ECD at an NQF Level 1-6, or an appropriate ECD qualification, or a minimum of three years' experience in implementing ECD programmes (Berry et al., 2011).

Table 10 summarises the qualifications and specialisations of ECD staff that are in teaching positions. Only 13% of practitioners and 12% of assistant practitioners have any qualification above that of a Grade 12, which is to be expected, given that the Grade 12 requirements were only set in 2013. Principals and supervisors tend to be slightly more qualified, but still almost 80% do not have any qualification above that of Grade 12. When looking at the number of practitioners with qualifications that specialise in ECD, however, it is evident that the minimum norms and standards do not apply in practice. Where one would expect the majority of practitioners to have at least the NQF basic certificate, Table 10 shows that 66% of practitioners and 82% of assistant practitioners do not have *any* qualification in ECD. Once again, principals and supervisors seem to have received slightly more training, with at least 40% of principals and supervisors having at least a certificate in ECD.

Table 10: ECD practitioner qualifications and specialisations

		Assistant	Practitioner	Principal/Supervisor
Qualifications:	*< Grade 12*	48%	45%	36%
	Grade 12	39%	42%	43%
	ABET 1 - 4	6%	7%	9%
	Post-matric diploma	2%	2%	5%
	Degree	0%	1%	2%
	Other	4%	3%	5%
	Total	100%	100%	100%
Specialisations:	*None*	82%	66%	46%
	Certificate	11%	21%	31%
	Diploma	1%	3%	8%
	Degree	0%	0%	1%
	Total	94%	90%	86%

Source: 2013 ECD Audit. **Notes:** The sample is not necessarily nationally representative, but rather representative of all teachers who participated in the national audit. The audit differentiated between the staff position "Principal/Matron" and "Supervisor", but these titles refer essentially to the same position at an ECD centre. For this reason, the categories were combined in the table.

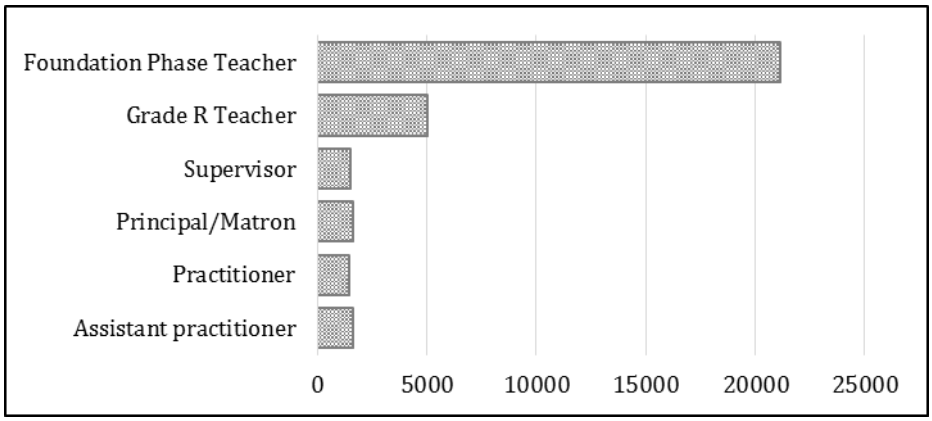
Both international and local literature agree that an association exists between ECD practitioner qualification and the quality of care and learning provided, but that qualifications are no guarantee of quality teaching (HSRC, 2010; Sylva et al., 2014; Warren and Haisken-DeNew, 2013). Given the low entry requirements, the high number of unskilled workers, and the very high unemployment rates in South Africa, being an ECD practitioner is a worthwhile option for many poorly qualified women to obtain a stable income, while saving on the exorbitant travel time and costs of working in urban areas. It is therefore essential to ensure that practitioners receive high-quality training in order to understand and appreciate the complexity and importance of cognitive and non-cognitive development for children.

In South Africa very little concrete data is available on the quality of teaching that takes place at ECD centres. Ideally, one would like to evaluate the quality of an ECD centre using a proper instrument such as the Early Childhood Environment Rating Scale (ECERS), but unfortunately such an evaluation has not been undertaken in a manner that allows any conclusions to be drawn regarding the system as a whole. From the ECD audit, one can establish that 73% of centres follow their own learning programmes with pre-Grade R children and that only 40% of these programmes are approved by the DBE and registered with the DSD. Twenty-eight per cent (28%) of ECD centres stated that their learning programmes do not follow National Early Learning Development Standards (NELDS), but among unregistered centres this percentage is higher, with 40% of programmes not following the national standards. In two-thirds of ECD centres, evidence was found that a structured learning programme was followed on the day of the audit.

As shown in figure 20, the average monthly salary of an ECD practitioner is extremely low. Practitioners with a post-matric diploma or a degree receive salaries similar to uneducated individuals. Despite there being a statistically significant premium on having a qualification that is above Grade 12, this difference is negligibly small in monetary terms. Regardless of a person's qualification or position at an ECD centre, their monthly salary will typically range between R1 400 and R2 000, not including any other benefits such as a pension fund, medical aid benefits or housing subsidy. In 2013 the teacher salary scales from the DBE made provision for a primary school teacher with a Relative Education Qualification Value (REQV) of 14 and above to receive an entry-level state salary of R185 184 per annum, excluding benefits. This amounts to R21 141 per month, including the 37% benefits, which comprise pension, medical aid and housing-subsidy contributions (Barry, 2014). This is almost ten times more than the average ECD practitioner gets with exactly the same degree. The salary prospects of practitioners in rural areas are even lower – about R442 per month less than their peers in urban areas.[52] Moreover, practitioners in the Western Cape earn on average R614 per month more than their peers in Gauteng.[53]

[52] See Figure 22 in 3.9 Chapter Appendix.
[53] See Figure 23 in 3.9 Chapter Appendix.

Figure 20: Comparison of average monthly salary (in Rand)



***Source*:** 2013 ECD Audit – ECD practitioner salaries; Grade R teacher salaries using the numbers supplied by Lesufi (2014); Foundation Phase teacher salaries using the numbers provided by Barry (2014). ***Notes*:** The average salary is a rough estimate of Grade R practitioner salaries, as their salaries are determined on a provincial level or sometimes even at a school level.

Delivering high-quality and effective early childhood care and education largely depends on the quality of ECD practitioners, but also the quality of the structures that support them. In this regard, district and provincial level support is essential in providing ECD practitioners with the necessary training, resources and equipment for functioning productively. Very little information is currently available on the capacity of the staff at provincial and district level to support ECD practitioners sufficiently. Key to delivering a high-quality pre-Grade R will be ensuring that officials and practitioners in the ECD sector are capable and effective.

3.5.4. Registration and funding of ECD centres

One of the main benefits of being registered with the DSD or DBE is that a centre can qualify for a subsidy. In 2013, an ECD centre could have received R330 per month per qualifying child registered at the centre. The DSD subsidies, however, are only available to means-tested children[54] in non-profit-registered ECD centres and are dependent on the availability of the departmental budget (Giese et al., 2006). The means test is based on the joint incomes of a child's parents, and if below a certain threshold, the child is eligible for the subsidy.[55] Centres that have registered Grade R classes with the DBE could receive a DBE subsidy of between R110 and R374 per month per child, according to the province in which it is located. In addition to receiving these subsidies, most ECD centres also charge basic fees to help cover their costs, which include practitioner salaries, children's meals, maintenance and infrastructure, and other necessary

[54] The thresholds for eligibility, as well as the manner in which the subsidy is calculated differs substantially across provinces. Some provinces take into account the number of days of actual attendance, whereas others receive a standard monthly subsidy based on the number of learners registered at the start of the year (Giese et al., 2011).
[55] The onus is on the ECD centre managers to collect the necessary information to prove eligibility.

resources. Since unregistered centres do not qualify for these subsidies, it is imperative to understand the scope of centre registration constraints.

As mentioned above, the ECD audit captured data on 17 846 ECD centres, of which 45% were fully registered with the DSD, 11% were conditionally registered and 44% were not registered. Of the centres that were conditionally registered, the largest prohibitive factor to full registration reported was a lack of adequate infrastructure and adequate equipment. Furthermore, 52% of ECD centres that were not registered had applied for registration and were still awaiting a response from government.[56] Only half (54%) of the ECD centres that offered Grade R were registered with the DBE. Regarding pre-Grade R, 54% of centres registered their learning programme with the DSD and about 54% registered with the DBE, but only 45% registered with both institutions.

Given that unregistered centres do not qualify for these subsidies, it is disconcerting then that 77% of all unregistered ECD centres – 6 004 in total – were providing services in rural areas, where poverty is endemic.[57] The socio-economic circumstances in which these centres function restrict them severely in their ability to raise funds through fees, donations or other fund-raising events. On average, fees comprise about 78% of funding of unregistered centres and only 16% of income received is from DSD grants or subsidies. These centres serve approximately 190 000 children, who are likely to be from homes where they do not receive the necessary nutrition and cognitive stimulation. These are therefore the centres that have the largest responsibility for providing high-quality ECD services to children.

In light of the above, the current funding structure is counterproductive and exposes unregistered centres to a low-resource trap. Inherently, unregistered centres in poorer areas are constrained in raising the funds required to invest in the necessary physical and human resources that will enable them to register and subsequently qualify, for the government subsidies.[58] The category "conditionally registered" was designed to assist centres that may fall into this trap, but the assistance provided is merely enough to cover the nutritional costs of the centres and is not sufficient to adequately finance their needs. In essence, ECD centres are mostly left to their own devices to cover all start-up investment. Once they comply with the norms and standards, do they qualify for state assistance.

[56] Table 19 in 3.9 Chapter Appendix shows ECD registration status across the provinces.

[57] The areas included in this calculation constitute farms, reservations, villages/settlements, informal housing communities, non-residential areas and townships.

[58] The Municipal Infrastructure Grant is intended to assist unregistered centres with their infrastructural needs, but this rarely happens in practice.

3.6. Non-Registered and Conditionally Registered Centres

3.6.1. The conditions in these centres

Given that such a large proportion of ECD centres are unregistered, in the process of registering or conditionally registered, it is a concern that these centres provide care for children in unregulated conditions, as very little information is available on the quality of the physical and human resources in these centres. This section aims to gauge the difference between fully registered centres and conditionally or unregistered centres. The question is also asked: What number of conditionally registered or unregistered centres are on the verge of being registered and could therefore (with relatively little intervention) receive the subsidy? To fulfil these aims, indices were constructed to obtain an overall measure of the level and quality of the physical and human resources at ECD centres.

An index was constructed for each resource area required for delivering a high-quality ECD programme. The indices were constructed as unidimensional composite indicators of a set of questions in the audit, which reflects the underlying level of conditions of each resource area. The index score for each ECD centre is the linear combination of the set of questions (or variables), with weights assigned to each of the underlying questions. These weights were calculated according to the variance and covariance of these variables, using MCA. This method constructs each index by assigning unique weights to each of the variables included, based on the amount of common information each variable contributes in relation to the latent variable (in this case the level and quality of infrastructure,[59] equipment[60] and human resources[61]). By construction each index is centred on zero and has a standard deviation of one.

Figure 21 illustrates the difference in the mean of each index by centre registration status. Conditionally registered centres do significantly worse than other types of centres on the infrastructure index, but on the equipment and human resource indices they perform better than both unregistered centres that have applied for registration and unregistered centres that have not applied for registration. Both the equipment and human resource indices reflect a trend

[59] Underlying variables of the Infrastructure Index are: structure of ECD centre; heating & ventilation; condition of roof, inside of centre, plumbing; need for maintenance; access to water, energy for lighting and cooking; play area size; floor space; teaching area; paved surfaces. See table 16 in 3.9 Chapter Appendix. Cronbach's alpha for this index is 0.64.

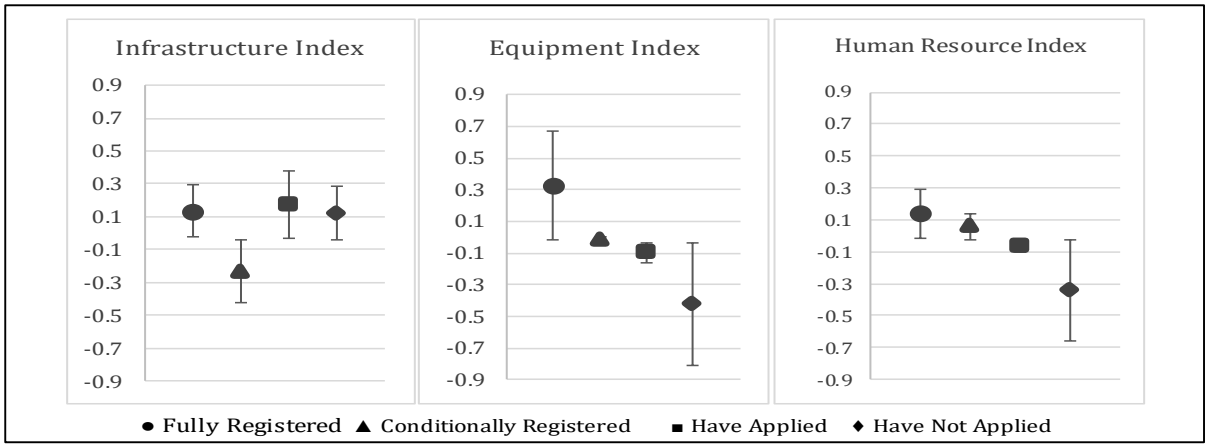
[60] Underlying variables of the Equipment Index are: quality and availability of toilets, arts and craft material, music equipment, educational games, manipulative and construction sets, puzzles, fantasy and make believe materials, outdoor and active play equipment, classroom furniture, 'Discovery of Nature' poster, other colourful posters, an outside gate, a fridge, a food garden. See table 17 in 3.9 Chapter Appendix. Cronbach's alpha for this index is 0.90.

[61] Underlying variables of the Human Resource Index are: qualifications; specialisations in ECD; study duration; training attended in the past 24 months; nature of appointment; having a clearance certificate. The index was only calculated for staff members that act in a teaching position. See table 18 in 3.9 Chapter Appendix. Cronbach's alpha for this index quite low at 0.2.

where conditionally registered centres perform worse than fully registered centres and centres who have applied for registration perform worse than conditionally registered centres. On both these indices, centres that have not applied for registration perform the worst.[62]

It is not surprising that conditionally registered centres perform significantly worse on the infrastructural index than fully registered centres, since infrastructural inadequacies were the main reason provided by ECD centres for being conditionally registered. The main features that these centres seem to be lacking are proper ventilation and heating (respectively 29% and 68% of conditionally registered centres do not have these), access to water either in the building or on the site (only 38% of sites have tap water in the building), electricity for both lighting and cooking (24% of the sites have no electricity for lighting and 65% have no electricity for cooking). Fewer conditionally registered centres have these facilities relative to both non-registered centres that have applied and those that have not applied for registration.

Figure 21: Resource indices by registration status[63]



Source: 2013 ECD Audit. **Notes:** Indices were constructed by making use of a range of questions from the ECD audit data on each subject area, and by applying MCA to the variables. The Human Resource Index is calculated by taking only teaching staff into consideration. Sample sizes: 8032 fully registered; 1922 conditionally registered; 3710 have applied; 3469 have not applied.

Regarding space, non-registered centres that have not applied for registration seem to have significantly smaller play areas, floor space and teaching space. A higher proportion of non-registered centres, both those that have applied for registration and those that have not, have no supporting materials (such as musical instruments, educational games, arts and crafts), or few supporting materials, which are in poor condition. For example, only a third of fully registered centres have little or no arts and crafts material, whereas half of the centres that have applied for

[62] In both indices these rakings are statistically significantly different from each other.
[63] Table 15 in the appendix provides the descriptive statistics illustrated in this figure.

registration and two-thirds of the centres that have not applied for registration have little or no arts and crafts material.

A significant difference exists in the human resource index between centres with different registration statuses. These differences originate from factors such as the ECD specialisations that practitioners have obtained, whether practitioners have attended any training in the past 24 months and whether staff members have a National Child Protection Clearance certificate.[64] There is a lot of variation in the proportion of practitioners with ECD specialisations, with just less than half (45%) of the practitioners in fully and conditionally registered centres having some specialisation in ECD, but only 14% of practitioners in centres that have applied for registration and merely 9% of practitioners in centres that have not applied for registration with any ECD specialisation. Furthermore, 46% of practitioners in fully registered centres have attended training in the past 24 months, whereas only 26% of practitioners in centres that have not applied for registration have attended any training. Finally, one-third of practitioners in fully registered centres have a clearance certificate, and one in ten practitioners in centres that have not applied for registration have a clearance certificate. The high number of practitioners in well-resourced, urban ECD centres without a clearance certificate suggests that institutional constraints on the side of the issuing authority are prohibiting practitioners from obtaining these certificates.

Although these indices provide a good sense of the conditions in ECD centres with different registration statuses, they are unable to provide any information regarding the number of ECD centres that are on the verge of registration. What is evident from the indices is that quite a number of conditionally or unregistered centres have similar (or even higher) index scores than the average registered centre. These centres provide an opportunity for raising the overall quality of ECD provision to children in South Africa and could serve as a short- to medium- term strategy for providing quality ECD centres to the burgeoning number of learners that attend ECD programmes. Gaining full registration status and receiving the state subsidy could greatly assist these centres in providing the much needed services to their learners.

Table 11 shows the number of ECD centres in each province that have both infrastructure and equipment index scores similar to or higher than the average scores for registered centres. Assuming that centres with an above average score on the equipment or infrastructure index could be registered and receive the state subsidy, then 2069 additional ECD centres in South Africa would be receiving the state subsidy. Of these 2069 centres, 1072 centres have applied for registration, but have not received it yet. Whether, due to variances in the implementation of the

[64] It is the responsibility of the school manager to send the list of staff members to the Director-General of Social Development to check if the names of staff or volunteers are not on the National Child Protection Register or the Sexual Offences Register (Berry et al., 2011).

minimum norms and standards, inefficient registration processes or budgetary and institutional constraints, these centres are not supported efficiently. In Eastern Cape it is evident that 75 centres have applied for registration, but are not registered yet, with Gauteng and the Western Cape having 309 and 431 centres respectively in this position.

Table 11: Number of centres with an index scores above the average score for registered centres

	Conditionally	NR: Applied	NR: Not Applied	Total
Eastern Cape	13	75	58	146
Free State	84	52	32	168
Gauteng	29	309	332	670
KwaZulu-Natal	5	70	30	105
Limpopo	122	43	30	195
Mpumalanga	27	64	41	132
North West	8	14	12	34
Northern Cape	1	14	12	27
Western Cape	76	431	85	592
Nationally	***365***	***1072***	***632***	***2069***

Source: 2013 ECD Audit. **Notes:** The number of centres were calculated by considering only those centres which have an average infrastructure and equipment index score which is above the average scores for registered centres.

3.6.2. Constraints to registration

Given the financial constraints conditionally registered and unregistered centres face, in this section the extent to which the minimum norms and standards are adhered to, and which of the norms and standards serves as binding constraints to becoming fully registered are determined.

The indices constructed for the study and presented in the previous section suggest that irregularities exist in the process of registering ECD centres. When considering the distribution of ECD registration status by province, the same irregularities become apparent (Table 12). The Eastern Cape, the Free State and KwaZulu-Natal are the provinces with the largest percentage of their ECD centres registered. The Free State and Limpopo have the largest percentage of centres conditionally registered. The Western Cape, Gauteng and Mpumalanga have the highest percentage of their centres that have applied but are still awaiting their registration certificate, and Gauteng, North West and Mpumalanga have the largest percentage of centres not having applied for registration yet. The high percentage of ECD centres registered in the Eastern Cape and KwaZulu-Natal stands in direct contrast with the situation indicated in Table 9, which shows these provinces as having the largest percentage of ECD centres with inadequate water, electricity and toilet facilities. This raises questions around the implementation of the minimum norms and standards in these provinces.

Table 12: ECD registration status by province

		Registered		Not Registered		Total
	Observations	*Full*	*Conditional*	*Applied*	*Not Applied*	
Eastern Cape	1 662	62%	7%	17%	14%	100%
Free State	1 434	57%	21%	13%	9%	100%
Gauteng	3 131	35%	3%	24%	39%	100%
KwaZulu-Natal	2 052	69%	11%	14%	6%	100%
Limpopo	2 963	32%	27%	18%	22%	100%
Mpumalanga	1 654	29%	9%	32%	30%	100%
North West	901	46%	10%	12%	32%	100%
Northern Cape	467	78%	2%	13%	7%	100%
Western Cape	2 869	52%	5%	34%	10%	100%
National	17 133	47%	11%	22%	20%	100%

Source: 2013 ECD Audit.

Using the National Norms and Standards for ECD Programmes, and the National Norms and Standards for Partial Care Facilities (Children's Act 38, section 79), it is possible to compile a checklist of requirements for a centre to be registered. In compiling this checklist for this study, however, it became clear that several of the norms and standards are relatively open to interpretation and as a result introduce subjectivity on the part of the provincial DSD in granting a centre its registration status. This inevitably leads to the inconsistent implementation of the norms and standards across and perhaps even within provinces.

The ECD audit contains information on an ECD centre's compliance with this checklist. This information makes it possible to analyse the trends in ECD centre registration status and determine whether discrepancies are shown in the manner in which the requirements for registration are applied. Given that the norms and standards of being registered as an ECD centre are set nationally, it is expected that a much higher proportion of registered centres will comply with the requirements than of the conditionally or unregistered centres. Upon closer inspection, however, it became clear that for a large number of the checklist items, no remarkable difference exists between the percentage of registered centres and conditionally registered centres that comply (see table 19 in the appendix). The differences between registered and non-registered centres are larger, but it is still clear that there are non-registered centres that comply with a number of the checklist items.

One requirement worth mentioning is that staff members need to have been cleared by the Department of Justice and received a certificate stating that their names do not appear on the National Sex Offenders Register. Poor compliance with this requirement is evident among both registered and unregistered centres, but is the worst among centres that have not applied for registration. These centres that have not applied are the least regulated, potentially exposing children attending these centres more to the risk of abuse.

The minor differences observed among the other norms and standards between registered and conditionally registered centres lead to the question of whether certain norms and standards are regarded as critical for registration and whether others are open to the provincial DSD's discretion. Table 13 presents the odds ratios of being fully registered when complying with each of the norms and standards. Five logit regression models were run on being either fully registered or not. The first regression includes only the items that relate directly to the national norms and standards, the second regression includes the provincial dummies, the third controls for the monthly income a centre receives from various sources, the fourth controls for the indices developed in the previous section and the final regression, as a sensitivity check, includes all other indicators that might play a role in whether a centre is registered or not.

The base model (A) suggests that the critical requirements for obtaining full registration are having a fridge in which to keep food cool, a health clearance certificate, having submitted an implementation plan to the DSD, having been inspected by the DSD, having a structured daily programme and daily menu, and whether the indoor play area is of an adequate size and has adequate ventilation. Two additional controls, monthly income and the previously calculated indices, are included to examine their influence on the odd ratios. The monthly income controls included all income derived from fees, donations, fundraising and from the National Lottery. The indices are included to control for the overall level and quality of infrastructure, equipment and staff. The odd ratios remain relatively robust when the additional controls are included, with only the importance of having a fridge, adequate indoor play space and ventilation diminishing with the inclusion of these controls.

The provincial dummies offer some useful insight regarding provincial adherence to the norms and standards. Relative to ECD centres in the Western Cape, the results indicate that ECD centres in the Eastern Cape are three-and-a-half times more likely to be registered, conditional on all the other included variables in the model. An ECD centre in KwaZulu-Natal is just over six times more likely to be fully registered than an ECD centre in the Western Cape, after controlling for all the required minimum norms and standards. This result links in with the anomaly observed above with the Eastern Cape and KwaZulu-Natal having the highest percentage of ECD centres registered, despite the infrastructural inadequacies.

This lenient implementation of the norms and standards has advantages and disadvantages, specifically in the most rural areas. Being registered in a rural area means that these ECD centres, which are limited in raising any additional funds, gain access to subsidised funding easier. However, this lenience defies the purpose of having norms and standards completely and

introduces the risk that ECD centres are run in circumstances that are not fit for children, and provide programmes that have very little developmental benefits for the children attending them.

