CONFERENCE ON QUANTITATIVE EDUCATION RESEARCH
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