To disentangle the provincial effects further, multinomial logit regression models were run on the same explanatory variables (see table 20 in the appendix[65]). These models allow one to evaluate the relative importance of each of the norms and standards for becoming registered when the centre is conditionally registered, not registered but have applied, or not registered and have not applied. Provincial dummies were included once again to determine the irregularity of adhering to the norms and standards by province. In the regression that determined the probability of being conditionally registered relative to being fully registered, the only factor that emerged as a determinant to being registered was having an emergency action plan. The provincial dummies are once again large and significant, with ECD centres in the Eastern Cape, Gauteng and KwaZulu-Natal being more likely to be registered than conditionally registered, after controlling for all other factors. These results suggest that provincial departments in these provinces are more likely to grant a centre full registration status, rather than conditional registration status than centres with the same conditions in the Western Cape.

A fridge, a health clearance certificate, submitting an implementation plan, being inspected by the DSD, having a daily programme and having a daily menu are all elements that make an ECD centre more likely to be registered (both having applied and not having applied). In determining the requirements that serve as binding constraints to becoming registered, it is worthwhile noting that the majority of these items relate to good governance and management. Compiling a daily programme, a daily menu and an implementation plan does not require financial resources, but rather a capable practitioner or principal. Obtaining a health clearance certificate and a fridge in which to keep perishable food cool will require more significant financial investment, but this investment will be dependent on the state of the current facilities, such as availability of electricity.

One critical element in stimulating children in early childhood education is the availability of age-appropriate LTSM. The current minimum norms and standards make no mention of this as a minimum requirement and consequently no emphasis is placed on the availability of these materials in ECD centres. For ECD centres to function as a place of early learning (and not merely as a childminding facility), it is imperative that a stronger focus is placed on the availability of age-appropriate LTSMs.

[65] The test for combining dependent categories established that none of the categories are indistinguishable and therefore they should not be combined. Furthermore, the test independence of irrelevant alternatives shows that the assumption is not violated.

Table 13: Logit model predicting the likelihood of being a registered ECD centre

	(A)		(B)		(C)		(D)		(E)	
Fridge to keep food cool	1.62	***	1.39	***	1.38	***	1.26	**	1.28	*
Fire extinguishers - 1 per 200 m^2	1.07		1.19		1.16		1.11		0.97	
First Aid kit	0.98		0.89		0.96		0.91		0.90	
Staff member trained in First Aid	1.00		1.05		0.99		0.97		0.99	
Health Clearance Certificate	1.49	***	1.99	***	1.82	***	1.82	***	1.77	***
Emergency Action Plan	0.98		1.11		1.12		1.07		1.21	*
Staff Clearance Certificate	1.02		0.91		0.90		0.81		0.76	*
Submitted an Implementation Plan	3.46	***	3.10	***	3.22	***	3.16	***	3.25	***
Have been Inspected by DSD	3.42	***	3.39	***	3.10	***	3.13	***	3.10	***
Staff Job Descriptions	1.01		1.09		1.05		0.97		0.93	
Daily Programme	1.97	***	1.65	***	1.72	***	1.62	***	1.52	***
Menu	1.72	***	1.79	***	1.67	***	1.65	***	1.58	***
Accident File	0.92		1.03		0.99		0.93		0.93	
Outdoor Play: At least 2 m^2 per child	1.12		1.00		0.94		0.91		0.99	
Indoor Play:At least 1.5 m^2 per child	1.27	***	1.28	***	1.14		1.17		1.39	**
Toilet Facilities: Enough Toilets	1.06		0.98		0.94		0.90		0.93	
Toilet Facilities: Enough Potties	0.84	**	0.85	*	0.87		0.90		1.06	
Indoor Play Area with windows	1.19	*	0.99		1.00		0.96		0.97	
Toilet Facilities: Nappy Changing	0.97		1.00		1.11		1.07		1.08	
Kitchen: Separate prep area	0.95		1.04		1.09		1.11		1.05	
Kitchen: Hygienic, clean, safe	1.00		1.09		1.11		1.14		1.17	
Outside Premises Enclosed	0.98		1.11		1.14		1.05		0.99	
Eastern Cape			3.97	***	3.63	***	3.63	***	3.53	***
Free State			1.79	***	1.54	***	1.55	***	1.54	***
Gauteng			0.76	**	0.81		0.85		1.01	
KwaZulu-Natal			5.93	***	6.36	***	6.30	***	6.23	***
Limpopo			0.83		0.89		0.85		0.70	
Mpumalanga			0.44	***	0.49	***	0.50	***	0.49	***
North West			0.84		0.88		1.02		0.90	
Northern Cape			16.28	***	12.94	***	12.68	***	10.07	***
Rural			0.71	***	0.71	***	0.72	***	0.68	***
Constant	0.02	***	0.02	***	0.02	***	0.03	***	0.01	***
Observations	4 090		4 052		3 540		3 440		3 113	
Pseudo R^2	0.17		0.24		0.25		0.25		0.28	
Log Pseudolikelihood	-2 342.2		-2 124.4		-1 838.7		-1 771.5		-1 550.4	
Income					X		X		X	
Indices							X		X	
All other possible factors									X	

3.7. Discussion

Using a variety of datasets, the preceding analysis considered both the demand for, and the supply of early childhood care and education for the age group that will be affected by the proposed pre-Grade R year. On the demand side, it is evident that the participation of four-year-olds in early childhood care and education has increased significantly over the past decade, with about half of all four-year-olds participating in an early-learning programme in 2013. Although there are discrepancies between datasets on the exact number of learners not participating in any form of early childhood care and education, a lower-bound estimate would be around 28%, which is about 300 000 children. Children living in urban informal areas are the least likely to participate in early childhood care and education, although these are the areas in which high-quality early childhood care and education may be most needed. Entry constraints caused by high school fees might be one of the reasons, and further research would have to be conducted on understanding this phenomenon. Children that live in urban informal settings are at risk of receiving inadequate nutrition and very little cognitive stimulation at home, and will therefore greatly benefit from attending a high-quality ECD centre. Assisting conditionally registered or unregistered centres that are on the verge of becoming registered might be a relatively cost-effective strategy for reaching these children.

The supply-side focus has been on both the quantity and the quality of ECD provisioning. Although there is still very little information available about four-year-olds' access to ECD centres, one is able to get a sense of the nature of ECD centres currently. One in five ECD centres is battling with inadequate drinking-water supply, one in four centres has inadequate electricity supply, a quarter struggle with inadequate ablution facilities and more than half of all ECD centres are overcrowded. The prevalence of the infrastructural inadequacies differs among provinces, with ECD centres in Limpopo, KwaZulu-Natal and the Eastern Cape being the worst off. Moreover, the lack of LTSM is rife and centres in these same provinces are the most in need of additional resources. It is surprising, however, that these provinces also have the highest percentage of their ECD centres as fully registered, despite these inadequacies. As will be argued below, this seems to indicate that variable standards are applied across provinces.

Another feature of the current state of ECD centres is the low levels of qualifications among ECD practitioners. Merely one out of every ten practitioners has a qualification above matric level, and only a quarter of the practitioners have received some training in ECD. The entry requirement for becoming an ECD practitioner is very low and it is evident that ECD centres are not currently implementing norms and standards relating to qualifications. Although qualifications are not necessarily required for quality teaching, they are critical for ensuring that practitioners are

aware of the importance and complexity of both cognitive and non-cognitive stimulation for the development of young children. It is therefore necessary to focus on the needs of these practitioners and to provide them with the skills and capacities required to be more effective. Therefore, in order to implement an effective pre-Grade R, a teaching force for an entire cohort, i.e. approximately 50 000[66] practitioners or teachers will need to be trained.

Furthermore, prominent differences exist in the implementation of the national minimum norms and standards in registering ECD centres across the provinces. In some provinces it is evident that there are large numbers of centres that could be registered, but are either classified as conditionally registered or still awaiting the outcome of their application. This might be the result of provincial budget constraints and therefore rationing on the province's side, or just inefficiencies in the registration process. Either way, these irregularities are prohibiting some ECD centres in certain provinces from gaining access to much needed funding. On the other hand, centres in the Eastern Cape and KwaZulu-Natal are more likely to be granted full registration than centres with similar conditions in the Western Cape. Although the benefit of full registration to centres in these provinces is easier access to subsidised funding, the danger is that these centres function in conditions that are not conducive to early childhood care and education. Moreover, there is also a risk that these centres do not provide adequate developmental stimulation for the children in their care and that these facilities serve merely a childminding purpose.

Finally, the policy space in which the ECD sector currently finds itself does not reflect the importance of this sector for development and is not conducive to the proper implementation of a pre-Grade R. No evidence is available on the expertise or capacity of district officials, but the successful implementation of a high-quality pre-Grade R will depend strongly on their capability. Implementing an additional year of early childhood care and education will not have the expected (and much needed) impact if it is of the same quality as current Grade R provision (Van der Berg, et al., 2013). ECD first has to become a core function within government, and resources (both financial and human capital) and authority structures need to reflect this at national, provincial and district levels.

3.8. Conclusion

According to Heckman (2006: 1900) "Four core concepts important for devising sound policy toward early childhood development have emerged from decades of independent research in economics, neuroscience, and developmental psychology". The first is that the interaction between genetics and life experiences influences the process of skill formation. The second is that

[66] Calculated using the 20:1 practitioner-to-child ratio for three to four year olds as prescribed by the National Norms and Standards, and assuming an average cohort size of roughly a million learners a year.

skill formation follows hierarchical pathways and that these pathways are essential to economic success. The third is that cognitive, emotional, linguistic and social skills are interdependent and are shaped predominantly during the early childhood period. Lastly, skills are formed in a predictable sequence and there are certain critical time periods in which certain skills are formed most efficiently. If these time periods are missed, the acquisition of the same skill will require significantly more effort and investment at a later stage (Heckman, 2006).

In a developing country such as South Africa, the lack of human capital is a major constraint to future development and is a key determining factor of current income inequalities. The focus is often placed on the inadequacies of the South African education system and, while these inadequacies are significant, too little attention is paid to the social policies on ECD. This misplaced focus has often led to large investments in remedial actions taken when children reach high school but, given the fact that skill formation follows hierarchical pathways, this remedial action is often quite expensive and yields a very small return on the investment made (Spaull & Kotzé, 2015).

In light of the abovementioned features, it is crucial that South Africa implements its National Integrated ECD Policy in such a manner that it will benefit those children most in need. The introduction of a pre-Grade R could potentially have a significant impact on the future development of children, but these benefits will only be realised if pre-Grade R provision is of high quality, especially among the poor. The issue of quality is imperative here and the current landscape in which the ECD sector functions does not lend itself to the implementation of a high-quality service. Six binding constraints to delivering a pre-Grade R that will results in skill formation among four-year olds emerged from the analysis. Each of these constraints warrants further in-depth research to determine the remedial action that need to be taken in order to be alleviated.

1. **Lack of infrastructure and LTSM.** Significant investment in both these areas will be necessary regardless of whether pre-Grade R will be implemented in primary schools or in ECD centres. Among other things, this will entail assisting unregistered and conditionally registered ECD centres to attain the required health and safety standards.

2. **Capacity building among the national departments, provincial departments and districts.** Sufficient staffing and ECD expertise are required on all three levels to ensure that ECD centres and practitioners will receive the necessary professional support in implementing a pre-Grade R curriculum.

3. **Understanding the process of monitoring ECD centres.** Understanding how ECD centres are monitored could provide insights to the dilemma where ECD centres in poor areas

cannot access subsidies, or are delivering services that are not conducive to child care or learning

4. **A teaching force for an entire additional cohort.** Teachers for pre-grade R will need to be trained and provided with the vital skills to be more effective in unlocking the untapped potential of young children.

5. **Practitioner salaries.** Significant additional funding needs to be made available for practitioners. Given the lack of training and qualifications, however, additional funding could be linked to compulsory training and practical qualification.

6. **The policy space in which the ECD sector is positioned needs to be clarified.** The current milieu lends itself to perverse incentives, abdication of responsibility and a wide array of communication failures. Designing an organisation structure that will provide exceptional leadership and guidance on governance and accountability issues is complex as the structure needs to have sufficient capacity, authority and funding. What is essential, however, is to establish proper leadership and authority, with clear lines of responsibility, in the ECD sector. The quality of pre-Grade R is inextricably linked to the policy environment in which it is situated.

In conclusion, this research attempted to bring new information to bear on the current environment in which the NDP proposes to implement an additional year of preschooling. Although pre-Grade R may seem like a commendable idea, the effectiveness of this policy is fully dependent on the quality of the service provided and the capabilities of government administration to monitor the sector. Therefore, for pre-Grade R to fulfil its role as a stepping stone to social equality, the required structures must first be put in place before this policy is begun to be implemented.

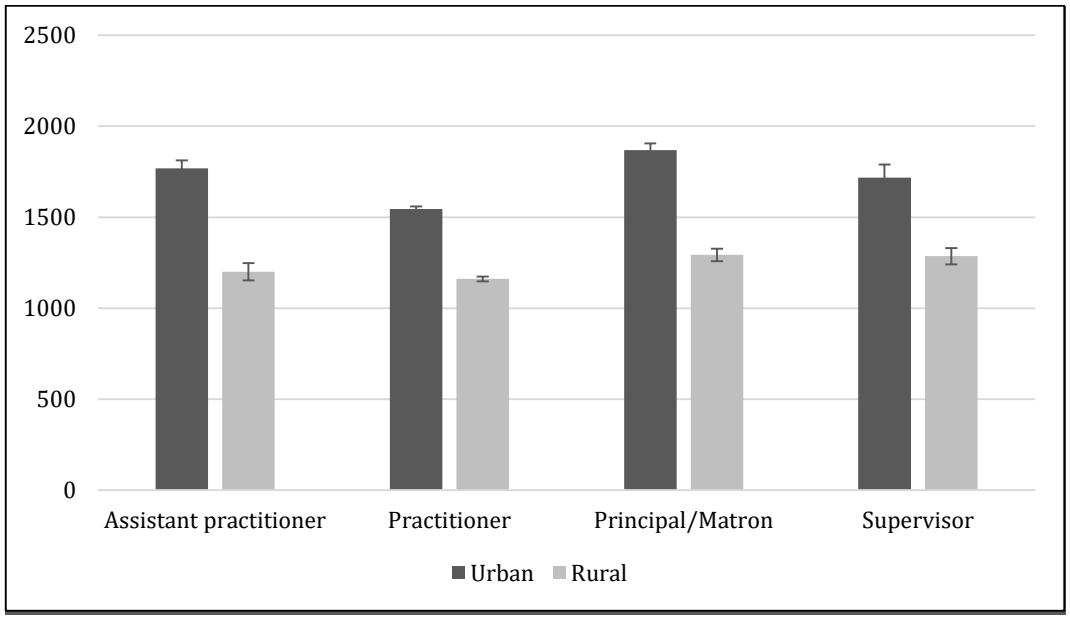
3.9. Chapter Appendix

Table 14: The composition of four-year-olds

Attending ECD	Not attending ECD
68% of Black Children	32% of Black Children
51% of Coloured Children	49% of Coloured Children
64% of Indian Children	36% Indian Children
89% of White Children	11% of White Children
66% of Males	34% of Males
68% of Females	32% of Females
64% Receive the Child Support Grant	75% Receive the Child Support Grant
61% of Children in the Western Cape	39% of Children in the Western Cape
77% of Children in the Eastern Cape	23% of Children in the Eastern Cape
59% of Children in the Northern Cape	41% of Children in the Northern Cape
83% of Children in the Free State	17% of Children in the Free State
49% of Children in KwaZulu-Natal	51% of Children in KwaZulu-Natal
61% of Children in North West	39% of Children in North West
76% of Children in Gauteng	24% of Children in Gauteng
61% of Children in Mpumalanga	39% of Children in Mpumalanga
78% of Children in Limpopo	22% of Children in Limpopo

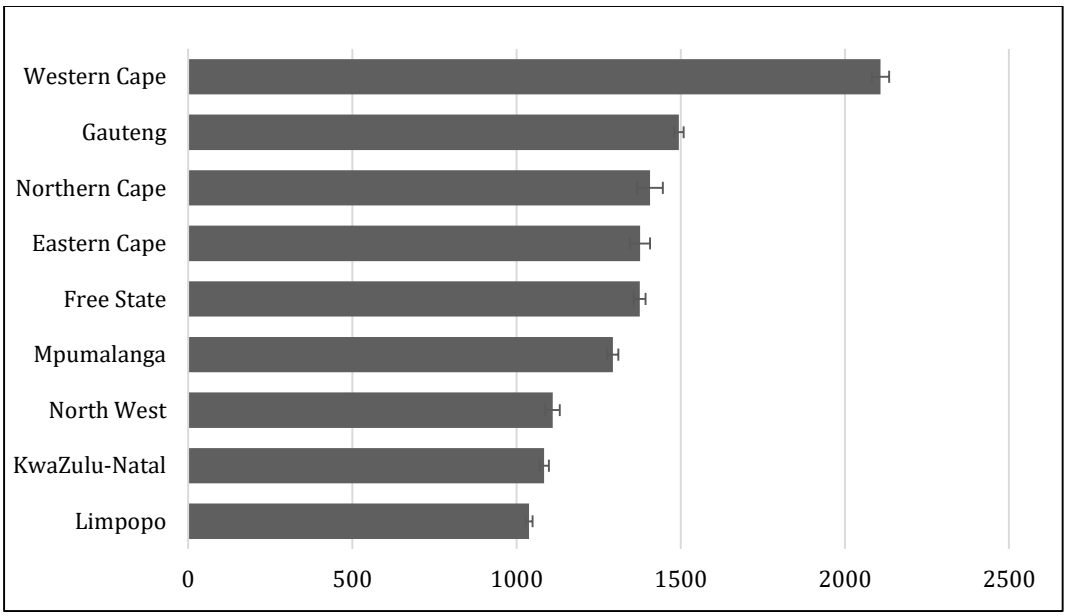
Source: General Household Survey 2013.

Figure 22: Average monthly salary in rural and urban areas (in Rand)



Source: 2013 ECD Audit.

Figure 23: Average Monthly Salary per Province (in Rand)



Source: 2013 ECD Audit.

Table 15: Resource indices by registration status

					Confidence Interval		Range	
		N	*Mean*	*Std. Err*	*Upper Limit*	*Lower Limit*	*Min*	*Max*
Infrastructure:	*Full*	8 032	0.134	0.012	0.159	0.110	-6.415	1.710
	Conditional	1 922	-0.232	0.022	-0.189	-0.274	-6.415	1.686
	NR: Applied	3 710	0.170	0.018	0.205	0.135	-6.415	1.710
	NR: Not Applied	3 469	0.122	0.019	0.160	0.085	-6.415	1.710
Equipment:	*Full*	8 032	0.326	0.011	0.347	0.305	-3.020	2.205
	Conditional	1 922	-0.020	0.020	0.020	-0.060	-2.540	1.852
	NR: Applied	3 710	-0.099	0.017	-0.065	-0.132	-2.711	2.061
	NR: Not Applied	3 469	-0.421	0.016	-0.389	-0.454	-2.711	2.061
Staff:	*Full*	8 032	0.139	0.007	0.153	0.126	-2.024	4.218
	Conditional	1 922	0.057	0.014	0.084	0.030	-1.897	3.184
	NR: Applied	3 710	-0.060	0.011	-0.038	-0.083	-2.134	3.862
	NR: Not Applied	3 469	-0.343	0.012	-0.320	-0.365	-1.897	3.623

Source: 2013 ECD Audit. **Notes:** Indices were constructed by making use of a range of questions from the ECD audit data on each subject area and by applying Multiple Correspondence Analysis to the variables.

Table 16: Factors underlying the Infrastructure Index

		Full	Conditional	Applied	Not Applied
Type of Structure:	*Other*	4%	3%	5%	4%
	Informal	10%	13%	14%	18%
	House	20%	20%	37%	41%
	Community	13%	13%	13%	11%
	Formal	53%	51%	32%	26%
Roof Condition:	*Many and Major*	2%	3%	3%	3%
	Many and Minor	0%	0%	1%	0%
	Some and Major	3%	4%	3%	3%
	Some and Minor	16%	19%	14%	13%
	None	78%	73%	80%	81%
Inside Conditions:	*Many and Major*	2%	3%	3%	3%
	Many and Minor	0%	0%	1%	0%
	Some and Major	3%	4%	3%	3%
	Some and Minor	16%	19%	14%	13%
	None	78%	73%	80%	81%
Condition of Plumbing:	*Many and Major*	1%	1%	0%	0%
	Many and Minor	0%	0%	0%	0%
	Some and Major	1%	1%	1%	0%
	Some and Minor	6%	5%	4%	3%
	None	92%	94%	95%	96%
Electrical Wiring:	*Exposed and Major*	1%	2%	1%	1%
	Exposed and Minor	4%	4%	4%	3%
	Not Exposed	96%	94%	95%	96%
Heating Facilities:	*No*	50%	68%	58%	63%
	Yes	50%	32%	42%	37%
Sufficient Ventilation:	*No*	19%	29%	24%	26%
	Yes	81%	71%	76%	74%
Maintenance Required:	*No*	62%	59%	61%	65%
	Yes	38%	41%	39%	35%
Water Supply:	*Borehole water on-site*	3%	4%	2%	2%
	Other	2%	5%	3%	3%
	Public or communal tank	8%	13%	9%	10%
	Rainwater tank on-site	7%	8%	3%	3%
	Tap water in building	57%	38%	61%	62%
	Tap water on-site	23%	32%	22%	20%
Electricity - Lighting:	*Electricity from main*	81%	75%	82%	80%
	Electricity from own	1%	1%	1%	0%
	Gas/paraffin/candles	11%	9%	8%	10%
	None	6%	14%	9%	9%
	Other	1%	1%	1%	1%
Electricity - Cooking:	*Electricity from main*	50%	34%	61%	60%
	Electricity from own	1%	0%	1%	0%
	Gas/wood/coal/paraffin	46%	61%	30%	30%
	None	2%	3%	7%	7%
	Not applicable	1%	1%	2%	2%
	Other	1%	0%	0%	1%

Source: 2013 ECD Audit.

Table 17: Factors underlying the Equipment Index

		Full	Conditional	Applied	Not Applied
Toilets:	*None*	1%	1%	2%	3%
	Other	0%	1%	1%	1%
	Bucket	6%	9%	7%	11%
	No Vent	14%	31%	14%	15%
	Vent	10%	13%	8%	8%
	Potties	31%	24%	36%	35%
	Chemical	4%	5%	2%	2%
	Septic	3%	1%	2%	1%
	Flush	30%	14%	29%	25%
Arts and Crafts:	*None & Poor*	4%	5%	11%	16%
	None & Fair	0%	1%	2%	2%
	None & Good	0%	0%	0%	0%
	Few & Poor	5%	6%	8%	8%
	Few & Fair	19%	26%	24%	29%
	Few & Good	5%	7%	5%	7%
	Most & Poor	1%	1%	1%	0%
	Most & Fair	15%	14%	12%	12%
	Most & Good	16%	15%	14%	11%
	All & Poor	1%	1%	1%	0%
	All & Fair	5%	4%	4%	2%
	All & Good	28%	21%	18%	11%
Music:	*None & Poor*	15%	19%	25%	31%
	None & Fair	2%	2%	4%	6%
	None & Good	1%	2%	1%	1%
	Few & Poor	6%	8%	6%	6%
	Few & Fair	23%	30%	23%	26%
	Few & Good	7%	8%	6%	6%
	Most & Poor	1%	1%	1%	1%
	Most & Fair	11%	10%	9%	8%
	Most & Good	12%	8%	10%	7%
	All & Poor	1%	0%	0%	0%
	All & Fair	3%	2%	2%	1%
	All & Good	18%	9%	12%	7%
Games:	*None & Poor*	6%	7%	13%	17%
	None & Fair	1%	2%	2%	3%
	None & Good	0%	1%	0%	0%
	Few & Poor	5%	5%	6%	7%
	Few & Fair	21%	29%	25%	30%
	Few & Good	5%	6%	5%	6%
	Most & Poor	1%	1%	1%	1%
	Most & Fair	13%	13%	11%	10%
	Most & Good	15%	12%	13%	11%
	All & Poor	1%	0%	0%	0%
	All & Fair	5%	3%	4%	2%
	All & Good	28%	22%	20%	12%

Factors underlying the Equipment Index (continued)

Manipulative and Construction Sets:	*None & Poor*	10%	14%	21%	27%
	None & Fair	2%	2%	3%	5%
	None & Good	0%	1%	1%	1%
	Few & Poor	5%	6%	6%	7%
	Few & Fair	25%	33%	26%	29%
	Few & Good	6%	8%	5%	5%
	Most & Poor	1%	1%	1%	0%
	Most & Fair	13%	11%	10%	9%
	Most & Good	14%	9%	11%	9%
	All & Poor	1%	0%	0%	0%
	All & Fair	3%	1%	2%	1%
	All & Good	20%	12%	14%	8%
Puzzles:	*None & Poor*	5%	7%	12%	18%
	None & Fair	1%	1%	1%	3%
	None & Good	0%	1%	0%	1%
	Few & Poor	6%	7%	7%	7%
	Few & Fair	22%	31%	27%	31%
	Few & Good	6%	9%	6%	7%
	Most & Poor	1%	1%	0%	1%
	Most & Fair	14%	13%	12%	10%
	Most & Good	16%	14%	13%	10%
	All & Poor	1%	0%	0%	0%
	All & Fair	3%	2%	3%	1%
	All & Good	25%	15%	17%	10%
Fantasy and Make Believe:	*None & Poor*	9%	13%	19%	26%
	None & Fair	1%	2%	3%	5%
	None & Good	0%	1%	1%	1%
	Few & Poor	7%	7%	7%	8%
	Few & Fair	25%	32%	26%	29%
	Few & Good	6%	7%	5%	5%
	Most & Poor	1%	1%	1%	0%
	Most & Fair	13%	11%	11%	9%
	Most & Good	14%	11%	11%	9%
	All & Poor	1%	0%	0%	0%
	All & Fair	3%	2%	2%	1%
	All & Good	20%	12%	14%	8%
Outdoor Equipment:	*None & Poor*	10%	13%	23%	28%
	None & Fair	1%	2%	3%	5%
	None & Good	0%	1%	1%	1%
	Few & Poor	7%	8%	7%	7%
	Few & Fair	24%	33%	25%	28%
	Few & Good	7%	8%	6%	6%
	Most & Poor	1%	1%	1%	0%
	Most & Fair	12%	10%	9%	7%
	Most & Good	15%	13%	11%	8%
	All & Poor	1%	0%	0%	0%
	All & Fair	3%	1%	2%	1%
	All & Good	20%	10%	13%	7%

Factors underlying the Equipment Index (continued)

Furniture:	*None & Poor*	4%	6%	10%	14%
	None & Fair	1%	2%	2%	3%
	None & Good	0%	1%	0%	1%
	Few & Poor	6%	6%	8%	9%
	Few & Fair	21%	28%	26%	32%
	Few & Good	5%	7%	6%	6%
	Most & Poor	1%	1%	1%	1%
	Most & Fair	14%	14%	12%	10%
	Most & Good	17%	17%	14%	11%
	All & Poor	1%	0%	0%	0%
	All & Fair	4%	2%	3%	1%
	All & Good	28%	17%	19%	11%
Nature Poster:	*No*	41%	44%	53%	62%
	Yes	59%	56%	47%	38%
Colour Poster:	*No*	9%	15%	18%	28%
	Yes	91%	85%	82%	72%
Fridge:	*No*	21%	33%	36%	43%
	Yes	79%	67%	64%	57%
Food Garden:	*No*	54%	49%	77%	82%
	Yes	46%	51%	23%	18%

Source: 2013 ECD Audit.

Table 18: Factors underlying the Human Resource Index

		Full	Conditional	Applied	Not Applied
Qualification:	*<Gr 12*	42%	40%	42%	47%
	Gr 12	41%	48%	42%	41%
	ABET	8%	7%	7%	5%
	Diploma	3%	2%	4%	3%
	Other	4%	3%	4%	3%
	Degree	1%	0%	1%	1%
ECD Specialisation:	*None*	54%	55%	71%	80%
	Certificate	29%	24%	16%	10%
	Diploma	5%	5%	3%	2%
	Degree	1%	0%	1%	0%
	Other	12%	15%	10%	7%
Training attending in past 24 months:	*No*	54%	62%	62%	74%
	Yes	46%	38%	38%	26%
Nature of Appointment:	*Other*	2%	1%	1%	1%
	Temporary	7%	6%	7%	7%
	Substitute	0%	0%	0%	1%
	Contract	6%	8%	5%	5%
	Permanent	86%	85%	87%	86%
National Child Protection Clearance:	*No*	67%	74%	75%	89%
	Yes	33%	26%	25%	11%

Source: 2013 ECD Audit.

Table 19: Percentage of ECD centres that comply with the registration criteria

	Registered:		Not Registered:	
	Fully	*Conditionally*	*Applied*	*Not Applied*
Total Number of Children Enrolled	455 654	100 219	140 424	111 429
Equipment:				
Fridge to keep food cool	77%	66%	62%	55%
Fire extinguishers - 1 per 200 m^2	72%	64%	56%	43%
First Aid kit	79%	76%	66%	52%
Governance:				
Staff member trained in First Aid	57%	44%	49%	36%
Health Clearance Certificate	56%	49%	34%	20%
Emergency Action Plan	60%	50%	52%	36%
A Clearance Certificate for each staff member that proves their name does not appear in the National Sex Offenders Register	28%	23%	22%	10%
Submitted an Implementation Plan	86%	83%	60%	24%
Have been Inspected by DSD	92%	92%	72%	43%
Staff Job Descriptions	78%	77%	64%	47%
Daily Programme	85%	84%	69%	59%
Menu	84%	81%	62%	53%
Accident File	76%	77%	64%	49%
Infrastructure:				
Indoor Play Area is at least 1.5 m^2 per child	39%	44%	33%	33%
Indoor Play Area has windows which can open	80%	70%	76%	74%
Outdoor Play Area is at least 2 m^2 per child	37%	32%	32%	31%
Outdoor Play Area is free of hazardous surfaces	100%	100%	100%	100%
Toilet Facilities: Enough Potties/Buckets	69%	69%	78%	81%
Toilet Facilities: Enough Toilets	85%	83%	87%	87%
Toilet Facilities: Separate Nappy Changing Facility	46%	45%	43%	32%
Kitchen: Separate area to prepare food	85%	84%	75%	71%
Kitchen: Hygienic, clean, safe	85%	83%	76%	71%
Outside Premises Enclosed by a Fence	84%	82%	76%	74%

Source: 2013 ECD Audit. **Notes**: These items are all listed as requirements for registering as an ECD centre according to the National Norms and Standards for ECD programmes and the National Norms and Standards for Partial Care Facilities.

Table 20: Multinomial regression models predicting the likelihood of becoming a registered ECD centre

	(A)		(B)		(C)		(D)		(E)	
Conditionally Registered										
Fridge to keep food cool	0.52	***	0.91		0.91		1.14		0.99	
Fire extinguishers - 1 per 200 m^2	1.14		1.12		1.17		1.22		1.40	**
First Aid kit	1.12		1.26		1.22		1.26		1.26	
Staff member trained in First Aid	0.73	***	0.83		0.91		0.89		0.90	
Health Clearance Certificate	0.99		0.95		0.96		1.02		0.99	
Emergency Action Plan	0.79	**	0.76	**	0.76	**	0.80	*	0.75	**
Staff Clearance Certificate	1.11		1.63	***	1.63	***	1.60	**	1.67	**
Submitted an Implementation Plan	0.86		0.76		0.76		0.79		0.71	*
Have been Inspected by DSD	1.15		0.93		1.13		1.15		1.07	
Staff Job Descriptions	1.23		1.02		1.11		1.23		1.34	*
Daily Programme	0.78		0.92		0.90		0.85		0.81	
Menu	0.85		0.80		0.89		0.85		0.90	
Accident File	1.08		0.85		0.89		0.99		0.86	
Outdoor Play Area is at least 2 m^2 per child	0.76	**	0.90		1.03		1.05		0.84	
Indoor Play Area is at least 1.5 m^2 per child	1.07		0.98		1.17		1.04		0.90	
Toilet Facilities: Enough Toilets	0.76	*	0.94		0.89		0.89		0.92	
Toilet Facilities: Enough Potties	0.89		1.03		1.00		0.97		0.90	
Indoor Play Area has windows which can open	0.70	***	0.99		0.99		1.14		1.25	
Toilet Facilities: Separate Nappy Changing Facility	1.04		1.06		0.97		1.03		1.06	
Kitchen: Separate area to prepare food	1.05		0.95		0.89		0.88		0.84	
Kitchen: Hygienic & clean	1.05		0.95		0.98		0.97		0.90	
Outside Premises Enclosed by a Fence	1.82	***	1.46	**	1.43	*	1.62	**	1.80	**
Eastern Cape			0.39	***	0.29	***	0.24	***	0.24	***
Free State			3.03	***	2.51	***	2.29	***	2.12	**
Gauteng			0.38	***	0.28	***	0.24	***	0.24	***
KwaZulu-Natal			0.40	***	0.25	***	0.21	***	0.20	***
Limpopo			2.94	***	2.14	***	1.92	**	2.01	*
Mpumalanga			1.63		1.11		0.97		1.06	
North West			1.60		1.17		0.88		1.00	
Northern Cape			0.10	**	0.10	**	0.10	**	0.11	*
Rural			3.78	***	2.92	***	2.92	***	2.48	***
Constant	0.57		0.15	***	0.23	***	0.15	***	0.08	

Multinomial Regression (continued): Centres that are not registered but have applied

	(A)		(B)		(C)		(D)		(E)	
Not Registered: Applied										
Fridge to keep food cool	0.75	**	0.54	***	0.54	***	0.57	***	0.58	***
Fire extinguishers - 1 per 200 m^2	0.84		0.61	***	0.59	***	0.63	***	0.75	*
First Aid kit	1.02		1.04		0.96		1.02		0.98	
Staff member trained in First Aid	1.20	*	0.96		1.00		1.06		1.01	
Health Clearance Certificate	0.56	***	0.36	***	0.39	***	0.39	***	0.43	***
Emergency Action Plan	1.38	***	1.22		1.21		1.27	*	1.06	
Staff Clearance Certificate	0.92		0.86		0.85		1.00		1.17	
Submitted an Implementation Plan	0.32	***	0.36	***	0.36	***	0.39	***	0.39	***
Have been Inspected by DSD	0.28	***	0.30	***	0.33	***	0.33	***	0.35	***
Staff Job Descriptions	0.98		0.99		0.96		1.06		1.08	
Daily Programme	0.46	***	0.48	***	0.44	***	0.50	***	0.57	***
Menu	0.53	***	0.60	***	0.63	***	0.66	**	0.68	**
Accident File	1.17		1.25	*	1.30	*	1.39	**	1.46	**
Outdoor Play Area is at least 2 m^2 per child	0.99		0.93		0.98		0.99		0.92	
Indoor Play Area is at least 1.5 m^2 per child	0.60	***	0.69	***	0.74	**	0.76	**	0.64	**
Toilet Facilities: Enough Toilets	1.21		1.17		1.30		1.36	*	1.30	
Toilet Facilities: Enough Potties	1.46	***	1.25	*	1.25	*	1.15		0.91	
Indoor Play Area has windows which can open	0.98		1.13		1.07		1.11		0.98	
Toilet Facilities: Separate Nappy Changing Facility	1.03		0.90		0.79	**	0.83	*	0.84	
Kitchen: Separate area to prepare food	0.92		0.86		0.80		0.82		0.90	
Kitchen: Hygienic, clean, safe	0.95		0.87		0.84		0.82		0.80	
Outside Premises Enclosed by a Fence	0.73	**	0.68	***	0.65	***	0.71	**	0.81	
Eastern Cape			0.17	***	0.20	***	0.20	***	0.23	***
Free State			0.17	***	0.20	***	0.20	***	0.23	***
Gauteng			0.90		0.90		0.81		0.70	*
KwaZulu-Natal			0.10	***	0.11	***	0.11	***	0.13	***
Limpopo			0.41	***	0.40	***	0.41	***	0.59	*
Mpumalanga			2.36	***	2.18	***	2.08	***	2.36	***
North West			0.41	***	0.41	***	0.33	***	0.38	***
Northern Cape			0.07	***	0.10	***	0.10	***	0.14	***
Rural			0.54	***	0.61	***	0.59	***	0.70	*
Constant	16.12	***	90.92	***	90.92	***	46.53	***	60.34	**

Multinomial Regression (continued): Centres that are not registered and have not applied

	(A)		(B)		(C)		(D)		(E)	
Not Registered: Not Applied										
Fridge to keep food cool	0.55	***	0.53	***	0.55	***	0.54	***	0.50	***
Fire extinguishers - 1 per 200 m^2	0.88		0.70	**	0.75	*	0.75	*	0.83	
First Aid kit	0.90		0.97		0.88		0.94		1.00	
Staff member trained in First Aid	1.15		0.94		0.98		1.04		1.04	
Health Clearance Certificate	0.51	***	0.27	***	0.30	***	0.29	***	0.30	***
Emergency Action Plan	0.91		0.93		0.98		0.98		0.82	
Staff Clearance Certificate	0.81		0.90		0.92		1.16		1.39	
Submitted an Implementation Plan	0.13	***	0.16	***	0.15	***	0.15	***	0.16	***
Have been Inspected by DSD	0.16	***	0.18	***	0.20	***	0.20	***	0.21	***
Staff Job Descriptions	0.82		0.80		0.84		0.89		0.96	
Daily Programme	0.41	***	0.44	***	0.44	***	0.50	***	0.54	***
Menu	0.52	***	0.41	***	0.46	***	0.47	***	0.49	***
Accident File	0.97		0.96		1.01		1.03		1.17	
Outdoor Play Area is at least 2 m^2 per child	0.96		0.95		1.01		1.05		1.02	
Indoor Play Area is at least 1.5 m^2 per child	0.84		0.79	*	0.84		0.91		0.69	*
Toilet Facilities: Enough Toilets	0.94		1.02		1.06		1.16		1.17	
Toilet Facilities: Enough Potties	1.40	***	1.19		1.13		1.08		0.79	
Indoor Play Area has open windows	0.96		0.98		0.99		0.95		0.85	
Toilet Facilities: Separate Nappy Changing Facility	0.98		0.96		0.84		0.83		0.83	
Kitchen: Separate area	1.23		1.23		1.21		1.14		1.25	
Kitchen: Hygienic	1.00		0.85		0.81		0.79		0.75	
Outside Premises Enclosed by a Fence	1.01		0.76	*	0.75	*	0.77		0.67	*
Eastern Cape			0.73		0.90		1.00		0.99	
Free State			0.44	***	0.59		0.63		0.67	
Gauteng			8.67	***	8.76	***	8.33	***	5.64	***
KwaZulu-Natal			0.28	***	0.31	***	0.34	***	0.36	**
Limpopo			2.75	***	2.66	***	2.94	***	3.53	***
Mpumalanga			10.70	***	9.78	***	10.07	***	8.58	***
North West			8.00	***	8.25	***	7.69	***	7.54	***
Northern Cape			0.00	***	0.00	***	0.00	***	0.00	***
Rural			0.77		0.84		0.90		1.06	
Constant	50.91	***	53.52	***	47.47	***	29.67	***	84.12	***
Observations	4090		4052		3540		3440		3113	
Pseudo R^2	0.18		0.29		0.30		0.31		0.33	
Log Pseudolikelihood	-4210		-3590		-3185		-3048		-2666	
Income					X		X		X	
Indices							X		X	
All other possible factors									X	

Chapter 4

Analysing schools performing above expectations using three constructed datasets

4.1. Introduction

A commonly accepted fact in the Economics of Education literature is that the educational outcomes of the affluent are better than those of the poor. As a result, high academic achievement in poor schools is an unusual phenomenon not only in South Africa but across developing and developed countries alike. Notwithstanding, some poor schools are delivering outcomes that are above expectations, given the home backgrounds of learners, their living conditions and levels of schooling resources. Using the same terminology as Hoadley and Galant (2015), these schools are referred to as "schools which perform above their demographic expectation'.[67] This study examines poor schools in South Africa that are managing to overcome their socio-economic disadvantage, by considering the following research questions: (1) How many schools are there in South Africa that perform at an acceptable level and how accessible are they to the greater majority of poor learners? (2) What are the benefits for a poor learner of attending a Quintile 1 – 3 school that performs at an acceptable level? (3) Which factors contribute to the outcomes in these above-average, poor schools? This study therefore contributes to a growing literature on school effectiveness in South Africa and developing countries more broadly.

Large disparities in the quality of education in South African have significant implications for both the acquisition of cognitive skills and future labour market success given strong, convex returns to education (Van der Berg, 2010). It is not just educational attainment but particularly school choice that is vitally important in the South African context (Coetzee, 2014; Taylor and Yu, 2009). Given the country's divided past of institutionalised racial (and as a consequence class) separation (Habib et al., 2015), large parts of the population still live in geographic clusters characterised by either affluence or poverty. The characteristics of neighbourhood schools in these clusters mainly reflect their surroundings, with low-quality schools serving poor communities and high-quality schools serving affluent communities (Yamauchi, 2004). The learning gaps that result from this division are already established by Grade 4 and largely mirror the pattern of university exemptions by Grade 12. It is argued that a learner's future access to university, and subsequently to the formal labour market, is largely determined by Grade 4 (Van

[67] Initially this study focused on high-performing poor schools, but it was disheartening to realise that the incidence of these schools is too small. To obtain a large enough sample, expectations had to be lowered and the definition was changed to consider schools that merely perform at a level above the average of schools with similar demographics.

der Berg, 2015). Inequities in access to quality schooling augment current labour market inequalities, impeding on future opportunities already by early grades. The intergenerational consequences of this vicious cycle are devastating and demand an alternative strategy.

The consequences of school choice for learners from disadvantaged backgrounds have long-term implications for life trajectories. Two sets of research confirm that when poor learners attend high-income, high-quality schools this has significant impacts on learning as they gain up to a full additional year's worth of learning (Coetzee, 2014; Shepherd, 2016). As the exception, more motivated parents who have accessed resources may opt to send their children to more expensive, better-performing schools in higher-income neighbourhoods. However, the demand for these schools is high, barriers to admission are significant, and the location of these schools makes them inaccessible for learners who reside in poorer areas. Owing to the relatively small number of these schools[68], as well as their inaccessibility to poor learners, enrolling considerably more poor learners in these schools is not feasible as an approach to addressing systemic inequalities in learning. More effort is required to disrupt systemic dysfunctionality among the majority of poorer schools in order to provide increased learning opportunities for their communities.

In South Africa a few Quintile 1 - 3 schools[69] are managing to overcome their socio-economic disadvantage, following a better trajectory. Using a unique dataset compiled from the 2012 – 2014 Universal ANAs, the 2013 Verification-ANA and the 2011 School Monitoring Survey (SMS), this chapter goes beyond a qualitative study of a handful of these schools and instead places these schools in a national context. This chapter tackles three overarching research questions related to the learning opportunities poor schools[70] provide their learners as mentioned above. In answering these research questions, I first consider how many Quintile 1 – 3 schools are performing above the demographic expectation, examining their spatial distribution across the country and their proximity to poor learners. Secondly, I estimate the learning gains of attending a poor school that is performing above expectation using the value-added approach, mostly following the methodology of Andrabi et al. (2009) and the application of the methodology to the South African context by Coetzee (2014). Finally, I examine the school-level factors and parameters that are associated with 'higher' school performance among poor schools.

[68] In 2014 there were 1 294 (9%) primary schools classified as Quintile 5 schools and they served 13% of the Grade 1 – 6 population.
[69] South African schools are classified according to the average socio-economic status of the communities in which they are situated. Quintile 5 schools are situated in affluent areas and are generally well-functioning schools. Quintile 1 – 3 schools serve the lowest-income communities and are generally poorly-performing schools.
[P]Poor schools comprise Quintile 1 – 3 schools.

4.2. Above expectation, poor schools

The bimodal distribution of learner performance in South Africa is a social regularity that has been proven using a wide variety of datasets. Various authors have shown that two largely distinct educational systems are functioning within the South African context and that the bimodality can be expressed as a function of school language, wealth quintile, geographic location or the historical administrative system under which the school operated (Bhorat & Oosthuizen, 2009; Fleisch & Christie, 2004; Spaull, 2013; Taylor, 2011; Van der Berg, 2008). Bimodality in school quality is a reflection of the 'two nations in one country' notion, one nation that is affluent and has access to high-quality services and the other (the majority of the population) poor and largely deprived of quality services (Mbeki, 1998).

This clear distinction in school quality originates from the separate administrative systems under which schools had to function during the Apartheid era and, more specifically, the unequal resource allocation linked to these administration systems. Since the advent of democracy, massive strides have been made in ensuring a more equitable distribution of funding to previously disadvantaged schools (Fiske and Ladd, 2004; Van der Berg, 2009). Despite significant redistributive transfers in the post-Apartheid era, the administrative system under which schools were controlled remains one of the main determinants of a school's overall performance, even two decades after the abolition of these systems. Van der Berg (2008) describes these two groups of schools as functioning under "separate data generating processes", thereby proposing that two unique sets of parameters drive the performance in these two systems.

A number of studies has focussed on determining whether a learner's future outcomes are affected by attending a higher performing school. Internationally, studies from Ghana (Ajayi, 2014), Malawi (De Hoop, 2010), Romania (Pop-Eleches and Urquiola, 2013) and Trinidad and Tobago (Jackson, 2010) have found positive effects of learners attending higher performing schools due to selective admission. Studies in Kenya (Lucas and Mbiti, 2014), the United Kingdom (Clark, 2010) and the United States (Abdulkadiroglu, et al., 2014), however, find very limited effects of attending private or elite high schools.

In the South African context two studies have been conducted to estbalish the benefits of attanding former advantaged schools, of which both studies found a robust positive effect (Coetzee, 2014; Shepherd, 2016). It is, however, recognised that transferring all poorer performing learners to better performing schools is not a sustainable solution and therefore much of the policy focus in South Africa has been on improving the weaker performing schools rather.

The unresponsiveness of educational outcomes in previously disadvantaged schools to increased resource inputs has given rise to a wide range of literature on how effectively schools can convert resources into learner academic achievement. The research conducted over the past two decades unequivocally agrees that resources on their own will not necessarily lead to improved learner performance, but that the ability to utilise these resources efficiently is the key to learner academic improvement. Economists refer to a school's ability to convert resources into outputs as 'school efficiency'. Pioneering this research in South Africa, Crouch and Mabogoane (1998) show that even after statistically controlling for resources, 30% of the performance of schools remains unexplained. More specifically, they showed that after controlling for resources, poor learners in poor schools perform significantly worse than their peers in rich schools. Using the rich SACMEQ III dataset, Van der Berg (2008:153) concludes that more resources have not nessasarily improved learner outcomes, but that "resources mattered only conditionally". Using decomposition techniques, Shepherd (2013) also finds that 19% of the test score gap between English or Afrikaans schools and African Language schools remains unexplained after controlling for learner, household and school characteristics, and ascribes this portion of the test score gap to school efficiency.

The issue researchers now face is to determine those factors that are required to achieve school efficiency. Crouch and Mabogoane (1998:4) ascribe their unexplained 'residuals' broadly to 'managerial factors'. Gustafsson (2007) shows that the correct allocation of teaching and management time is beneficial to learner performance. All things held equal, he shows that more teaching time is related to better test scores, but that less teaching time (and therefore more time managing) for the principal is associated with better learner performance. He also shows that certain teaching methodologies have a positive impact on learner scores, regardless of the number of years of training a teacher has received. Using the National School Effectiveness Study, Taylor (2011) found that an organised learning environment, proxied through evidence of curriculum planning, a functional timetable, low teacher absenteeism, up-to-date assessment records, quality inventories of LTSM, the effective coverage of curriculum and the completion of exercises, positively contributed to learner performance. Teacher quality and administration-related resources that add to more effective managerial functioning were also important factors in determining school performance (measured in Grade 12 pass rates) (Bhorat and Oosthuizen, 2009).

Most of the school effectiveness studies conducted in South Africa have disaggregated schools by whether they were previously disadvantaged or not. These methods of disaggregation cluster all previously disadvantaged schools together, assuming that the same data-generating process determines school outcomes among these schools. This assumption precludes differentiation

between higher-performing and low-performing previously disadvantaged schools. A sample of poor schools, however, manages to some extent to overcome socio-economic disadvantage and produce higher learner outcomes. Understanding the mechanisms and parameters that allow these schools to translate their resource inputs into academic achievement efficiently, could be key in assisting and supporting other low-income schools overcome their socio-economic disadvantage.

International literature on high-performing, high-poverty schools originates mostly from the charter school literature in the United States (Angrist et al., 2013; Dobbie and Fryer, 2011; Hanushek et al., 2007), and mostly focusses on the debate as to whether these schools are more effective than public schools. A few studies that are more qualitative in nature focusses specifically on the factors associated with high-poverty, high-performing schools. Common characteristics emerging from these studies include strong leadership, high-quality teachers, a strong focus on instruction and regular learner assessment (Carter, 2000; Kannapel et al., 2005; McGee, 2004; Scheerens, 2013). In developing countries, studies additionally focus on the role of low-fee private schools in providing better schooling in low-resourced contexts (Andrabi et al., 2009; Lucas and Mbiti, 2014; Muralidharan and Kremer, 2006; Muralidharan and Sundararaman, 2013). However, there is a gap in the literature with regard to examining the success drivers of higher-performing, poor schools in the developing country context.

A few qualitative studies in South Africa have compared small samples of relatively better - performing schools with relatively worse-performing schools. Similar to the international literature, strong instructional leadership and increased instructional time are shown to be important characteristics in well-functioning schools (Fleisch and Christie, 2004; Taylor et al., 2013a). The Ministerial Report on 'Schools that work' broadly found that more motivated schools with dedicated staff and busy learners generally performed better in the National Senior Certificate (Christie et al., 2007). Hoadley et al. (2009) posit that the role of the School Governing Bodies (SGB) as a supporting agent to the school leadership contributes positively to learner performance, and also found curriculum coverage and management of LTSM to be strong predictors of school performance. Furthermore, in-depth interviews in six schools that performed above the average in systemic tests revealed that higher-performing schools are associated with "more complex division of labour and stronger classification of roles, professional forms of solidarity, epistemic authority and stronger framing over order and reproduction" (Hoadley and Galant, 2015:21).

4.3. Data and Methodology

The population-based nature of the ANAs allows for the identification of schools that perform above the demographic expectation. As alluded to earlier, these schools are more the exception than the rule, which means that a study of this nature can easily run into sample size problems. Using the ANAs it is possible to identify all above-average, poor schools in South Africa and investigate their spatial distribution. This dataset also allows the identification of these schools in some other school-based surveys through the standardised unique identifier for each school (EMIS number). This study will exploit this distinct feature of the ANAs to answer the research questions set out above in the introduction of this chapter.

The ANAs were conducted from 2011 until 2015, but the most comprehensive data is available for the years 2012 – 2014. Although the validity of the ANAs as a 'standardised' test of learner performance is compromised by the lack of inter-temporal and inter-grade comparability, the ANA results are still very valuable as a mechanism for comparing sub-groups within grades and years (Van der Berg, 2015). More specifically, the ANAs allow the comparison of performance between learners who receive schooling of varying levels of quality. Furthermore, for the purpose of identifying all the well-performing poor schools in the system and determining the accessibility of these schools, working with a population-based dataset is imperative. This chapter exploits these unique features afforded by the ANAs by comparing the performance of learners in well-performing Quintile 1 to 3 schools with the performance of learners in weaker-performing Quintile 1 to 3 schools.

4.3.1. Data

The analysis in this chapter is based on three newly constructed datasets that comprise of the U-ANA results for the years 2012 – 2014, the 2013 V-ANA, and the 2011 SMS. The first dataset is at school level and tracks the average performance of schools on the U-ANAs from 2012 to 2014. This dataset is primarily used to identify above-average poor schools. The second dataset follows learners over the three-year period using the 2012 and 2014 U-ANA data and 2013 V-ANA data. This learner-level panel allows for a more rigorous analysis of the value add of an above-average school. The final dataset matches the 2012 U-ANA school-level results to the 2011 SMS, which provides the opportunity to examine the relationship of certain school administrative practices on average school performance.

2013 Verification Annual National Assessment Panel

V-ANA is a sub-sample of the 2013 U-ANA and was conducted in just over 2 052 schools (Deloitte, 2013). The V-ANA was administered by an external service provider and entailed the same

learner assessments as in the 2013 U-ANA, but included a learner background questionnaire, a teacher questionnaire and a principal questionnaire. Unlike U-ANA (administered and marked by teachers), V-ANA learner assessments were marked by an external service provider so that measurement error resulting from teacher-level, school-level or district-level cheating in terms of marking was not present in these test scores.

The first section of this study specifically tracks the Grade 2 cohort of learners in 2012 through to Grade 3 in 2013 and Grade 4 in 2014. This cohort was chosen specifically as it allows the use of the learner background information collected in the V-ANA for Grade 3 learners in 2013. A further advantage to tracking this specific cohort of learners is that Grades 2 - 4 are quite critical years in a learner's school career. First the Foundation Phase, as it is aptly named, establishes the foundational numeracy and language skills that learners require for them to thrive in the grades that follow. For example, during the Foundation Phase, learners are taught how to read. From Grade 4 onwards, the curriculum assumes that learners have mastered this skill and can now use it to learn additional content and skills through the use of textbooks and other resources. Second, for the majority of Grade 3s a significant language of instruction shift takes place as they enter Grade 4. School language policy allows most learners to be taught in their home language (HL) up to the end of Grade 3 but, from Grade 4 onwards, learners are taught in either English or Afrikaans. This language transition has significant learning consequences for African mother tongue learners,[71] particularly if they were not adequately prepared to read fluently and form meaning in English during the foundation phase. Tracking the 2012 Grade 2 cohort will therefore provide the opportunity to investigate learners' performance through this transition.

Unfortunately, no standardised unique identifier exists for each learner in the ANA data across the three years. Learners were therefore matched using their date of birth, their school EMIS number, their names and their surnames. The risk in matching learners using this information is false matches, and therefore every effort was made to limit the risk of this occurring. It was evident that relaxing the EMIS number requirement resulted in a too high percentage of false matches, so that it was only possible to follow learners within a school. Ideally one would like to examine learner performance *across* schools, but identifying school switchers is not yet possible. A total of 21 070 Grade 3 learners from 812 schools participated in the 2013 V-ANA. Of these learners, only 18 619 learners had information available on their date of birth (a matching requirement). Some 13 924 of these learners could be matched to the 2012 U-ANA, and 15 511 could be matched to the 2014 U-ANA. However, only 8 304 learners (39%) could be matched across all three years. Finally, only 6 360 learners (30%) were matched to the school panel that

[71] Taylor and Von Fintel (2016) found that 827 745 learners in 9 180 primary schools represent the population where the challenge of English as second language is the language of instruction.

identifies schools as either well performing or weaker performing. Successful matches were lower than expected. Matching problems largely originated from entire schools not being matched across the years, rather than specific learners not being matched. While this could present a concern for the estimations that follow, matched and non-matched schools do not differ significantly in terms of the performance of the learners who could not be matched across all three years.[72]

A further advantage of working with the V-ANA dataset is that it contains information on household assets from learner questionnaires. This information enables the construction of an asset index with which to rank learners from poor to wealthy. Where the focus of this chapter is specifically on the benefit of attending an above-average school for poor learners, the asset index is critical in differentiating between the poor and more affluent. Learners are defined as poor if their index falls below the 60th percentile of the national asset index distribution.

Table 23 in 4.6 Chapter Appendix shows the correlations between learners' mathematics scores across the three grades, and the correlation between their mathematics and language scores in each grade. From Grade 4 onwards, learners have the choice of taking either English as Home Language (HL) or English as First Additional Language (EFAL). Given that the target population in this study is made up of the poorest 60% of learners and that the majority of these learners opt for EFAL, correlations between mathematics and EFAL are shown. The Grade 3 scores are sourced from the V-ANA assessments, which were externally marked, and should therefore be a more reliable indication of the true scores learners would have obtained without any cheating. Comparing the inter-subject correlations within Grade 2 (0.64) and Grade 4 (0.60) with the inter-subject correlation in Grade 3 (0.71), it is evident that the inter-subject correlation is slightly lower, but still of a magnitude that does not raise too many concerns.

Universal Annual National Assessment Panel

This dataset is used to identify the above-average, poor schools and is compiled using the 2012 to 2014 Universal ANA data collapsed to school level. Only schools that offered Grades 1 to 6 were included since the focus of this chapter is on primary schooling specifically. Across the three years, performance data is available and could be matched for 17 139 of the 21 191 primary schools listed in the 2013 Quarter 4 Masterlist dataset. Although the number of primary schools in the Masterlist dataset is not necessarily the correct number, it helps to gain a sense of the number of schools for which complete data is not available. It is not possible to know the performance levels of those schools that did not opt to write ANAs at all, but there is no

[72] The difference in performance between the schools that were matched and those that were not matched is not statistically significantly different when looking at the 2013 results. On average, the schools not matched performed only slightly worse on their 2014 results.

remarkable difference in the performance of the schools for which data was missing in one or two of the years.

It is necessary to note some of the limitations to identifying well-performing schools. The ANA assessments are administered and marked by the teachers of the learners who take the assessments. This method compromises the reliability of the ANA scores, since teachers have ample opportunity to game the system either by providing learners with the answers while they are writing or by marking much more leniently than an external marker would have. The intention of having 'standardised' tests at the primary level has been to obtain information on how learners are currently performing in these grades in relation to what is expected of them through the curriculum. Until 2011 no national data had been available on learner performance in the Foundation Phase and the ANAs have therefore made a positive contribution to understanding the dynamics of South African primary schooling. Although the ANA results are not used for promotion or salary determinations nor have any punitive consequences linked to them, the information revealed through these assessments (how learners are performing relative to their peers in other schools and provinces) has placed some pressure on teachers to show improved results. The very act of measuring learners' learning therefore might introduce perverse incentives to inflate learner results. The extremely low levels of monitoring throughout the ANA process mean that cheating can happen anywhere during the process, from learner-level cheating, through to class-level, grade-level, school-level or even district-level cheating.

These falsely inflated numbers pose the risk of some schools falsely presenting themselves as well-performing schools. To mitigate some of the risk of obtaining a false positive in the sample, the identifying strategy specifies that schools must reach a certain benchmark consistently over the three-year period. Although this does not completely rule out the likelihood of obtaining a false positive, it will filter out the majority of outliers. The correlations shown in table 24 in 4.6 Chapter Appendix provide some indication of the credibility of the sample in each of the provinces included in this study. As shown in Van der Berg (2015), the Grade 3 and Grade 6 ANA results in the Western Cape are highly correlated with the Western Cape Systemic Evaluations,[73] and can therefore be deemed credible. For this reason, it is useful to compare the correlations in each of the provinces to the Western Cape correlations. When considering the intra-grade correlations, most provinces compare quite well with the Western Cape. In Grade 4 the correlations decrease slightly, but this is largely due to the language transition and the fact that the language teacher most likely differs from the mathematics teacher in this grade. The inter-grade correlations are

[73] The Western Cape Systemic Evaluations are standardised assessments written by all Grade 3, 6 and 9 learners in the Western Cape. These evaluations are externally marked and the process of administering the assessments is much more regulated than the ANA assessment administration process.

significantly weaker (see table 25 in 4.6 Chapter Appendix). Nationally the correlations for consecutive years are around 0.47; in the Western Cape they range from 0.65 to 0.71, whereas the correlations in Mpumalanga range from 0.34 to 0.37. In Gauteng and the Free State, the correlations are more in line with the national average.

2011 School Monitoring Survey

The SMS was conducted in the fourth term in 2011 and entailed the collection of administrative data on 2 005 schools across the country. The purpose of the survey was to monitor the progress schools had made in realising the goals set out in the DBE's "Action Plan to 2014" (DBE, 2013b). A random sample of schools was selected in such a way that the findings would be nationally representative. The survey entailed the administration of various questionnaires, structured interviews, school observation instruments and document review forms. For the purposes of this study, only primary schools were included and the main focus was on the principal and teacher questionnaires, and the document analysis form.

4.3.2. Methodology: Defining an 'above average' school

Deriving a quantifiable definition of a high-performing school is quite complex and can be rather abstract. Is a high-performance school one that on average performs just as well as a Quintile 5 school? Or is it rather a school that performs among the top performing schools in the country? In this chapter two definitions are used to identify those schools that perform better than their peers. The definitions are constructed using a composite measure of school performance, based on the performance of learners in both numeracy and literacy. It is worth noting here that, although the schools perform better than their peers, they still perform far below the international average. That these schools are 'high-performing' is therefore not correct: at best these schools can be referred to as performing above demographic expectations. Here they will sometimes be referred to as schools performing "at an acceptable level".

In order to arrive at a single indicator of school performance that is based on the individual learner performance in the school, the learner numeracy and literacy scores were averaged for each grade to create an average literacy and numeracy score per grade, and then averaged to arrive at a composite measure of performance per grade. Finally, these scores were averaged across the grades to create a final composite measure of school performance. This approach in this way gives equal weight to both numeracy and literacy, and to each grade within a school.

The classification of schools as above-average schools is based on this overall composite measure of school performance. In order to work with a comparable group of weakly performing schools, these schools are defined as those that consistently perform among the bottom 60% of all Quintile

1 - 3 schools. Two different definitions of an above-average school are used to compare the difference in learner performance between those attending an above-average school and a weakly performing school. These are provided below.

1. **Schools that consistently perform at least at the level of the TIMSS low international benchmark**

   Van der Berg (2015) relates the ANA results to the TIMSS low international benchmark by using the white and Indian population groups (which are typically wealthier than black South Africans and accessed better-quality schools during apartheid). Learners from these population groups who are of an appropriate age are used as a comparison group. These population groups performed roughly at the 2011 TIMSS international average, which is about 1 standard deviation above the TIMSS low international benchmark. Using these learners as the reference group, it is possible to define Quintile 1 – 3 schools as performing at the low international benchmark if they perform 1 standard deviation below the average performance of white and Indian learners who are of the appropriate age.[74]

2. **Schools that consistently perform among the top 25% of all Quintile 1 - 3 schools, excluding small schools**

   This definition only considers the relative ranking among Quintile 1 - 3 schools. By construction, schools that perform among the top 25% are performing consistently better than their peers. This definition, however, results in a large number of small schools (defined as having fewer than 250 learners in total in the school) included in the definition. The concern with very small schools is that they are likely to have multi-grade classrooms and might therefore have very different parameters that drive the school process. As a sensitivity check of the first definition, this definition is constructed to exclude all schools with fewer than 250 learners.

Table 21 contains the sample sizes in each of the datasets and the number of schools that are classified as above average under each of the definitions. In total 1 055 Quintile 1 – 3 schools performed consistently among the top 25% of all Quintile 1 – 3 schools, whereas only 737 schools managed to perform at least at the low international benchmark level. A total of 92 of the top 25% schools, and 64 of the above average schools were sampled in the 2011 SMS, and 21 top 25% schools, and 11 low international benchmark schools were sampled in the 2013 V-ANA dataset. The sample sizes in the V-ANA dataset are quite small, but working at the learner level provides

[74] For a more in-depth description on this definition, please refer to Van der Berg (2015).

one with more variation. Given the sample sizes, learners in the top 25% of Quintile 1 – 3 schools will be used as the main group of interest in this study.

Table 21: Sample size per school performance category, for each dataset used

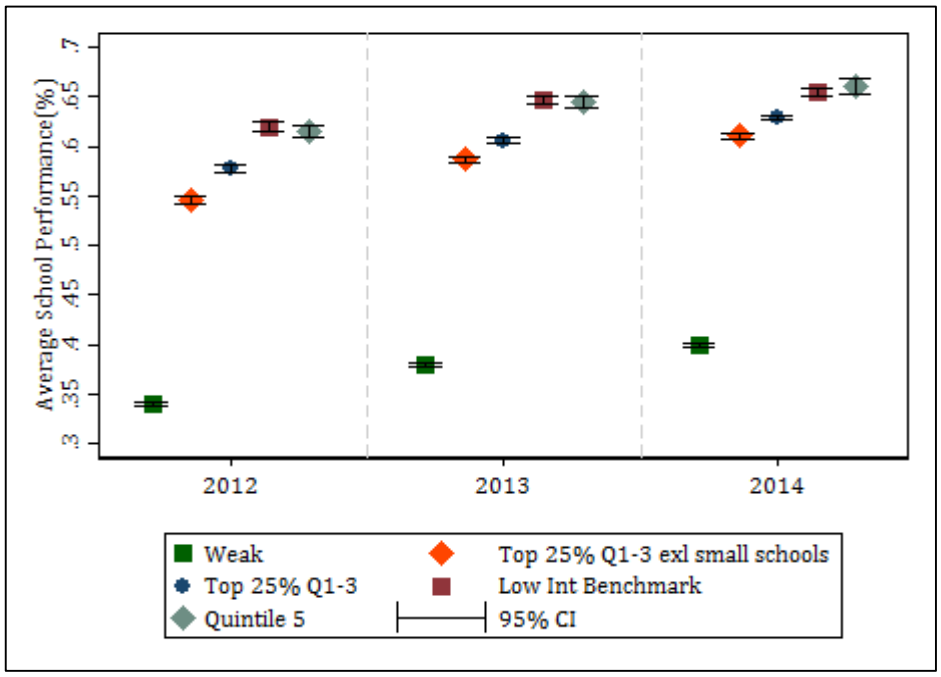
	All Primary Schools	Bottom 60%	Top 25% excl. Small Schools	Low Int. Benchmark	Quintile 5
ANA School Panel	16 949	9 164	1 055	737	1 105
School Monitoring Survey	1 366	1 125	92	64	118
V-ANA Panel - Schools	454	135	21	11	62
V-ANA Panel - Learners	8 304	2 469	535	200	1 210

Source: U-ANA 2012 – 2014, 2013 V-ANA, 2011 School Monitoring Survey. **Notes**: For the SMS dataset and the V-ANA dataset, only the schools that could be matched to the ANA school panel are included.

Figure 24 compares the average school performance across the three years using each of the definitions. This confirms that schools classified under each of these definitions perform significantly better than their weaker-performing peers. Figure 24 also provides a sense of how these schools fare relative to Quintile 5 schools. Furthermore, an additional definition is included to examine the result of including very small schools among the top 25% of schools. As expected, the exclusion of very small schools decreases the average performance of the top 25% of schools, but with a difference of only 1 to 2 percentage points. The average performance of the schools that are classified as performing at the low international benchmark does not differ statistically from the average performance of Quintile 5 schools. In the interpretation of figure 24 it is necessary to note that the reference group for the TIMSS low international benchmark group is specifically white and Indian learners of the appropriate age, and not Quintile 5 schools. The average Quintile 5 school's performance is bound to be lower than the average of the reference group, given a more diverse learner population attending these schools. The similarity in performance between Quintile 5 schools, and the low international benchmark schools are to be expected.

The language policy in South African schools allows an SGB to determine the Language of Learning and Teaching (LoLT) in the school. More often than not, a school's LoLT will be similar to the HL of the majority of the learners who attend the school. This language then serves as the HL taught in the Foundation Phase, as well as the language in which the learners are assessed in the ANAs. From Grade 4 onwards a school has a choice as to whether learners will be taught in English or in Afrikaans. Given this rather complex language system, this chapter focuses on the *mathematics* performance of learners.

Figure 24: Overall school performance by performance category



Source: U-ANA 2012 – 2014, Grades 1 – 6. **Notes**: Average school performance is calculated by averaging literacy and numeracy scores per learner, over grade and finally averaging per school.

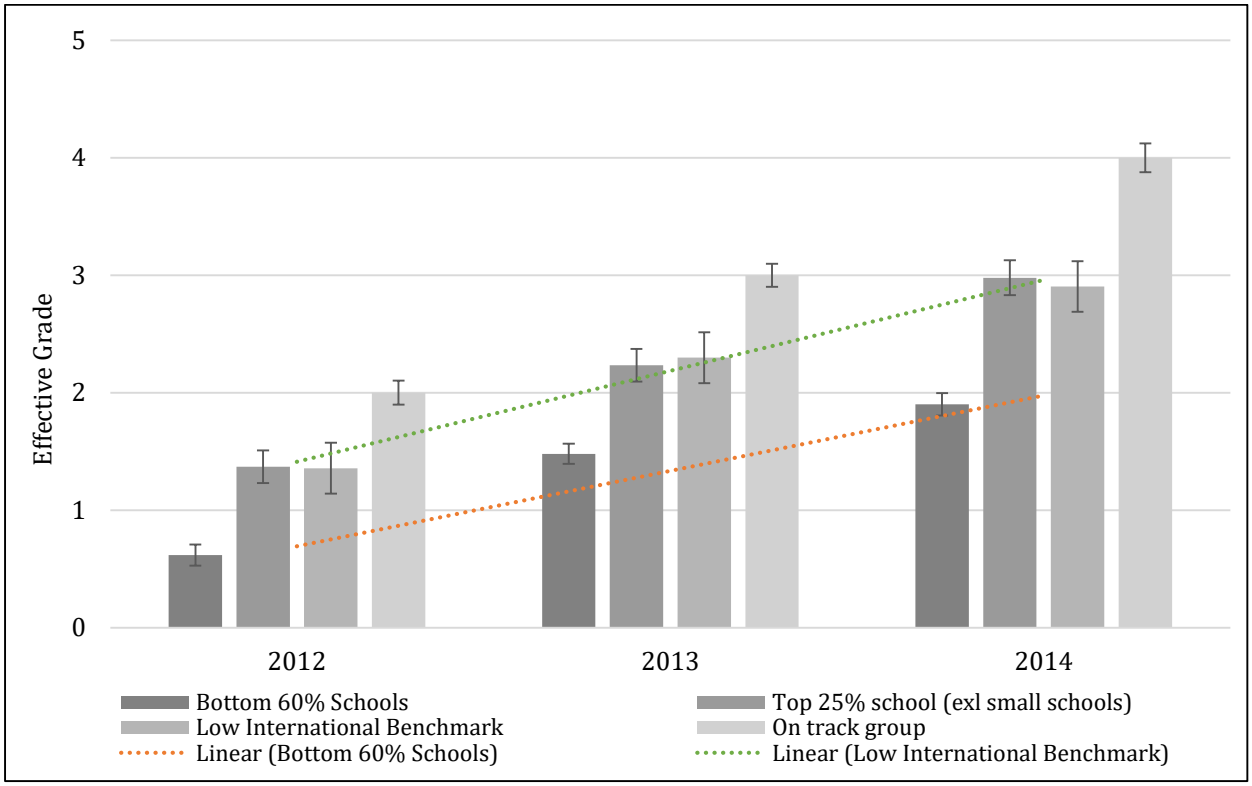
The study focus is limited to the poorest 60% of learners in South Africa; the part of the learner population whose educational access is typically confined to attending lower-quality schools. Figure 28 in 4.6 Chapter Appendix provides a graphical representation of the performance distribution of the poorest 60% of learners who attend a weakly performing Quintile 1-3 school, a Quintile 1 – 3 school that performs at the TIMSS low international benchmark or a Quintile 5 school. It is clear from these graphs that the distribution of the poorest 60% of learners' numeracy scores in schools that perform at the TIMSS low international benchmark are clearly higher than for poor learners in weaker-performing Quintile 1 – 3 schools, and quite similar to the scores of poor learners in Quintile 5 schools. These graphs also seem to suggest that the learning gaps between the poorest 60% of learners who attend the different types of schools might be expanding over the time period.

To explore the possibility that learners in weaker schools are falling further behind their peers in better-performing schools during these critical years, learning trajectories were constructed. Figure 25 shows the learning trajectories for the poorest 60% of learners (hereafter called "the poor" of "poor learners") from Grade 2 (2012) through to Grade 4 (2014). These learning trajectories were computed using the same methodology as Spaull and Kotzé (2015), by assuming that a specific reference group was performing at the correct grade level. White and Indian learners of the appropriate age were used as the reference group in this chapter. The performance of the poorest 60% of learners in the different types of schools was then compared relative to the

reference group learners. Using the common assumption that 0.4 standard deviations relate to one year's worth of learning, the difference in average performance between the different groups of learners was converted to effective grades. This means that by assuming that white and Indian learners (who are of the appropriate age) perform at the grade-appropriate level (that is, Grade 2 in 2012), then learners who attended a school that was identified as a weakly performing school performed on average just less than one year behind their peers in better-performing schools and about a year-and-a-half behind the reference group of learners. By Grade 4, the learning gap had extended to being just over one year behind peers in better-performing schools, and over two years behind the reference group.

The results portrayed in these graphs are merely descriptive statistics. It is therefore not possible to conclude whether it is the type of school that is contributing to the performance of these learners or whether other confounding factors are contributing to the school performance. The value-added models that follow provide a better sense of the learning gains that can be attributed to the type of school.

Figure 25: Learning trajectories of poor learners



Source: 2013 V-ANA, 2012 & 2014 U-ANA. **Notes**: 'Different quality schools' refers to the top 25% schools (excl. small schools) and schools performing at the TIMSS low international benchmark. Learners are tracked through from Grade 2 to Grade 4 from 2012 until 2014. White and Indian learners who are of an appropriate age are assumed to perform at the correct grade level, and therefore serve as the on track group. Poor learners refer to the 60% poorest learners.

4.3.3. Methodology: Estimation framework

The three questions that this study seeks to answer are:

1. How many above-average, poor schools are there in South Africa and how accessible are they to the greater majority of learners?
2. What are the benefits for a poor learner of attending an above-average Quintile 1 – 3 school?
3. Which factors contribute to the success of these above-average, poor schools?

Three different approaches are taken and each question addressed separately. Answering question one is a matter of identifying above-average, poor schools and determining the number of learners they serve in each province. To quantify the learning gains among poor learners, this study makes use of the value-added model methodology followed by Coetzee (2014) and Andrabi et al. (2009) in identifying the learning gains of previously disadvantaged learners who are attending above-average, poor schools. Once the treatment effect of attending an above-average, poor school has been quantified, a second set of models is run to determine which school-level factors are strong predictors of this treatment effect.

4.3.3.1. Value-added framework

The value-added framework finds its roots in the standard education production function approach, which relates present learner achievement to all past and present inputs. Todd and Wolpin (2003) provide a comprehensive explanation of the value-added estimation framework and the assumptions made in using this model, whereas Andrabi et al. (2009) provide an in-depth discussion on the issues of bias inherent in this model. In this section I provide a brief summary of the model, how it relates to the data it is being applied to, and the parameters of interest.

Estimating the traditional education production function is problematic since many of the previous inputs or endowments are unobservable and therefore impossible to control for. Omitting any of these unobservable inputs, however, will lead to biased estimates of the treatment variable. To demonstrate this, I start with a simple model of an education production function:

$$y_{it}^{*} = \alpha_1 x_{it} + \alpha_2 x_{i,t-1} + \cdots + \alpha_t x_{i1} + \delta T_{it} + \sum_{s=1}^{s=t} \theta_{t+1,s} \mu_{is}, \qquad (1)$$

where true learner achievement (y_{it}^{*}) of learner i in time t is a function of all present and past inputs ($\overline{\boldsymbol{x}}_i$), and cumulative productivity shocks to learning summed as μ_{is}. Since the focus of this chapter is to determine the added benefit of attending a well-performing Quintile 1 – 3 school, a treatment dummy (T_{it}) is included to capture the effect of attending a better-performing school.

The value-added strategy circumvents the problem of unobserved past inputs by including a lagged test score as a 'catch-all' variable. The intuition behind including a previous test score is that it captures the contribution of all previous inputs to learner achievement, learner ability and any previous productivity shocks. Following Andrabi et al. (2009), the lagged test score can be incorporated into equation (1) by adding and subtracting the lagged test score ($\beta y_{i,t-1}$), normalising θ_1 to unity and assuming that the coefficient β and θ are geometrically decreasing:[75]

$$y_{it}^{*} = \alpha \bar{\boldsymbol{x}}_{it} + \beta y_{i,t-1}^{*} + \delta T_{it} + \mu_{it} \qquad (2)$$

In equation (2), α is referred to as the 'input parameter' and β as the 'persistence parameter' as it links previous achievement to present achievement. The following discussion focuses on estimating δ, the treatment effect, and considers possible limitations in estimating this effect.

Andrabi et al. (2009) argue that estimating β and α (and by default then also δ) using pooled Ordinary Least Squares (OLS) is problematic because two opposing biases at work: unobserved, heterogeneous learning ability (η_i) and measurement error (ε_{it}). Unobserved, heterogeneous learner ability refers to how certain learners learn faster than others, which influences the value-added model continuously in each period. Where $\mathrm{Cov}(y_{i,t-1}^{*}, \mu_{it},) > 0$, β will be biased upwards. The second avenue through which bias will influence the persistence and input parameters is that of the inherent measurement error in the test scores. Let $y_{it} = y_{it}^{*} + \varepsilon_{it}$ represent observed learner test scores, then equation (2) becomes:

$$y_{it} = \alpha \bar{\boldsymbol{x}}_{it} + \beta y_{i,t-1} + \delta T_{it} + \left(\eta_i + \nu_{it} + \varepsilon_{it} - \beta \varepsilon_{i,t-1}\right) \qquad (3)$$

The persistence parameter will therefore be biased upwards due to the influence of the ability bias, but biased downwards as a result of measurement error. Andrabi et al. (2009) highlight that this bias will only cancel out if $Cov\left(\eta_i, y_{i,t-1}^{*}\right) = \sigma_{\varepsilon}^{2}\beta$. Furthermore, they show that controlling only for measurement error without taking into account the ability bias may leave one even further from the true estimates. Their estimates show that controlling for measurement error, without controlling for the ability bias, leads to upwardly biased estimates of the persistence parameter, but downwardly biased estimates of the input parameter.

The purpose of this study is to quantify the coefficient on the treatment variable (δ), drawing on the methodology by Coetzee (2014) and focussing on the influence of these biases on estimating δ, rather than estimating β.[76] To estimate δ, $\alpha \bar{\boldsymbol{x}}_{it}$ is assumed to be zero to simplify the equations.

[75] That is, $\alpha_j = \beta \alpha_{j-1}$ and $\theta_j = \beta \theta_{j-1}$ for all j

[76] For a more in-depth explanation of the influence of ability bias and measurement error on the persistence parameter, please refer to Andrabi et al. (2009).

Taking into consideration that β is biased and therefore $\hat{\beta} \neq \beta$, equation (3) becomes:

$$y_{it} = (\beta - \hat{\beta})y_{i,t-1} + \delta T_{it} + (\eta_i + \nu_{it} + \varepsilon_{it} - \beta\varepsilon_{i,t-1})$$

$$= \beta y_{i,t-1} + \delta T_{it} + (\eta_i + \nu_{it} + \varepsilon_{it} - \beta\varepsilon_{i,t-1} - \hat{\beta}y_{i,t-1})$$

The bias in the persistence parameter now forms part of the error term. The bias influencing the treatment coefficient can be illustrated as follows:

$$plim\hat{\delta}_{OLS} = \frac{cov(y_{it}, T_{it})}{var(T_{it})}$$

$$= \frac{cov(\beta y_{i,t-1} + \delta T_{it} + (\eta_i + \nu_{it} + \varepsilon_{it} - \beta\varepsilon_{i,t-1} - \hat{\beta}y_{i,t-1}), T_{it})}{var(T_{it})}$$

$$= \delta + (\beta - \hat{\beta})\frac{cov(y_{i,t-1}, T_{it})}{\theta_T^2} + \frac{cov(\eta_i, T_{it})}{\theta_T^2} + \frac{cov(\varepsilon_{i,t}, T_{it})}{\theta_T^2} - \beta\frac{cov(\varepsilon_{i,t-1}, T_{it})}{\theta_T^2} \quad (4)$$

From equation (4), it is evident that the coefficient on the treatment variable can be biased through four different interactions: first, through lagged test scores being positively correlated with school treatment; secondly, through learner ability; thirdly, through measurement error in test scores in time *t*; and, lastly, through measurement error in the lagged test score variable (*t-1*).

Considering the V-ANA panel and the manner in which the treatment variables were constructed, each of these terms may affect δ. Since the treatment variables were constructed by making use of the 2012 to 2014 ANA results, there might be some correlation between the lagged test scores and the treatment effect. However, the treatment variables are constructed using test scores for both subjects, averaged across the grades and then averaged by school. To prevent any potential correlation between the treatment variable and the outcome variable as a result of the construction of the definitions, the test scores of the relevant years (Grade 2 in 2012, Grade 3 in 2013 and Grade 4 in 2014) were excluded in the construction of the treatment variables. However, depending on whether $\beta > \hat{\beta}$ or $\beta < \hat{\beta}$, the term $(\beta - \hat{\beta})\frac{cov(y_{i,t-1}, T_{it})}{\theta_T^2}$ could be positive or negative and, subsequently, the direction of the bias could be either upwards or downwards. To control for any potential correlation stemming from the construction of the treatment variables, the value-added models are run by including treatment variables that were constructed by excluding the test scores of the cohort of interest.

The bias introduced through learner ability presents more of a serious concern than other sources of bias, as it is expected that learners with higher unobserved ability are more likely to self-select into better-performing schools. This may be due to higher ability learners being more

likely to be from homes in which they receive more support and whose parents are more willing to invest in their education, regardless of their financial constraints. Another reason might include high performing schools screening the learners they accept based on previous performance. Notwithstanding, it is therefore expected that δ will be upwardly biased due to a positive selection bias. This bias is addressed through an instrumental variable approach, by exploiting historical spatial inequalities in the location of different race groups and schools. Restricting the sample to include only schools in urban areas ensures that only learners with a certain level of ability are compared. This is based on the rationale that poorer learners that live in urban areas come from households where their family members have decided to migrate in search of better opportunities. There is also reason to believe that learners in urban areas have more exposure to information and are relatively more stimulated cognitively than their rural peers. The number of above-average schools in a fifteen kilometre radius around the current school is used as an instrument to establish whether or not a learner attended an above-average school. The logic of this instrument lies in the increased probability of learners attending a type of school of which there is a larger number. The validity of this instrument is discussed in the results section (Section 4.4).

The final bias is introduced through measurement error in both the test score in time *t* and *t-1*. Given the nature of the ANA assessments and the risk of teachers cheating, it is plausible that there will be measurement error in both the test scores and that the measurement error is serially correlated over time. However, it is possible to argue that, given the construction of the treatment variable (which excludes the 2012 Grade 2, 2013 Grade 3 and 2014 Grade 4 scores), the correlation between treatment and measurement error in learner *i*'s Grade 3 or Grade 4 mathematics score will be negligibly small. This argument, however, becomes less credible if there is reason to believe that cheating is happening at a school or district level. To control for this, the models are run on a sub-sample of schools whose data is deemed to be more credible. On the basis of the relatively higher credibility of the Western Cape scores, and the correlations shown in table 25 in 4.6 Chapter Appendix, this sub-sample comprises schools in the Western Cape, Gauteng and the Free State. To control for any measurement error that could originate from random guessing, the language test scores are used to instrument for the lagged test score.

4.3.3.2. Examining the factors that predict the treatment effect

Once the effect of attending a well-performing Quintile 1 – 3 school has been established, it is necessary to determine which factors contribute to the success of these schools. To this end, it is possible to draw on information collected from principals and teachers in both the V-ANA dataset and in the 2011 SMS. Unfortunately, not enough overlap was found in schools that participated in

both the surveys, which means that two different models would have to be run on the two distinctly different datasets.

The process of determining the factors that contribute to school success involves two steps. First, standard OLS regressions are run to predict overall school performance using the information from the 2011 SMS. The covariates available in this dataset are grouped into six different categories, which are believed to be significant drivers in a school's overall performance. These categories are (1) general school characteristics, (2) accountability systems, (3) school governance, (4) school management, (5) teacher training and (6) provincial and district support. The summary statistics of all variables included under each of these themes are available in table 26 of the 4.6 Chapter Appendix.

The second set of models is used to interrogate the information gathered through the V-ANA surveys. As was undertaken with the SMS dataset, standard OLS regression is run on a set of covariates to predict Grade 3 mathematics performance. The covariates in these models are also grouped under five themes: principal and teacher characteristics, general school characteristics, teacher training, classroom practices and accountability systems**.** The summary statistics of the variables included under these themes are available in table 27 of 4.6 Chapter Appendix. A further modelling strategy is employed to explain the treatment effects specifically and entails a two-step school-fixed-effects model. The value-added model, including school fixed effects rather than the treatment dummy, functions as the first step. In this model, the coefficients for each school would be an indication of the efficiency of each school, after controlling for learner-level factors. The second step uses the coefficients obtained on each school-fixed-effect dummy in the first model as the outcome variable for a second school-level model.

4.4. Results

4.4.1. Access to above-average, poor schools

The first research question relates to the access the poorest 60% of learners have to above-average, no-fee schools. Using the school-level U-ANA panel dataset, table 22 identifies the number of better-performing schools in each province. Overall, 1 055 schools (excluding very small schools) performed consistently among the top 25% of Quintile 1 – 3 schools across all three years.[77] Only 737 Quintile 1 – 3 schools across the country managed to perform consistently at or above the low international benchmark in all three years. In the Eastern Cape only 176 Quintile 1- 3 schools provide their learners with an education that is at least at the low

[77] The average school performance for Quintile 1 – 3 schools that consistently performed among the top 25% is 53% in 2012, 57% in 2013 and 60% in 2014. For schools that consistently performed at the TIMSS low international benchmark level, the average school performance was 62% in 2012, 65% in 2013 and 65% in 2014.

international benchmark level. Stated differently, only 4% of Quintile 1 – 3 schools in the Eastern Cape provide learners with an education that is at least one standard deviation below the performance of the average white or Indian South African learner of the appropriate age. In North West, the picture is even more dire, with merely 6 of the 926 Quintile 1 - 3 schools managing to perform at the low international benchmark level. In Mpumalanga, the situation is not much better, with only 10 schools (or 1% of all Quintile 1 – 3 schools in the province) in the entire province being able to perform at the low international benchmark level.

Figure 29 in 4.6 Chapter Appendix provides a map to illustrate the spatial distribution of these schools. Overall, it is evident that only 5% of all Quintile 1 – 3 schools in South Africa, serving only 4% of the learner population in Quintile 1 – 3 schools, manage to perform at an acceptable level. These schools merely manage to perform at a basically acceptable level of service delivery, providing their learners with only an entry level of academic proficiency. It is a sobering thought that nearly all of the poor learners in South Africa are deprived of affordable, good-quality schools and as a result the opportunity for these learners to enter the formal labour market eventually is compromised.

Table 22: Spatial distribution of well-performing schools

	Total Number of Schools			**Top 25% of Q1-3 – excl. small schools**		**Low Int. Benchmark**		**Poor Learners**	
	All Schools	*Q 5 schools*	*Q1-3 Schools*	*Number*	*%*	*Number*	*%*	*Number*	*%*
Full Sample	17 021	1 341	13 978	1 055	8%	737	5%	5 811	42%
Eastern Cape	4 376	80	4 170	138	3%	176	4%	1 722	41%
Free State	812	59	686	100	15%	69	10%	178	26%
Gauteng	1 500	402	729	238	33%	59	8%	171	23%
KwaZulu-Natal	4 055	295	3 371	466	14%	319	9%	1 012	30%
Limpopo	2 437	31	2 336	123	5%	42	2%	1 366	58%
Mpumalanga	1 219	101	939	60	6%	10	1%	547	58%
Northern Cape	369	53	267	25	9%	21	8%	143	54%
North West	1 020	11	931	24	3%	6	1%	545	59%
Western Cape	1 137	309	549	77	14%	35	6%	127	23%
Urban	5 311	1 098	3 232	521	16%	173	5%	1 211	37%
Rural	8 818	119	8 459	612	7%	518	6%	3 329	39%

Source: 2012 – 2014 U-ANA Data. **Notes**: Data includes only primary schools that participated in the ANAs in all three years, and that could be matched across all three years.

4.4.2. What is the benefit of attending an above-average, poor school?

For the purpose of this study, two groups of poor learners are compared to learners who attend a weakly performing Quintile 1 – 3 school: (1) learners who attend an above average Quintile 1 – 3 school and (2) learners who attend a Quintile 5 school. It is to be expected that these learners will differ on observable characteristics and table 28 in 4.6 Chapter Appendix summarises the main differences in the covariates of the different sub-samples. On average, the poorest 60% of

learners in above-average, poor schools are more likely to be in a school where the LoLT is the same as their HL, are more likely to have a mother with more than just primary education, are more likely to be from a slightly larger household, are less likely to have never gone to a community library to borrow books and are less likely to eat fewer than three meals a day. As expected, poor[78] learners in Quintile 5 schools are, on average, wealthier, have more constructive reading practices at home and are from significantly smaller households than their peers in high poverty, weakly performing schools. From these descriptive statistics, it appears that more unobserved differences, such as parent and learner motivation, drive poor learners to attend a Quintile 5 school than to attend an above-average Quintile 1 – 3 school.

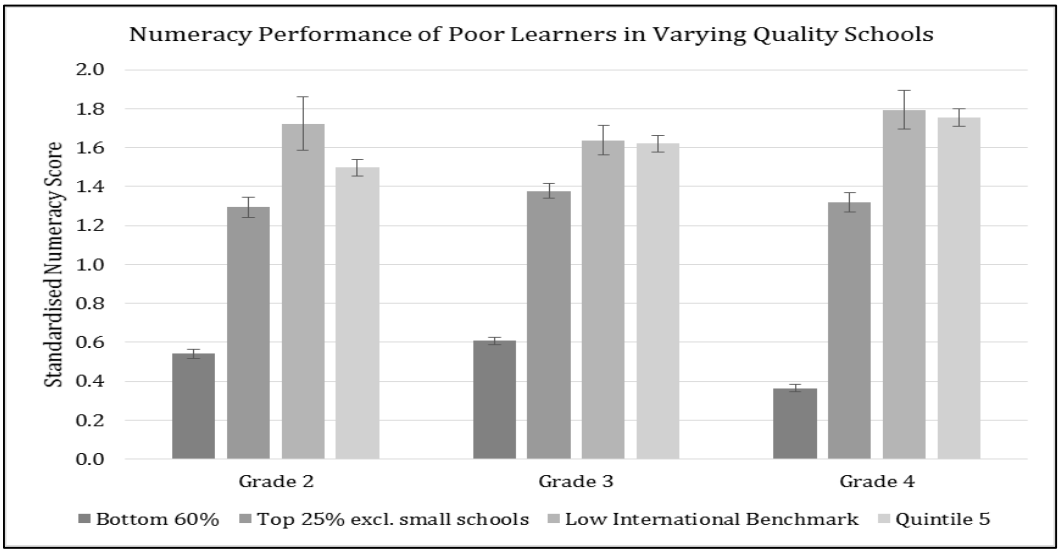
The mean unconditional test score differences for the poorest 60% of learners in each of the different school categories are shown in figure 26 below. The scores shown in the graph are the standardised numeracy scores for learners who were tracked from the 2012 U-ANAs to the 2013 V-ANA and the 2014 U-ANA. From this figure, it is evident that there is no significant difference in the Grade 3 numeracy scores among the poorest 60% of learners who went to the schools that were identified as above-average schools, but that they performed significantly better than their peers who went to weaker-performing schools. Comparing the differences in the unconditional means, learners in the top 25% of Quintile 1 – 3 schools perform 0.8 standard deviations better than their peers in weaker-performing schools in Grade 2, but this learning gap increased to 1 standard deviation in Grade 4. The differences in the mean unconditional test scores, however, do not control for any confounding factors. The rest of this section therefore attempts to establish a more credible estimate of the differences of attending more effective schools by making use of the methodology set out above.

The first value-added models, as specified in equation 2, are estimated by including a set of controls for learner characteristics, household characteristics and school-level characteristics. The purpose of this study is to estimate the learning gains of poor learners by attending more efficient schools; hence, the sample is restricted to include only the poorest 60% of learners. Three treatment variables were created to compare better- versus weaker- performing schools. The first treatment variable controls for schools that have been performing among the top 25% of schools, the second controls for schools that have performed at least at the low international benchmark and the final variable (more for comparative purposes) controls for Quintile 5 schools. Each of these variables was created with weaker-performing schools as the comparison group. Table 29 in 4.6 Chapter Appendix summarises the results for the baseline models and reports the coefficient on the treatment variables, and on the persistence parameter. Three

[78] Poor learners in this chapter refers to the poorest 60% of learners as determined through the asset index.

different models were run for each of the treatment variables: the first model (A) controlled only for learner characteristics, the second (B) includes household controls and the third (C) includes school-level controls. Including all the controls, the learning gains of attending a top 25% school were around 0.57 standard deviations, whereas learners in a school performing at the low international benchmark level showed gains of 0.8 standard deviations. Poor learners in Quintile 5 schools showed gains of 0.63 standard deviations. The coefficient on the persistence parameter ranges from 0.33 for the top 25% of schools to 0.37 for Quintile 5 schools.

Figure 26: Mean unconditional test scores[79]



Source: 2013 V-ANA; 2012 & 2014 U-ANA. **Notes**: Sample includes only Quintile 1 – 3 learners who could be matched across the three years. Mathematics scores were standardised to have a mean of zero and a standard deviation of one.

To interpret this measure, it is necessary to understand the context of the intervention, as well as the effect sizes that have been obtained in similar studies. In India, Muralidharan and Sundararaman (2013) found learning gains of 0.23 standard deviation for primary school learners who opted to attend a private school. In Pakistan, testing third grade learners, the effect of attending a private school was found to be 0.25 standard deviations each year of attending a private school (Andrabi et al., 2009). In Kenya, however, no significant effect was found at secondary school level for learners who chose to attend private schools. In South Africa, learning gains of attending a high-performing school were significantly higher. Comparing black South African learners attending former white schools (using National Systemic Evaluation data), Coetzee (2014) found gains of 0.5 standard deviation using mathematics scores and 0.7 standard

[79] When interpreting this graph, it is necessary to keep in mind that the reference group used to construct the low international benchmark group was only white and Indian learners of the appropriate age, and the reference group therefore consists of group of learners that performs better than the average wealthy learner. For this reason, it is possible for poor learners in the low international benchmark group to perform better than poor learners in Quintile 5 schools.

deviation using language scores, with Shepherd (2016) confirming these gains when comparing African HL learners in English or Afrikaans schools to their peers in African LoLT schools. The coefficients of the baseline models shown here are therefore relatively similar to other effect sizes identified in the South African context despite a very different dataset being used to those of Coetzee (2014) and Shepherd (2016).

4.4.2.1. Robustness checks

As discussed in the methodology, these estimates are most likely to be biased, but it is not clear whether the bias will be upwards or downwards. The first source of potential bias is introduced through the correlation between the lagged test scores and the treatment variable. To minimise any potential bias that may originate from this, the test scores of the grades of interest[80] were excluded in the construction of the treatment variables. The second source of bias originates from the construction of the dataset owing to the learners who could not be matched across all three years. During the matching process, it became evident that entire schools often did not take part in either of the ANA years and therefore learners in those schools could not be matched. Table 31 in 4.6 Chapter Appendix depicts the difference in covariates between the groups of learners who could not be matched across all three years and the learners who were matched. It is reassuring that there are no significant differences in the standardised test scores between the learners who were not matched and the learners who were included in the sample.[81] It is, however, evident that the learners who were not matched are from poorer backgrounds. To make sure that no bias was introduced as a result of the matching process, a probit model was run to predict a learner's probability of not being matched across all three years. From these estimates, inverse probability weights were constructed, which were then in turn used to re-estimate the basic models. The results are set out in table 30 in 4.6 Chapter Appendix, and show that both the coefficients on the persistence parameter remain consistent and that the coefficient on the treatment variable for the top 25% schools increases slightly, whereas the coefficient on the Quintile 5 schools decreases slightly.

The final robustness check is to address the argument by Andrabi et al. (2009) and accounts for heterogeneous learning ability and measurement error in test scores. Table 32 in 4.6 Chapter Appendix presents the treatment coefficients and the coefficients for the persistence parameter when controlling only for measurement error. It is clear that the coefficient on the treatment variable is supressed, whereas the coefficient on the persistence parameter is enhanced. Two different instruments for measurement error were experimented with: the first is the lagged

[80] Grade 2 in 2012, Grade 3 in 2013 and Grade 4 in 2014
[81] There is a significant difference in the English as Home Language test scores, but the sample size for home language tests scores is too small to make any credible deductions from the sample.

language test score (column A) and the second is the second lagged math score (column B). The correlation between the math and language test scores in one year is stronger than the correlation between the 2014 and 2012 math score, thereby rendering the lagged language score a more valid instrument. However, the likelihood that the same teacher might have marked the language test and the mathematics test within the same year is high. Hence, the lagged language test score as an instrument will only account for any measurement error that does not relate to teacher cheating. The 2014 and 2012 mathematics test would definitely have been marked by different teachers, which makes the second lagged mathematics test score a more credible instrument when controlling for teacher cheating. Using this instrument, it is necessary to bear in mind that the treatment effect will only be observed for the value-added in Grade 4, given that no data is available on the Grade 1 test scores in 2011. For this reason, normal OLS regressions, rather than pooled OLS regressions, are run for the value-added score in 2014 (and not the value-added in 2013 as well).

The last robustness check explores to what extent cheating is biasing the results, by restricting the sample to those provinces that seemed to have higher correlations in their test scores (i.e. Western Cape, Free State and Gauteng). Using this sample, it is evident from column C in table 32 that the coefficients for the top 25% of schools do not differ significantly from the basic OLS models, but that the coefficient on the treatment variable for the low international benchmark schools and the Quintile 5 schools is slightly higher. This is mostly driven by the number of Quintile 5 schools present in, especially, Western Cape and Gauteng and the overall higher performance associated with schools in these provinces.

Learner ability biases the coefficient on the treatment coefficient through two channels. The first channel is through the bias it causes in the persistence parameter due to higher-ability learners learning faster and retaining more information. The second channel is through its correlation with the treatment variable, in that higher-ability, or more motivated learners, will self-select into better-performing schools, because of either their own motivation or that of their parents or caregivers. To control for unobserved heterogeneity, the spatial distribution of schools, as well as the historical geographic clustering of people based on race, is exploited.

South Africa suffers from high income inequality, and there is a strong correlation between a person's income and the neighbourhood in which they live. Furthermore, large-scale urbanisation has taken place over the past 20 years, with rural inhabitants flocking to urban areas in search of better opportunities. Learners in urban areas are therefore expected to have higher levels of inherent ability, both because their parents or caregivers were motivated enough to migrate in search of better opportunities and because of the general resources and cognitive stimuli learners

are more likely to experience in urban areas. The sample is therefore restricted to include only the poorest 60% of learners who attend school in urban areas.

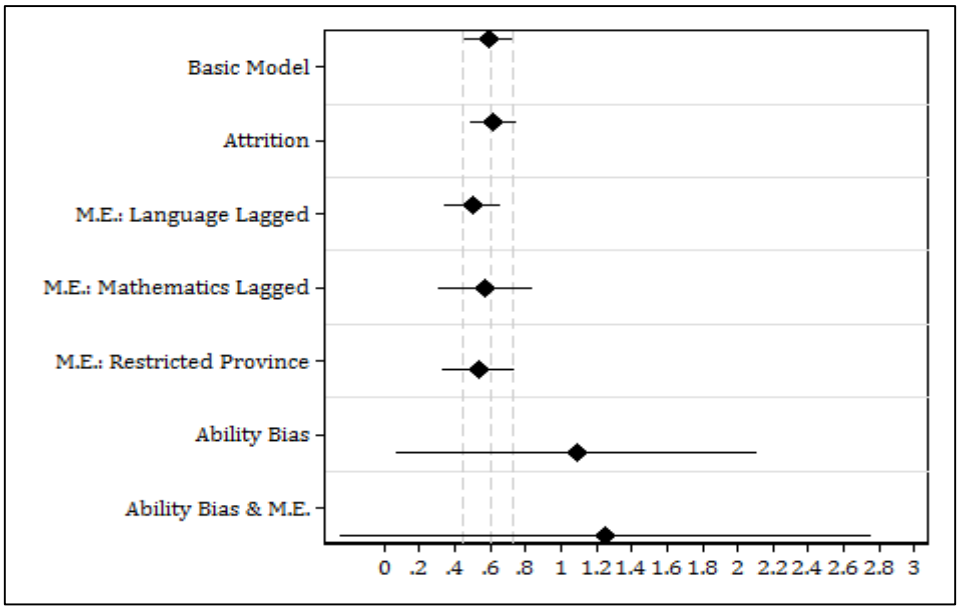
The homogeneity of this sample would mean that equally poor learners, who are from families who have already decided to migrate to the urban areas, will be compared with one another. To further control for the inherent ability that would lead learners (or their parents) to self-select into better-performing poor schools, the number of above-average poor schools in a fifteen kilometre radius around a particular school is used as an instrument for the treatment variable. This is based on the argument that the higher the number of above-average poor schools in an area, the higher the likelihood of a learner attending one of these schools. The number of above-average poor schools, however, will not be correlated to inherent ability since the sample is restricted in such a way that the comparison group is made up of learners who have been subject to similar stimuli by virtue of living in urban areas.

Table 33 presents the final models that control for both measurement error and ability bias. Results are shown for the top 25% of schools and the low international benchmark schools; however, results should be interpreted with caution where the sample of low international benchmarks schools is very small. Measurement error is taken into account by instrumenting the lagged mathematics score with the lagged language score. Ability bias is controlled for by restricting the sample to include only urban schools, and then instrumenting the treatment variable using the number of above-average poor schools in a 15 km radius around a school. Column A shows the results if only measurement error is controlled for in a sample restricted to urban areas. Compared to the results in table 29 the coefficient on the treatment variable varies minimally, but there is a large difference between the coefficients on the persistence parameter. Column B presents the results when only ability bias is controlled for, and shows a larger coefficient on the treatment variable and a smaller coefficient on the persistence parameter. When taking into account both sources of bias simultaneously (Column C), however, the coefficient on the persistence parameter and the coefficient on the treatment variables lose their significance. The high standard errors as well as the low F-statistics indicate that the instrument for the treatment variable is a weak instrument.

Figure 27 below visualises the change in the coefficient on the treatment variable of a poor learner attending a school that consistently performed among the top 25% of Quintile 1 – 3 schools, when the robustness checks are applied. It is clear that the coefficients are not statistically significantly different from the coefficients obtained in the basic value-added model but that once the instruments that control for ability bias are included, the variance in the coefficient becomes quite large. Figure 27 indicates therefore that the estimate from the basic

model is likely downwardly biased, but that it is not conclusive to what extent. It is, however, possible to conclude that the benefit of attending a top 25% Quintile 1 – 3 school is estimated to be around 0.6 standard deviations of learning for a learner in the poorest 60% of the population.

Figure 27: Coefficient plot of the learning gains of attending a top 25% school



Source: 2013 V-ANA, 2012 & 2014 U-ANA. **Notes**: Only the poorest 60% of learners are included in the sample. Shows the regression coefficients run in the previous models with standard errors clustered at the school level. 'M.E.' is an abbreviation for 'Measurement Error'.

4.4.3. Factors driving higher performance among poor schools?

The third research question relates to the factors that are driving the treatment effects observed in the previous section. The treatment variable encapsulates a smorgasbord of observable and unobservable school-level and teacher-level characteristics, after controlling for learner-level characteristics. Understanding what these factors are will provide some useful insight into the improvement of school efficiency among Quintile 1 – 3 schools. This research question is addressed by analysing two datasets: first, the 2011 SMS, merged with the 2012 U-ANA results, and, secondly, the same V-ANA panel dataset used in estimations of the value-added models.

4.4.3.1. Insights from the 2011 School Monitoring Survey

Table 34 displays the results of a normal OLS regression run on the average school performance on the 2012 U-ANA matched to the 2011 SMS (Column A). Explanatory variables were classified into six different categories namely: general school characteristics, accountability systems, school governance, school management, teacher training and provincial and district support. The nature of this dataset makes it difficult to control for any measurement error that might originate from teacher level or school level cheating. However, district fixed effects are included to capture any measurement error that might be driven from a district level (Column C).

General school characteristics include the school's location, wealth status, the department under which the school was administered before democracy, the size of the school and the learner-teacher ratio in the school. Most of these variables were included as basic controls, but the coefficients on the learner-teacher ratio and whether the school is a small school are reported. Small schools seem to perform significantly better than larger schools, but there is no significant association between the learner-teacher ratio and average school performance.

The second theme relates to accountability systems in place that ought to encourage better school performance. Using the accountability typology by Darling-Hammond (2004) reveals that at least three different accountability systems could potentially influence a South African school's performance. The first, most direct form of accountability is bureaucratic accountability from the district office. The more supervision and support a school receives from the district, the stronger its external accountability will be. To proxy for this form of accountability, two variables are included: (1) distance from the district office and (2) the number of visits by a district official. The second form of accountability is market accountability. The more competitive the market, i.e. the more schools there are in a specific area, the more choice learners have with regard to the school they would like to attend. Under these circumstances, principals and teachers may realise that they would need to improve their performance in order to attract parents and learners to their school.[82] The proxy for this form of accountability is the number of neighbouring schools within a 10 km radius from a school. The final form of accountability relates to professional accountability, where teachers and principals are regularly exposed to different, or new, practices, and have more exposure to the practices in better-functioning schools. To capture this form of accountability, the number of Quintile 5 schools in a 10 km radius is used as a proxy. Although some of these proxies do show some significance, none of them has an impact on overall school performance. When including the district fixed effects, the proxy for professional accountability has a negative effect on test scores. This might reflect that if there is a higher number of Quintile 5 schools in the area, it is likely that the higher-ability learners will find the means to attend these schools rather than the Quintile 1 – 3 schools in the sample.

The third theme relates to school governance and captures the influence of a functioning SGB, while the fourth theme encapsulates school management through the management of school finances and resources, and general school management ability. The number of functions a SGB fulfils is positively related to higher school performance. This is worth noting, given that merely having a general improvement plan has no significant association with school performance[83], but

[82] It is worth noting that in the South African context this is less likely to happen. Firstly, very little information is available to parents to guide their decision. Secondly, space in better performing schools are limited, so once the school is filled, learners will have to attend the weaker performing school.
[83] This is regardless of the content of the general improvement plan.

higher school performance is associated with whether a school has an academic improvement plan. Finally, schools where there was evidence of an LTSM asset register were also likely to be the higher-performing schools.

It is evident that the type of training a teacher attended throughout the year (the fifth theme) did not relate significantly with school performance.[84] The survey questionnaire asked teachers whether they participated in training that was self-initiated, initiated through the school or initiated externally through either the Department or a non-governmental organisation (NGO). Externally initiated training appeared to have had a positive effect on overall school performance before the district fixed effects were included. This suggests that there might be a positive district effect that goes beyond any possible cheating. More effective districts are likely to also drive more effective teacher training and this covariate might therefore be a proxy for district effectiveness.

The notion of provincial and district effectiveness is further explored as the final theme. First, general awareness of the learner allocation the school should be receiving that year, or have received the previous year, is positively associated with average school performance. Model A includes the four most crucial activities that subject advisors should fulfil in providing support and accountability functions. These activities are (1) checking a teacher's curriculum coverage, (2) checking a teacher's lesson planning, (3) giving a teacher advice on her teaching and (4) assisting the teacher with her content knowledge. Given the self-reported nature of these questions, it is necessary to note that these covariates merely capture the perception of the teacher and not necessarily the quality with which these functions are executed. The only function that is shown to have a positive impact on overall school performance is whether a subject advisor has checked a teacher's lesson planning. Two indices[85] were also compiled to capture the overall perception of district performance relative to the district's supporting function and its monitoring function. Even if the district fixed effects are included, the overall perception of teachers regarding whether they are being supported or just being monitored makes a significant impact. There was a positive correlation between school performance and the perception of teachers that they were being supported by their subject advisors. However, there was also a negative correlation between school performance and the perception of teachers that they were merely being monitored. This final finding reflects the phenomenon identified by Pritchett et al. (2013) of 'isomorphic mimicry', in which the district *appears* to be fulfilling its function of supporting

[84] Both whether a teacher attended training and the number of hours a teacher attended each type of training were tested; neither had a significant impact.

[85] Cronbach's alpha for the District Support Satisfaction Index is (0.88), whereas Cronbach's alpha for the District Monitoring index is (0.86)

teachers. However, when this support is merely a tick-box exercise which is perceived by teachers as monitor teachers it will actually have a negative effect on learner performance.

4.4.3.2. Insights from 2013 V-ANA

Using information from the principal and teacher questionnaires in the 2013 V-ANA data, the contribution of five different themes to school performance was analysed. These themes are (1) general principal and teacher characteristics, (2) general school characteristics, (3) teacher training activities, (4) accountability systems and (5) classroom practices. In the second model, the district support a principal stated to have received is expanded into more detail. Both models include basic learner-[86] and school-level[87] controls for which the coefficients are not reported. Covariates should be interpreted bearing in mind that the weighting of the 2013 V-ANA data is on the learner-level.

Table 35 presents the results of the 2013 V-ANA OLS models with the Grade 3 learner mathematics score being the outcome variable. Two different models were run for each outcomes variable: the first models (A and C) does not include controls for the number of visits that the district official made to a school to monitor certain aspect specifically, whereas the second models include these control (B and D). None of the principal and teacher characteristics seem to have a significant association with learner performance. With regard to school characteristics, higher school performance is associated with schools where the perception is that parents are supporting the school processes. Bearing in mind that teacher responses are self-reported, there is a significant positive relationship between schools that stated that all their teachers received training through the Department and that all their teachers have received in-service training through external service providers. The only classroom practice that is positively correlated to learner performance is whether a teacher marks her learners' homework at least once a week.

The final theme relates to the accountability and support systems in place to improve learner performance. The variables included under this theme follow the same logic as was used in the SMS models. The proxies included to account for bureaucratic accountability are whether a teacher's teaching was observed during the year by a district official, the school principal or a peer. The inclusion of the dummies for being observed by either the principal or a peer has no significant effect, but having been observed by a district official is positively associated with higher school performance. Similar to the SMS models, the number of Quintile 5 schools in a 10 km radius from the school is negatively related to school performance. The proxy for market

[86] Learner-level control are learner age, gender, household wealth, household size, race, mother education and whether their HL is similar to their LoLT.
[87] School-level controls are province, school wealth quintile, whether the school is in a rural location, and whether the school has fewer than 250 learners.

accountability (the number of neighbouring schools in a 10 km radius from the school) is positively associated with learner performance, which suggests that market accountability plays a significant role among Quintile 1 – 3 schools. Finally, an index was constructed to capture the overall satisfaction levels of principals with the support they are receiving from their district officials. Higher satisfaction ratings are positively associated with higher school performance, which affirms the importance of a school's feeling supported by its district officials (or more broadly by the DBE).

The second model focusses on the various areas in which district officials could support schools. Two functions are found to be related to higher school performance: first, the extent to which a school received support with EMIS-related activities, and, secondly, the extent to which the district officials organised training and support for the school management. The inclusion of the number of times a school was visited by a district official to fulfil the above mentioned activities does not nullify the effect of the satisfaction index, which reiterates the importance of schools' feeling supported by their district officials.

The final modelling strategy employed to determine those factors and parameters that are driving school performance among Quintile 1 – 3 schools entails a two-step process. First, the value-added models are re-run to include school fixed effects rather than a treatment dummy. The coefficients on each school dummy were then used as the outcome variable in the models mentioned above. The school fixed effects were included on the basic value-added model before any of the robustness checks are undertaken (the model depicted in table 29, column C). This model is chosen specifically, given its larger sample size. Moreover, the coefficients in this model are similar to the other studies conducted in South Africa, and the robustness checks did not invalidate the coefficients.

The intuition for this strategy, and therefore the benefit of using this strategy rather than the Grade 3 mathematics outcomes, is that the value-added models control for all previous learner inputs and therefore the coefficients on the school dummies are accounting for the efficiency with which schools are producing learner performance. Given that learner ability is already controlled for, it is expected that these results will differ from the results when predicting Grade 3 mathematics outcomes. The results of these models are shown in column C and D of table 35.

In predicting school efficiency among Quintile 1 – 3 schools, a principal's level of education is related to a higher school fixed effects coefficient (and therefore no numeracy learning gains). None of the school characteristics or classroom practices predicted a significant impact on the coefficients of the school fixed effects model. Similar to models A and B, there is a positive effect on learning gains in schools that stated that all their teachers had received training through the

Department and that all their teachers received in-service training through external service providers. Finally, bureaucratic accountability and support, proxied by whether a teacher was observed by a district official during the year, remained positively associated with school efficiency. Although the district support satisfaction index is not statistically significant, schools that received support with their EMIS activities showed higher learning gains.

4.5. Conclusion

School choice is of utmost importance for learners from poorer households. Attending a high-performing school could determine whether a learner will obtain university exemption at the end of their school career and subsequently whether they will gain access to the formal labour market (Van der Berg, 2015). Accessing previously advantaged schools, however, cannot be the only solution for learners escaping the poverty trap. In South Africa there are currently a few historically disadvantaged school that manage to overcome their socio-economic disadvantage to 'beat the odds'. These are the schools that have managed efficiently to convert the resources at their disposal to high learner achievement. Understanding the processes and factors that are drive the success in these schools could be key in motivating and supporting other high-poverty schools to achieve better performance.

This study set out to answer three research questions related to above-average poor schools in South Africa. First, it is evident that although a sample of Quintile 1 – 3 schools in South Africa are performing above expectations, the sample is very small and in some provinces the poorest 60% of learners have virtually no affordable schools that will provide them with adequate quality primary education. Secondly, it was found that poor learners could attain learning gains worth more than a year by attending one of these above average, poor schools.

The final question considered the common features associated with above-average poor schools and two main themes appeared to make a significant difference to learner performance in Quintile 1 – 3 schools. The first two features that emerged are school management and school governance. Having an academic improvement plan, having an LTSM asset register, knowing the learner allocation of the school both for the previous year and the current year, and having a functioning SGB are all related to high school performance. The underlying (mostly unobservable) feature that drives these factors is likely to be effective leadership, which confirms the findings of most qualitative studies both locally and internationally (Christie et al., 2007; Carter, 2000; Fleisch and Christie, 2004; Hoadley and Galant, 2015; Kannapel, et al., 2005).

The second major feature associated with school performance was effective accountability systems. Three different forms of accountability were investigated: bureaucratic accountability,

market accountability and professional accountability. Both bureaucratic accountability (through support from the district office) and market accountability (through the number of neighbouring schools in a 10 km radius from the school) are positively and significantly associated with learner performance. Importantly, bureaucratic accountability seems to be effective only if it is perceived to be of a supporting nature, rather than mere monitoring.

Some Quintile 1 – 3 schools are managing to overcome their socio-economic disadvantage to provide their learners with an entry level of academic proficiency. While this is not nearly at a level that can be referred to as 'high-performing', it is what is expected as basic service delivery. The small number of Quintile 1 – 3 schools that are performing at this mere basic level is disconcerting. However, despite the lack of physical or financial resources, these schools show that performance at this level is possible if a supportive bureaucratic accountability system is in place, strong leadership is present and the SGB is functioning effectively. These factors highlight the importance of placing strong and effective leaders in schools as well as in the district offices and makes the case for more stringent selection processes in the post-provisioning system.

4.6. Chapter Appendix

Table 23: Correlations in the V-ANA panel

	Grade 2	Grade 3	Grade 4	Language
Grade 2	1			0.6424
Grade 3	0.5298	1		0.7174
Grade 4	0.4738	0.5977	1	0.6005

Source: 2013 V-ANA, 2012 & 2014 U-ANA. **Notes**: Inter-grade correlations are shown for the mathematics scores. Intra-grade correlations are with home language (HL) scores in Gr 2 and Gr 3, and with First Additional Language (EFAL) scores in Gr 4.

Table 24: Intra-grade correlations of language and numeracy scores

	Grade 2	Grade 3	Grade 4: HL	Grade 4: FAL
Full Sample	0.719	0.758	0.669	0.753
Eastern Cape	0.651	0.661	0.605	0.679
Free State	0.711	0.774	0.728	0.868
Gauteng	0.812	0.845	0.662	0.717
KwaZulu-Natal	0.707	0.768	0.685	0.793
Limpopo	0.706	0.798	0.681	0.559
Mpumalanga	0.711	0.669	0.673	0.684
Northern Cape	0.774	0.866	0.658	0.788
North West	0.751	0.784	0.608	0.762
Western Cape	0.819	0.871	0.574	0.838

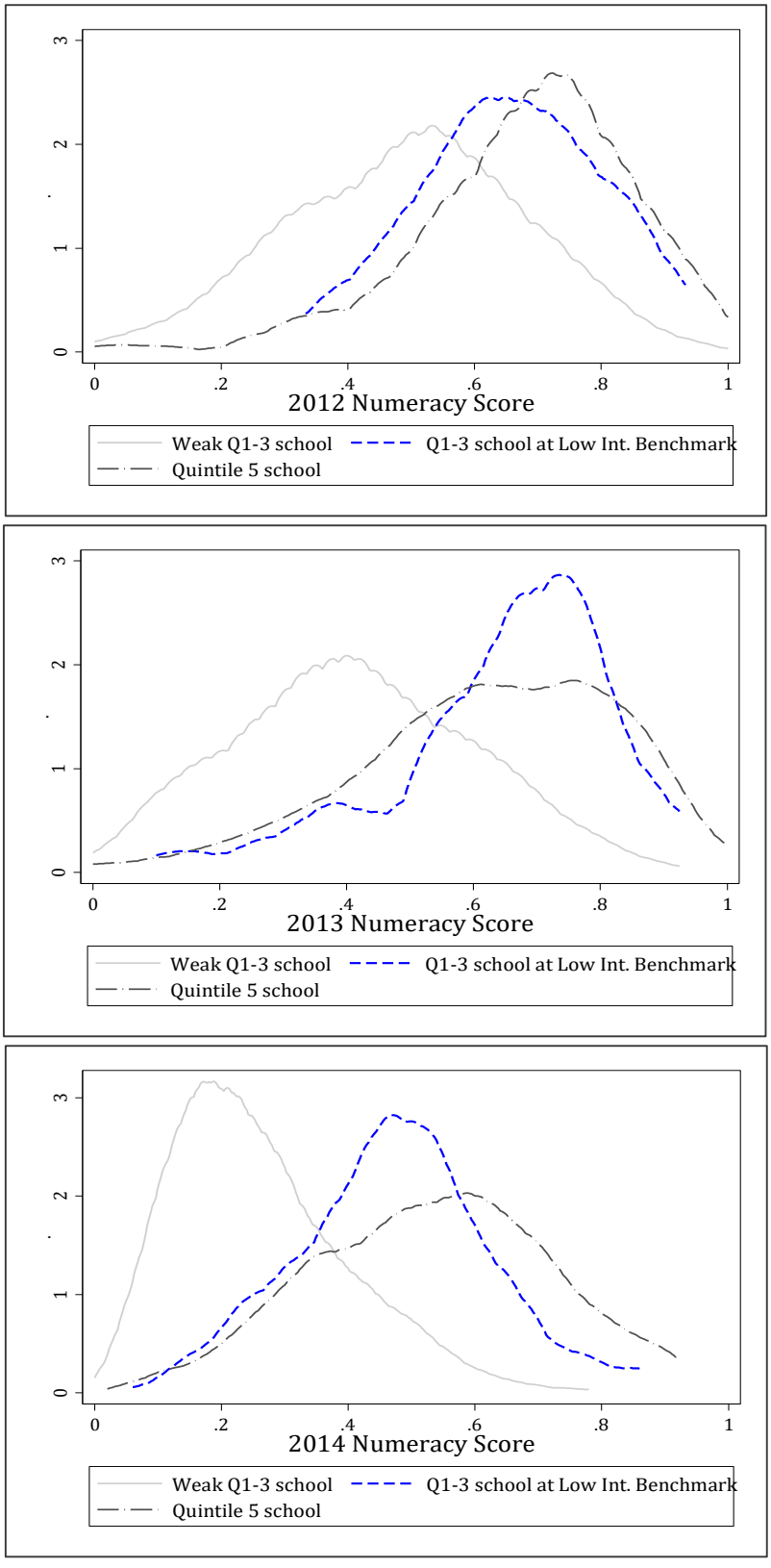
Source: 2012 – 2014 U-ANA. **Notes**: Correlations between numeracy and language scores within each grade, for each province.

Table 25: Inter-grade correlations of numeracy scores, by province

	Province	Grade 2	Grade 3	Grade 4	Province	Grade 2	Grade 3	Grade 4
Grade 2	*Full Sample*	1			*Limpopo*	1		
Grade 3		0.4756	1			0.4406	1	
Grade 4		0.4035	0.4718	1		0.3161	0.4095	1
Grade 2	*Western Cape*	1			*North West*	1		
Grade 3		0.6524	1			0.4197	1	
Grade 4		0.5785	0.7133	1		0.3237	0.3435	1
Grade 2	*Eastern Cape*	1			*Mpumalanga*	1		
Grade 3		0.3801	1			0.3749	1	
Grade 4		0.3029	0.3463	1		0.2907	0.3474	1
Grade 2	*Northern Cape*	1			*Free State*	1		
Grade 3		0.5955	1			0.4781	1	
Grade 4		0.4643	0.5693	1		0.4285	0.498	1
Grade 2	*KwaZulu-Natal*	1			*Gauteng*	1		
Grade 3		0.4051	1			0.5414	1	
Grade 4		0.3205	0.3967	1		0.4877	0.5399	1

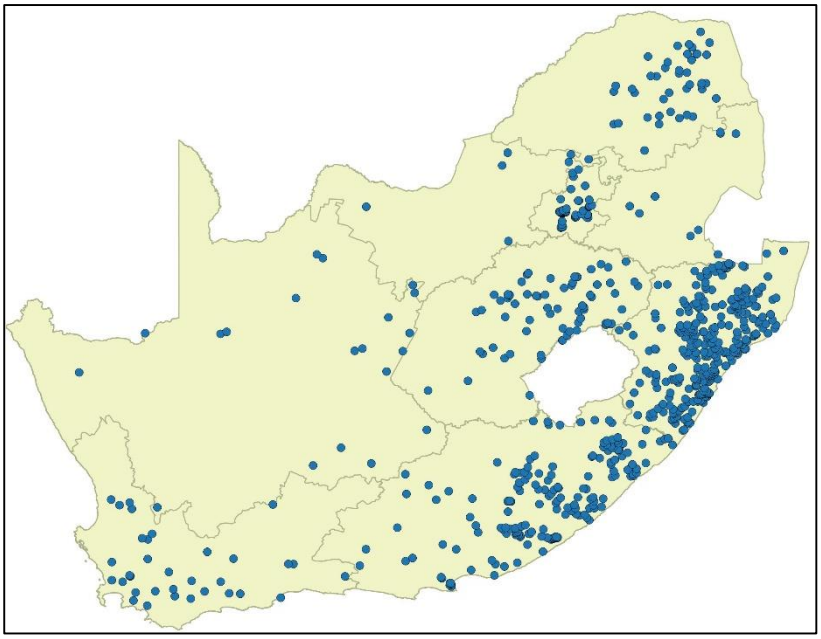
Source: 2012 – 2014 U-ANA. **Notes**: Correlations between Grade 2, Grade 3 and Grade 4 mathematics for all primary schools.

Figure 28: Distribution of Grade 2-4 numeracy scores for the poorest 60% of learners



Source: 2013 V-ANA, 2012 – 2014 U-ANA. **Notes**: Learners were classified by SES wealth status, based on an asset index derived from the V-ANA learner questionnaire. Only learners in Quintiles 1 – 3 of the asset index are included in this graph.

Figure 29: Spatial distribution of Quintile 1 – 3 schools who perform at least at the low international benchmark level



Source: 2013 Masterlist GIS Coordinates, 2012 – 2014 ANA.

Table 26: Descriptive statistics for the variables in the 2011 School Monitoring Survey

		Full Sample		Weak		Top 25%			Low International Benchmark		
		Mean	*s.e.*	*Mean*	*s.e.*	*Mean*	*s.e.*	*Significance*	*Mean*	*s.e.*	*Significance*
School Characteristics	Average School Performance	0.44	0.00	0.36	0.00	0.52	0.00	***	0.61	0.00	***
	Small School	0.20	0.01	0.19	0.01	.	.	.	0.31	0.03	***
	Learner-Teacher Ratio	29.29	0.12	29.26	0.16	32.17	0.20	***	27.91	0.53	.
	Rural	0.60	0.01	0.71	0.01	0.66	0.02	.	0.64	0.03	.
Accountability	Distance from District Office	52.95	0.82	60.56	1.08	52.80	1.89	***	47.32	2.24	***
	Number of Neighbours in 10 km radius	40.71	0.91	26.41	0.76	41.64	2.09	***	43.98	3.03	***
	Number of Q5 schools in 10 km radius	5.81	0.24	1.04	0.11	3.33	0.30	***	3.64	0.43	***
School Governance	Number of SGB Functions filled	7.73	0.03	7.44	0.04	7.88	0.03	***	7.76	0.05	***
	Received less money than expected	0.24	0.01	0.19	0.01	0.24	0.02	.	0.39	0.03	***
	Number Educators Absent	1.80	0.05	1.71	0.06	2.23	0.11	***	1.26	0.09	***
	School has at least 1 vacant position	0.30	0.01	0.30	0.01	0.35	0.02	.	0.21	0.03	***
	School has an Improvement Plan	0.92	0.01	0.90	0.01	0.97	0.01	***	0.93	0.02	.
	School has an Academic Improvement Plan	0.81	0.01	0.75	0.01	0.90	0.01	***	0.85	0.02	***
	Number of Academic reports	2.79	0.01	2.75	0.02	2.89	0.03	***	2.77	0.05	.
	Has a letter stating Learner Allocation 2010	0.26	0.01	0.19	0.01	0.27	0.02	***	0.17	0.02	***
	Has a letter stating Learner Allocation 2011	0.33	0.01	0.29	0.01	0.36	0.02	***	0.21	0.02	***
	Has a letter stating Learner Allocation 2012	0.25	0.01	0.19	0.01	0.25	0.02	***	0.17	0.02	.
	School has an updated Gr3 class register	0.96	0.00	0.96	0.01	0.95	0.01	.	1.00	0.00	***
	School has an LTSM asset register	0.85	0.01	0.81	0.01	0.91	0.01	***	0.90	0.02	***
	Number of SGB Meeting Minutes seen	2.79	0.01	2.77	0.02	2.84	0.02	***	2.83	0.03	.
Teacher Training	Attended self-initiated teacher training	0.57	0.01	0.53	0.01	0.64	0.02	***	0.59	0.03	.
	Attended school-initiated teacher training	0.69	0.01	0.62	0.01	0.73	0.02	***	0.75	0.03	***
	Attended externally teacher training	0.67	0.01	0.61	0.01	0.75	0.02	***	0.77	0.03	***
District Support	Number of visits by subject advisor	0.38	0.01	0.31	0.01	0.51	0.02	***	0.52	0.03	***
	SA: Checked curriculum coverage	0.31	0.01	0.26	0.01	0.44	0.02	***	0.45	0.03	***
	SA: Checked lesson planning	0.32	0.01	0.26	0.01	0.46	0.02	***	0.49	0.03	***
	SA: Gives advice on teaching	0.28	0.01	0.24	0.01	0.43	0.02	***	0.39	0.03	***
	SA: Assists with content knowledge	0.29	0.01	0.25	0.01	0.43	0.02	***	0.43	0.03	***
	District Support Index	-0.26	0.04	-0.71	0.06	0.24	0.09	***	0.11	0.13	***
	District Monitoring Index	-0.48	0.04	-0.84	0.06	0.10	0.10	.	-0.36	0.14	***

Source: 2011 School Monitoring Survey. **Notes***** indicates that the difference between high-performing Quintile 1 – 3 schools and weak-performing Quintile 1 – 3 schools are significant.

Table 27: Descriptive statistics for the variables in the 2013 V -ANA

		Full Sample		Weak Schools			Top 25% Schools		
		Coeff.	s.e.	Coeff.	s.e.	Significance	Coeff.	s.e.	Significance
Principal & Teacher Characteristics	Principal over 50	51%	0.01	47%	0.02	.	20%	0.02	***
	Principal is Male	65%	0.01	61%	0.02	.	37%	0.03	***
	Days principal is absent due to illness	0.45	0.02	0.70	0.04	***	0.93	0.13	***
	Days principal is absent due to work reasons	2.03	0.06	2.96	0.16	***	3.95	0.27	***
	Days principal is on leave	0.40	0.03	0.72	0.05	***	0.60	0.05	***
	Average teacher age	45.38	0.11	46.43	0.17	***	44.88	0.25	
	Female teachers	82%	0.00	77%	0.01	***	95%	0.01	***
	Average years of experience	18.09	0.13	17.79	0.20	.	13.76	0.32	***
School Characteristics	Has at least one vacancy at school[j]	42%	0.01	54%	0.02	***	44%	0.03	
	Parents support the school process	50%	0.01	41%	0.02	***	70%	0.03	***
	School LoLT is an African Language	50%	0.01	77%	0.02	***	73%	0.03	***
	School has a library	42%	0.01	21%	0.01	***	26%	0.03	***
	School has a computer room	58%	0.01	31%	0.01	***	76%	0.03	***
Teacher Training: All teachers attended	… CAPS training through the Department	78%	0.01	75%	0.02	.	84%	0.02	***
	… In-Service training through the school	74%	0.01	74%	0.02	.	71%	0.03	
	… In-Service training through someone external	16%	0.01	8%	0.01	***	50%	0.04	***
	… In-Service training through the Department	44%	0.01	46%	0.02	.	70%	0.03	***
Classroom Practices	Learners can borrow books from their classroom	76%	0.01	66%	0.01	.	83%	0.01	***
	Teacher covered 90% of the Grade 3 curriculum	43%	0.01	31%	0.01	***	65%	0.02	***
	Average Number of Hours a teacher teaches	22.53	0.13	21.04	0.30	***	17.72	0.90	***
	Average Number of Hours a teacher prepares	9.22	0.10	6.89	0.15	***	8.21	0.38	***
	Weekly class tests are administered	36%	0.01	19%	0.01	***	37%	0.02	
	Weekly oral tests are administered	76%	0.01	81%	0.01	***	65%	0.02	***
	Teacher marks homework regularly	97%	0.00	98%	0.00		97%	0.01	
	Teacher marks classwork regularly	55%	0.01	57%	0.01		46%	0.01	***
Accountability Systems	Teacher was observed by district official this year	39%	0.01	38%	0.02		36%	0.02	
	Teacher was observed by the principal this year	81%	0.00	78%	0.01		69%	0.03	***
	Teacher was observed by a peer this year	79%	0.00	80%	0.01		71%	0.03	***
	District Support Satisfaction Index	-0.08	0.02	-0.18	0.04		0.35	0.04	***
	District Support Index	-0.07	0.02	0.10	0.04	***	0.20	0.06	***
	Number of Neighbours in 10 km Radius	47.68	1.05	22.61	0.93	***	22.37	1.21	***
	Number of Q5 schools in 10 km Radius	10.86	0.33	1.52	0.18	***	3.17	0.28	***

Source: 2013 V-ANA. **Notes***** indicates the difference between poor learners in the better-performing schools and learners in a weakly-performing school is significant. [j] These variables has a significant amount of missing data and should therefore be interpreted with caution

Table 28: Descriptive statistics – differences between poor learners attending the four different types of schools (using the pooled V-ANA panel)

	Weak Performing[j]		Top 25% excl. small schools			Low International Benchmark			Quintile 5		
	Mean	*(s.e.)*	*Mean*	*(s.e.)*	*diff*	*Mean*	*(s.e.)*	*diff*	*Mean*	*s.e.*	*diff*
LEARNER CHARACTERISTICS											
% Male	49%	(0.01)	46%	(0.01)	.	48%	(0.02)	.	46%	(0.01)	.
% of Overaged Learners	28%	(0.01)	30%	(0.01)	.	33%	(0.03)	.	16%	(0.01)	***
% Home Language = Assessment Language	46%	(0.01)	67%	(0.01)	***	81%	(0.02)	***	44%	(0.01)	
% African home language = assessment	91%	(0.00)	91%	(0.01)	.	91%	(0.01)	.	48%	(0.01)	***
% with a mother with at most primary schooling	49%	(0.01)	40%	(0.01)	***	37%	(0.02)	***	37%	(0.01)	***
Average household size	5.50	(0.02)	5.67	(0.05)	***	5.85	(0.08)	***	4.51	(0.05)	***
% who eats less than 3 meals a day	39%	(0.01)	35%	(0.01)	***	33%	(0.02)	***	44%	(0.01)	***
HOUSEHOLD RESOURCES											
Learner SES	-0.83	(0.01)	-0.63	(0.02)	***	-0.81	(0.03)	.	-0.40	(0.01)	***
% that never use a PC at home	83%	(0.00)	81%	(0.01)	.	89%	(0.02)	***	55%	(0.01)	***
% traveling more than 30 min to school	22%	(0.00)	25%	(0.01)	***	21%	(0.02)	.	16%	(0.01)	***
READING PRACTICES											
% with no books at home	40%	(0.01)	38%	(0.01	.	39%	(0.02)	.	30%	(0.01)	***
% never read at home	46%	(0.01)	44%	(0.01)	.	51%	(0.03)	.	23%	(0.01)	***
% never borrow books from community library	80%	(0.00)	74%	(0.01)	***	69%	(0.02)	***	53%	(0.01)	***
% that never reads with an adult	46%	(0.01)	44%	(0.01)	.	51%	(0.03)	.	23%	(0.01)	***
SCHOOL PRACTICES											
% that gets language homework regularly	50%	(0.01)	49%	(0.01)	.	63%	(0.02)	***	56%	(0.01)	***
% that gets maths homework regularly	51%	(0.01)	48%	(0.01)	.	69%	(0.02)	***	53%	(0.01)	.
% whose teacher checks homework regularly	54%	(0.01)	46%	(0.01)	***	54%	(0.02)	.	48%	(0.01)	***
TOTAL OBSERVATIONS	13 572		2 358			837			2 328		

Source: 2013 V-ANA, 2012 & 2014 U-ANA. **Notes**: Sample restricted to include only the poorest 60% of learners. *** indicates that the difference between poor learners in the better-performing schools and learners in the weaker-performing schools is significant. [j]Weak performing schools refers to schools that consistently perform among the bottom 60% of Quintile 1 – 3 schools.

Table 29: Basic value-added models (estimated using pooled OLS)

	Top 25% excl. small schools			Low International Benchmark			Quintile 5		
	A	B	C	A	B	C	A	B	C
Treatment	0.58***	0.58***	0.57***	0.80***	0.80***	0.81***	0.74***	0.75***	0.63***
	0.08	0.08	0.08	0.09	0.09	0.1	0.07	0.07	0.08
Persistence Parameter	0.34***	0.34***	0.33***	0.35***	0.35***	0.33***	0.39***	0.39***	0.37***
	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
N	4282	4282	4282	3713	3713	3713	4422	4422	4422
R-squared	0.285	0.289	0.317	0.237	0.242	0.273	0.404	0.407	0.427
Clusters	316	316	316	277	277	277	375	375	375
Learner Controls	X	X	X	X	X	X	X	X	X
Household Controls		X	X		X	X		X	X
School-Level Controls			X			X			X

Source: 2013 V-ANA, 2012 & 2014 U-ANA. **Notes**: Only poor learners were included in the sample. Shows OLS regression coefficients with standard errors clustered at the school level. * p<.1; ** p<.05; *** p<.01

Table 30: Value-added models adjusted for learners not matched across all three years

	Top 25% excl. small schools	Low Int. Benchmark	Quintile 5
Treatment	0.60***	0.80***	0.60***
	(0.07)	(0.11)	(0.08)
Persistence Parameter	0.32***	0.33***	0.37***
	(0.02)	(0.02)	(0.02)
N	3 865	3 374	3 989
R-squared	0.315	0.269	0.424
Clusters	309	271	367
Learner Controls	X	X	X
Household Controls	X	X	X
School-Level Controls	X	X	X

Source: 2013 V-ANA, 2012 & 2014 U-ANA. **Notes**: OLS regression coefficients with standard errors clustered at the school level. The weights used are based on the inverse probability of being matched across both 2012 and 2014, and with the school level panel. * p<.1; ** p<.05; *** p<.01

Table 31: Descriptive statistics for learners who could not be matched across all three years

	Full Sample			Poor learners in Top 25% of schools			Poor learners in Low Int. Benchmark schools			Poor learners in Quintile 5 schools		
	Observed in all three years	*Observed in only one or two of the years*		*Observed in all three years*	*Observed in only one or two of the years*		*Observed in all three years*	*Observed only in one or two of the years*		*Observed in all three years*	*Observed in only one or two of the years*	
Observations	3 709	8 928		200	596		31	149		280	496	
Mean home SES	-0.118	-0.213	***	-0.488	-0.718	***	-0.224	-0.624	***	-0.382	-0.383	.
In Top25% (excl. small schools)	12.4%	13.4%										
In low int. benchmark schools	2.4%	2.5%										
In Quintile 5	16.1%	14.0%	***									
% Over age	19.6%	25.3%	***	21.4%	30.6%	.	22.1%	34.1%	.	11.9%	13.7%	.
% Home Language: African	76.7%	78.4%	.	93.2%	91.3%	.	82.5%	78.0%	.	47.0%	46.9%	.
% Black	82.2%	81.7%	.	96.1%	92.6%	.	87.4%	82.4%	.	61.4%	57.8%	.
% Mother only Primary	37.0%	38.8%	.	34.6%	43.6%	.	31.3%	33.5%	.	30.7%	41.7%	.
% Rural	41.9%	47.9%	***	56.0%	54.2%	.	24.5%	30.8%	.	8.9%	19.0%	.
Mean Grade 4 Numeracy	1.03	1.01	.	1.46	1.21	.	1.71	1.85	.	1.78	1.73	.
Mean Grade 4 EFAL	1.03	1.01	.	1.53	1.56	.	1.95	2.19	.	2.12	2.10	.
Mean Grade 4 HL	1.10	1.05	.	1.02	0.73	.	1.30	0.67	***	1.43	1.28	.

Source: 2013 V-ANA, 2012 & 2014 U-ANA. **Notes**: Only poor learners included in the sample. *** indicates that the sample of learners who could not be matched across all three years differs significantly (at a 95% level of confidence) from the learners in the sample who could be matched.

Table 32: Value added model - instrumenting for measurement error in test scores

	Top 25%			Low Int. Benchmark			Quintile 5		
	A	B	C	A	B	C	A	B	C
Treatment	0.44***	0.56***	0.57***	0.58***	0.92***	0.90***	0.48***	0.44***	0.55***
	0.09	0.13	0.10	0.12	0.15	0.11	0.09	0.12	0.11
Persistence Parameter	0.50***	0.48***	0.35***	0.53***	0.44***	0.33***	0.60***	0.58***	0.50***
	0.06	0.08	0.04	0.06	0.08	0.04	0.06	0.07	0.04
N	3953	1532	804	3447	1329	565	4121	1593	1054
R-squared	0.283	0.414	0.374	0.22	0.37	0.427	0.374	0.542	0.543
Clusters	312	270	63	273	236	45	372	314	113
First stage F-Stat	381.38	108.44		380.42	78.50		401.39	81.42	
Instrumented Lagged Score	Lang.	Math		Lang.	Math		Lang.	Math	
Learner Controls	X	X	X	X	X	X	X	X	X
Household Controls	X	X	X	X	X	X	X	X	X
School-Level Controls	X	X	X	X	X	X	X	X	X
Restricted Provinces			X			X			X

Source: 2013 V-ANA, 2012 & 2014 U-ANA. **Notes**: OLS regression coefficients with standard errors clustered at the school level. Two different instruments are used to instrument potential measurement error in the lagged math score: A – Lag language score; B – Lag mathematics score. Column C presents the results of the pooled LS model run on a sample restricted to the Western Cape, Free-State and Gauteng * p<.1; ** p<.05; *** p<.01

Table 33: Value-added model - controlling for ability bias and measurement error

	Top 25% excl. small schools			Low International Benchmark		
	A	B	C	A	B	C
Treatment	0.45***	1.09*	1.25	0.53***	1.60*	1.69*
	0.1	0.52	0.77	0.16	0.66	0.84
Persistence Parameter	0.41***	0.23*	0.10	0.44***	0.25**	0.18
	0.10	0.10	0.33	0.1	0.09	0.27
N	1 252	1 399	1 252	985	1 085	985
R-squared	0.305	0.238	0.185	0.3	0.195	0.173
Clusters	103	103	103	77	77	77
First Stage F Stat: Persistence Parameter	114.5		83.62	104.45		59.59
First Stage F Stat: Treatment Variable		4.78	35.37		3.6	7.58
Learner Controls	X	X	X	X	X	X
Household Controls	X	X	X	X	X	X
School-Level Controls	X	X	X	X	X	X

Source: 2013 V-ANA, 2012 & 2014 U-ANA. **Notes**: 2-Stage Least Squares regression coefficients with standard errors clustered at the school level. Model A controls for measurement error only, Model B only for ability bias and Model C controls for both. Lagged Language score used to instrument the persistence parameter. The number of well-performing Q1-3 schools in a 15 km radius is used as an instrument for the treatment variable. The sample is restricted to include only poor learners in urban areas. * p<.1; ** p<.05; *** p<.01

Table 34: Factors that contribute to school performance – School Monitoring Survey 2011

Dependent Variable	Grade 3 Maths (school average)	A		B		C	
		Coeff.	*s.e.*	*Coeff.*	*s.e.*	*Coeff.*	*s.e.*
School Characteristics	Small School	0.03***	(0.01)	0.03***	(0.01)	0.05***	(0.01)
	Learner-Teacher Ratio	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Accountability	Distance from District Office	0.00	(0.00)	0.00*	(0.00)	0.00	(0.00)
	No. of Neighbours within 10 km	0.00***	(0.00)	0.00***	(0.00)	0.00	(0.00)
	No. of Q5 schools within 10 km	0.00	(0.00)	0.00	(0.00)	-0.00*	(0.00)
School Governance	No. of SGB Functions filled	0.01***	(0.00)	0.01***	(0.00)	0.01***	(0.00)
	No. of SGB Meeting Minutes	0.00	(0.00)	-0.01*	(0.00)	-0.01*	(0.00)
School Management	Number Educators Absent	-0.00**	(0.00)	-0.01***	(0.00)	0.00	(0.00)
	Has an Improvement Plan	-0.01	(0.01)	-0.02*	(0.01)	-0.02**	(0.01)
	Has an Academic Improvement Plan	0.03***	(0.01)	0.03***	(0.01)	0.03***	(0.01)
	Number of Academic reports	0.00	(0.00)	0.00	(0.00)	-0.01***	(0.00)
	Has an updated Gr3 class register	0.03*	(0.01)	0.04***	(0.01)	0.02	(0.01)
	School has a LTSM asset register	0.01**	(0.01)	0.01	(0.01)	0.02**	(0.01)
Attended Teacher Training	Self-initiated teacher training	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
	School teacher training	0.00	(0.00)	0.01	(0.01)	0.01	(0.00)
	External teacher training	0.01	(0.00)	0.02**	(0.00)	0.00	(0.00)
Provincial & District Support	Received less money than expected	-0.01	(0.01)	-0.01*	(0.01)	-0.02**	(0.01)
	Has a letter stating the learner allocation for 2010	-0.06**	(0.02)	0.04*	(0.02)	0.05**	(0.02)
	Has a letter stating the learner allocation for 2011	0.04***	(0.01)	0.02*	(0.01)	0.05***	(0.01)
	Has a letter stating the learner allocation for 2012	0.03	(0.02)	-0.06***	(0.02)	-0.04	(0.02)
	At least one vacant position	0.01	(0.00)	0.01	(0.01)	0.02***	(0.00)
	No. of visits by subject advisor	0.01	(0.01)			0.00	(0.01)
	Subject Advisor: Checked curriculum coverage	-0.02	(0.01)			-0.02*	(0.01)
	Subject Advisor: Checked lesson planning	0.03**	(0.01)			0.02*	(0.01)
	Subject Advisor: Gives advice on teaching	0.01	(0.01)			0.01	(0.01)
	Subject Advisor: Assists with content knowledge	-0.01	(0.010			0.00	(0.01)
	District Support Index			0.01***	0.00	0.01***	(0.00)
	District Monitoring Index			-0.01***	0.00	-0.01***	(0.00)
	Observations	2 610		2 287		2 154	
	R-squared	0.230		0.249		0.698	
	School-level Controls	X		X		X	
	District Fixed Effects					X	

Source: 2011 School Monitoring Survey. **Notes** * p<.1; ** p<.05; *** p<.01. Sample restricted to include Quintile 1 – 3 schools only.

Table 35: Factors that contribute to school performance - 2013 V-ANA

		Grade 3 Math Scores				School Fixed Effects Coefficients[j]			
		A		B		C		D	
		Coeff.	*s.e.*	*Coeff.*	*s.e.*	*Coeff.*	*s.e.*	*Coeff.*	*s.e.*
Principal & Teacher Characteristics	Principal over 50	-0.42	(0.75)	-0.71	(0.82)	-0.04	(0.11)	-0.04	(0.11)
	Principal has a university-level degree	-2.9	(1.52)	-1.26	(1.82)	0.32	(0.22)	0.67**	(0.24)
	Principal has a college diploma	-1.42	(1.61)	-0.38	(1.72)	0.24	(0.22)	0.62*	(0.25)
	Principal is Male	-0.16	(0.82)	-0.26	(0.97)	0.02	(0.11)	-0.10	(0.13)
	Average Teacher Age	-0.07	(0.09)	-0.13	(0.09)	0.01	(0.01)	0.00	(0.01)
	Proportion of Teachers who are Female	0.94	(1.98)	0.88	(2.23)	0.39	(0.23)	0.25	(0.30)
School Characteristics	Parents support the school process	1.74*	(0.86)	1.79*	(0.86)	0.13	(0.11)	0.07	(0.11)
	School LoLT is an African Language	-3.73***	(0.94)	-3.37***	(0.98)	0.02	(0.15)	0.12	(0.14)
	School has a library	-0.58	(0.90)	0.51	(0.92)	-0.20	(0.11)	-0.16	(0.10)
Teacher Training	All teachers attended CAPS training through the Dept.	1.39	(0.96)	2.67*	(1.03)	0.19	(0.10)	0.34**	(0.12)
	All teachers received In-Service Training through the school	-0.39	(0.86)	0.9	(0.92)	-0.04	(0.10)	-0.04	(0.13)
	All teachers received In-Service Training Externally	1.79	(1.16)	2.59*	(1.14)	0.13	(0.13)	0.39**	(0.15)
	All teachers received In-Service Training through the Dept.	-0.99	(0.81)	-1.52	(0.80)	0.00	(0.11)	0.07	(0.12)
Classroom Practices	Teacher states that she covered 90% of the Grade 3 curriculum	0.99	(1.02)	1.56	(1.09)	-0.24	(0.12)	-0.19	(0.15)
	Average Number of Hours a teacher teaches	-0.07	(0.05)	-0.07	(0.05)	0.01	(0.01)	0.01	(0.01)
	Weekly class tests are administered	-1.07	(1.15)	-0.59	(1.22)	0.08	(0.15)	0.01	(0.16)
	Weekly oral tests are administered	0.09	(1.50)	-0.76	(1.54)	-0.14	(0.15)	-0.33	(0.18)
	Teacher marks homework regularly	12.86**	(4.55)	13.78***	(3.87)	0.01	(0.42)	0.24	(0.51)
	Teacher marks classwork regularly	-0.14	(1.40)	-0.33	(1.48)	-0.07	(0.16)	0.09	(0.16)
Accountability systems	Teacher was observed by a district official this year	1.34	(1.15)	4.02**	(1.41)	0.37*	(0.15)	0.47**	(0.18)
	Teacher was observed by the principal this year	-1.34	(2.04)	-4.17	(2.58)	0.12	(0.26)	-0.08	(0.31)
	Teacher was observed by a peer this year	-0.89	(2.04)	-0.35	(2.52)	-0.52*	(0.25)	-0.43	(0.29)
	Number of Neighbours in 10 km Radius	0.03	(0.01)	0.04*	(0.01)	0.00	(0.00)	0.00	(0.00)
	Number of Q5 schools in 10 km Radius	-0.15**	(0.05)	-0.21***	(0.06)	0.00	(0.01)	0.00	(0.01)
	Satisfaction with district support index	0.78*	(0.34)	1.06*	(0.42)	-0.07	(0.05)	0.00	(0.05)

...Table 35 continued

Accountability systems: Number of visits by District Official	To check the general functioning of the school		0.34	0.31		0.02	0.04
	To conduct Classroom Observations		0.09	0.28		-0.01	0.04
	To provide guidance on CAPS implementation		-0.72*	0.32		0.02	0.05
	To monitor assessment practices		-0.34	0.37		-0.09	0.06
	To coordinate EMIS activities		0.64*	0.32		0.13*	0.05
	To explain circulars and new policies		-0.2	0.29		-0.03	0.06
	To organise training and support for school management		0.92*	0.39		0.00	0.04
	To organise training and support for SGB		-0.59	0.41		-0.03	0.05
	To assist & monitor school development planning		-0.31	0.38		-0.03	0.04
	Observations	3 573	2 721		4 835	3 680	
	R-squared	0.198	0.246		0.234	0.293	
	Clusters	229	174		231	176	

Source: 2013 V-ANA, 2012 & 2014 U-ANA. **Notes**: Only poor learners included in the sample. Shows OLS regression coefficients with standard errors clustered at the school level. [j] The school fixed effects coefficients are obtained from the basic value added models. * p<.1; ** p<.05; *** p<.01

Chapter 5

5.1. Summary

Enabled by the availability of larger-scale, nationally representative data, the South African education system has benefited from more rigorous analysis by researchers in the last two decades. While the South African education system has expanded and evolved substantially since 1994, the inequities along racial and income lines persist (Spaull, 2013; Van der Berg, 2008). It is therefore necessary to inform policy making with empirical research to ensure that these rigidities are progressively being solved and not further established through current policies. The objective of this dissertation has been to exploit a wide selection of the available datasets to provide relevant and informative insights into various policy questions.

Three distinct research questions were investigated in the three separate chapters. The first topic, discussed in chapter two, developed a new methodology for measuring learner wealth in the absence of data on household income or expenditure. The measure augments the traditional asset-index measure put forward by Filmer and Pritchett (2001), by improving both the measure's comparability and its accuracy. The second topic, addressed in the third chapter, examined the South African education system's capacity to implement an additional reception year and highlighted those factors that would need to be increased, or improved on, before such a year could be implemented successfully. The final chapter considered poor schools that perform above the socio-economic expectation and determined the prevalence of these schools in South Africa, the value they add to poor learners' educational careers, and, finally, the school-level factors associated with these schools.

5.2. Chapter two: A new methodology for investigating cognitive performance differentials by socio-economic status across international assessments

Chapter two focused on developing a new methodology for measuring the household wealth of a learner in the absence of information on their household income or expenditure. The current measures of learner socio-economic status (SES) all face the trade-off between the accuracy of the measure and its comparability across countries (Buchmann, 2002; Chudgar et al., 2012; Filmer and Pritchett, 2001; Fuller and Clark, 1994; Harttgen and Vollmer, 2011). The main purpose of constructing the new measure is therefore not only to estimate the relationship between learner performance and learner SES, but also to compare it across different contexts. The value of this measure is twofold: First, it provides an accurate comparison of the social gradients across different countries and allows the comparison of learner performance of equally

poor learners in different countries, and secondly, it provides a more accurate measure of SES in multivariate analyses. With the increased availability of international learner assessments and the consequent increase in cross-country comparative analysis, the development of such a measure is necessary.

The method put forward in the chapter is straightforward and can be applied to any international learner assessment that has collected data with which to construct an asset index. The proposed method entails constructing an asset index specifically for each country participating in the study and ranking the learners according to this measure. This step increases the accuracy of the measure since the weights associated with each asset in the asset index are constructed specifically to reflect the relative importance of the asset in the specific country. To ensure the comparability of this measure across countries, the learner distribution is linked to the per capita household income distribution using income or expenditure data. The per capita household income distribution is created by including only households with learners who are of a similar age to the learners who participated in the learner assessment, and ranking these households according to their income levels. Both the learner SES distribution and the per capita household income distribution are divided into n percentiles and the n^{th} percentile of the SES distribution is allocated the average household income of the n^{th} percentile of the household income distribution. To increase the comparability in an international context further, the per capita household income values are converted to be denoted in purchasing power parity dollars (PPP $). The accuracy of the measure is also improved by adjusting the gradients to take into account those learners who are currently not attending school and were therefore not included in the learner assessments.

Applying this measure to the SACMEQ III data, chapter two first compared the social gradients for seven Sub-Saharan African countries. This comparison showed that Kenyan and Tanzanian learners whose household income was at, or below the $3.10 poverty line, performed on average at a level that was about two years ahead of equally poor learners in South Africa and Namibia. Despite having much larger numbers of learners living in poverty, both Kenya and Tanzania also had a larger proportion of their poor learners who performed at a level that could be deemed as mathematically literate.[88] Moreover, at both the $1.90 poverty line and the $3.10 poverty line, learners in Uganda and Mozambique outperformed South African learners. Finally, the flat social gradient found in Malawi suggests that the Malawian education system is failing both its wealthy and the poor learners.

[88] Following Spaull and Taylor (2012), Ross et al. (2005) and Hungi et al. (2010), all learners who performed at a level below "Basic numeracy" are deemed to be functionally innumerate. The inverse, all learners who performed at, or above, the "Basic numeracy" level, should then hold.

The second comparison highlighted in chapter two was between sixteen Latin-American countries and the seven Sub-Saharan African countries. This comparison made use of a dataset constructed by Gustafsson (2012), which changed countries' average achievement scores in either SACMEQ (2007) or SERCE (2006) into a single normalised scale. The comparison showed that five out of the seven Sub-Saharan African countries performed among the six poorest-performing countries. The Dominican Republic was the only Latin-American country among the poorest-performing six countries. Kenya, on the other hand, was the only Sub-Saharan African country to perform among the top six countries, with learners at the $1.90 poverty line performing similar level to equally poor learners in Uruguay and Chile. In absolute numbers, both Kenya and Tanzania had a much larger number of their learners who were from households that live below the $3.10 poverty line than, for instance, Mexico. Notwithstanding, they still managed to have a larger proportion of their poor learners performing at, or above, the mathematically competent level.

This chapter contributed to the literature on cross-country comparisons of learner performance on international assessments, by proposing a more accurate measure of SES. The construction of this measure was used to compare social gradients between Sub-Saharan African and Latin-American countries and allowed the comparison of the educational outcomes of equally poor learners in the different countries. The large differentials in learner performance that were exposed through this comparison provide a framework with which to review countries' experiences and encourage informed debates.

5.3. Chapter three: The readiness of the South African education system to implement pre-Grade R year

Chapter three made use of the 2013 ECD audit and household surveys to contribute to the national debate on the feasibility of implementing an additional reception year. Given the hierarchical nature of skill attainment, and the learning gaps between the affluent and the poor that are already prominent by the start of Grade 1, it is crucial for the South African education system to place a much stronger focus on preparing children adequately for their school career. However, merely implementing an additional year, without ensuring that the service delivered is of an adequate quality, would not justify the expenditure of the resources required to implement such a year. This chapter therefore considered the current conditions of the resources that are likely to be employed in the implementation of a pre-Grade R year. This was undertaken on the basis of the assumption that the implementation of an additional reception year will follow the same model as the implementation of Grade R. The main focus of the chapter was therefore to determine the demand for and the supply of the resources associated with ECD centres since pre-

Grade R will either be hosted in these centres or, if hosted in primary schools, some of the resources in these centres (specifically the human resources) might be transferred to the primary schools.

At first, chapter three considered the current participation rates of four-year-old children to gain a sense of the proportion of children who currently use the resources. It is evident that there has been an overall increase in the participation of children of all ages in education institutions since 2003, but that the largest increase has been among three- and four-year-old children. It is also clear that about 50% of three-year-olds attend pre-primary school and about 60% of four-year-olds are attend either a pre-primary school or Grade R. The differences in four-year-old participation rates across provinces are quite stark, with around 80% of four-year-olds in the Free State but only 50% of four-year-olds in KwaZulu-Natal attending an educational institution. During the implementation of a pre-Grade R year, a specific focus would therefore have to be on increasing and improving the resources in especially KwaZulu-Natal.

To contribute further to the debate on the readiness of the South African education system to implement pre-Grade R, chapter three examined the current conditions of the physical and human resources in ECD centres. With regard to the quality of the physical resources in ECD centres, the differences across provinces are once again clear. A large percentage of centres in Limpopo, KwaZulu-Natal and the Eastern Cape lack even the basic infrastructure to provide a safe environment for children. The provincial differentials were also evident in the availability of learning and teaching support material (LTSM), with one in every two ECD centres in North West lacking the basic LTSM, compared to only one in every five centres in the Western Cape and one in every four in Gauteng and the Free State. Finally, it was also found that, on average, 57% of centres in South Africa are overcrowded.

Recognising that well-trained, passionate and capable ECD practitioners have the potential to make an invaluable contribution to the basic development of children, it is disconcerting that human resource constraints are rife in the ECD sector. Chapter three showed that only 10% of practitioners and assistant practitioners have any qualification above that of a Grade 12 and that 74% of practitioners and 88% of assistant practitioners do not have *any* specialisation qualification in ECD. In conjunction with the weak academic preparation ECD practitioners have, the average monthly salary of an ECD practitioner is also unacceptably low. The ECD audit revealed that regardless of a person's qualification or position at an ECD centre, on average their monthly salary ranges between R1 400 and R2 000, and does not include any other benefits such as a pension fund, medical aid benefits or housing subsidies. Key to delivering a high-quality pre-Grade R is the quality of the practitioners employed and it is therefore of utmost importance to

upskill current ECD practitioners with the purpose of enabling them to deliver a service that is of an acceptable standard.

The final issue considered as a binding constraint to implementing a successful pre-Grade R year is the governance structures in which it will need to function. Currently, there are prominent differences in the registration of ECD centres across provinces. It was found that relative to ECD centres in the Western Cape, ECD centres in the Eastern Cape are three-and-a-half times more likely to be registered and ECD centres in KwaZulu-Natal are just over six times more likely to be fully registered, even after controlling for all the required minimum norms and standards. This is despite these provinces also having the highest proportion of centres lacking adequate infrastructure. Although this lenient implementation of the norms and standards has certain benefits, there are also risks involved in this approach. Being registered in a rural area means that ECD centres that are limited in raising any additional funds gain access to subsidised funding more easily. However, this lenience defies the purpose of having norms and standards completely and introduces the risk of ECD centres being run in circumstances that are not fit for children and providing programmes that have very little developmental benefits for the children attending them.

Chapter three also presented the large numbers of centres that could be registered but are either classified as conditionally registered or are still awaiting the outcome of their application. It is possible that these irregularities might be the result of provincial budget constraints and are therefore the result of rationing on the province's side. They may also be merely inefficiencies in the registration process. Either way, these inefficiencies are prohibiting some ECD centres in certain provinces from gaining access to much-needed funding.

The fact that some provinces are more lenient in granting full registration indicates that the implementation of the policy is haphazard and often irregular and that inherent flaws exist in the national funding and registration system. First, it indicates that provincial and district officials are not equally capable of, or trained in identifying the appropriate conditions for children to develop during their first five years. Secondly, it suggests that the funding model is not sufficient and that it is currently creating perverse incentives to circumvent the norms and standards in order to provide ECD centres with some assistance. This is specifically the case for centres that have very little means to raise funding through fees or fundraising events. Finally, it indicates that there are weaknesses in the implementation of the system. This then calls into question the ability of the current administrative system to facilitate the provision of quality ECD services for the country and this challenge is important to address this system if more funding is to be directed to

ECD centres through the current model. More stringent guidelines and accountability will need to be built into the system to prevent financial abuses.

5.4. Chapter four: Schools that perform above expectations

Chapter four examined poor schools that managed to overcome their socio-economic disadvantage and perform above expectations by considering three overarching research questions. In answer to the first question, the study considered the number of Quintile 1 – 3 schools that are performing above the demographic expectation and examined their spatial distribution and their proximity to poor learners. The second question related to the learning a poor learner gains by attending a poor school that performs above expectation. These gains were estimated using the value-added approach and the study mostly followed the methodology by Andrabi et al. (2009) and the application of the methodology to the South African context by Coetzee (2014). The final question was addressed by examining the school-level factors and parameters associated with 'higher' school performance among poor schools.

Three uniquely constructed datasets, using the 2012-2014 Universal Annual National Assessments (ANAs), the 2013 Verification ANA and the 2011 School Monitoring Survey (SMS), were employed to investigate the prevalence and performance of poor schools that manage to perform above the demographic expectation. The first dataset was at school level and tracked the average performance of schools on the U-ANAs from 2012 to 2014. This dataset was used particularly to identify above-average, poor schools. The second dataset followed learners over the three-year period using the 2012 and 2014 U-ANA data and 2013 V-ANA. This learner-level panel allowed for a more rigorous analysis of the value-add of an above-average school. The third dataset matched the 2012 U-ANA school-level results to the 2011 SMS, which provided the opportunity to examine the effect of certain school administrative practices on school performance.

Two different definitions of an above-average school were used to compare the difference in learner performance between those attending an above-average school and those attending a weak performing school. The first definition included schools that consistently perform at least at the level of the TIMSS low international benchmark and the second definition included schools that consistently perform among the top 25% of all Quintile 1 – 3 schools, but excluded very small schools. Using these definitions, only 1 055 Quintile 1 – 3 schools performed consistently among the top 25% of all Quintile 1 – 3 schools, while only 737 schools managed to perform at least at the low international benchmark level. Chapter four also examined the provincial distribution of these schools and showed that in North West merely 6 of the 926 Quintile 1 – 3 schools managed

to perform at the low international benchmark level and in Mpumalanga only 10 schools in the entire province were able to perform at the low international benchmark level.

Chapter four also estimated the learning gains of attending an above-average school and found learning gains of around 0.57 standard deviation in learner test scores for learners attending a top 25% school, whereas learners in a school performing at the low international benchmark level showed gains of 0.8 standard deviations. Using a similar methodology to Coetzee (2014), the chapter addressed some of the concerns with the estimates. First, because of the high non-matched rate between the three different datasets (2012 ANA, 2013 V-ANA, 2014 ANA), inverse probability weighting was implemented to control for biases arising from selective attrition. Following this, the analysis controlled for measurement error in the test scores by including the lagged language test score and the second lagged mathematics score. In addition, the issue of remaining unobserved individual child ability was also addressed by using an instrumental variable. Unfortunately, small sample size prohibits a credible conclusion on the robustness of the estimates; however, none of the checks contradicted the estimates from the OLS value-added model.

Finally, school performance was estimated using a variety of parameters to determine which common factors are positively associated with higher school performance. The first models were run using the SMS dataset, while the second and third models were run on the V-ANA panel dataset. From these models it emerged that the quality of the governance and management structures within a school is positively related to higher school performance. Furthermore, the estimates from both datasets confirmed that there is a positive correlation between school performance and the perception of teachers that they are being supported by their subject advisors, rather than merely being monitored. From both datasets, it also appeared that teacher training that was driven through the district office or provincial department was positively associated with higher overall performance. The final modelling strategy employed to determine the common factors related to higher school performance involved predicting the coefficients on the school fixed effects derived from the value-added model. This model confirmed the positive association between schools that stated that all their teachers had received training through the Department and that those that stated that all their teachers had received in-service training through external service providers. Finally, bureaucratic accountability and support, proxied by whether a teacher was observed by a district official during the year remained positively associated with school performance.

5.6. Recommendations for further research

A key contribution of this thesis has been to provide a quantitative view on education issues using large-scale nationally representative datasets. Chapter two focused more specifically at the improvement of a method, whereas chapters three and four investigated research questions which have not previously been dealt with quantitatively at a national scale. Naturally, all three chapters paths the way for further in-depth research to be conducted. Additional analysis and augmentation of any of the chapters will strengthen the current understanding of the issues addressed in the thesis. I briefly consider a few avenues for further research.

Chapter two sets out a new method of constructing asset indices when comparing social gradients across countries. It is recognised that the method put forward in this chapter does not adequately control for learner drop-out in Grade 6. The current method takes learner drop-out into account by controlling for learners who are not currently attending school. A more accurate measure would be to use Grade 6 survival rates since the age range of learners in Grade 6 varies significantly in the sub-Saharan context. However, the information needed to calculate the survival rates were not available in all of the household surveys used in this analysis. A very useful extension of this chapter will be to apply the proposed method to the latest SACMEQ data (collected in 2013) and the latest TERCE data (also collected in 2013) and then control for the Grade 6 survival rates.

The nationally representative data on ECD in South Africa is relatively limited, but further in-depth studies using mix-methods could add significant value to a more comprehensive understanding of the five areas highlighted as binding constraints to delivering a high quality pre-Grade R. Lack of infrastructure and LTSM, lack of capacity and expertise among national departments, provincial departments and district offices, lack of adequately trained teachers, the severely low salaries of ECD practitioners and the undefined policy space in which ECD operates are all areas that will require systematic and focussed research before the implementation of an additional year of schooling can be considered. Furthermore, a study focussing on mapping the monitoring processes among ECD centres could provide part of the solution to the dilemma poor quality ECD centres that are not conducive to child care or learning.

Finally, the fourth chapter considered poor schools that are performing above expectations. The schools analysed in the chapter were identified using the ANA data. It is no secret, however, that the ANA data is not highly reliable. Finding more credible ways of identifying primary schools that are overcoming their socio-economic disadvantage will be beneficial to the South African literature, as these schools will shed some light on a number of the unobservable characteristics present in a good school. Moreover, determining what a 'good school' constitutes in the primary

school realm where credible standardised testing does not yet exist will provide some useful insights on the information parents base their school choice on.

5.5. Final Comments

This dissertation used a variety of large-scale nationally representative datasets to provide decision makers with more credible and reliable information in the policy-making process. The literature on the Economics of Education in South Africa has established now that the large strides made in redistributing resources have not resulted in improved learning outcomes (Taylor, 2011; Van der Berg, 2008). Chapter two confirmed this by illustrating not only the very steep social gradient present in South Africa but also how poorly the country performs relative to other low income countries. Chapter 3 starts from the premise that these inequalities are already present by Grade 1 and that, given the hierarchical nature of learning, they will only enlarge over time. The NDP recognises this and proposes the implementation of an additional year to better prepare poor learners for their schooling career (NPC, 2013). However, chapter 3 highlights the binding constraints to implementing a pre-Grade R year that will be of a standard that actually improves learning. The final chapter considers those schools that have managed to overcome this socio-economic disadvantage and first shows that very few schools have managed this; secondly, that schools that have managed to do this provide their learners with a large advantage over the schools that have not; and, finally, that the common factors of these above-average schools are related to high-quality school management, good school governance and effective district support.

Datasets on the South African education system has evolved substantially over the past two decades and have played a tremendous role in providing decision makers with useful and relevant information. The latest addition to the bouquet of datasets available, the Annual National Assessments is particularly useful and has the potential to shed light on research questions that have never been properly addressed in South Africa. Augmenting the ANAs to be comparable across grades and over time will allow policy makers to establish the effect of systemic improvements over time, and to evaluate the implementation of certain interventions. Furthermore, the standardised nature of the assessments will allow policy makers to identify schools that are in need of additional support and assistance, and to intervene in a much more targeted and appropriate manner. In collaboration with a well-functioning Learner Unit Record Information and Tracking System (LURITS), researchers will be able to track learners and their performance over time. This will further allow researchers to determine learner migration and learner progression trends.

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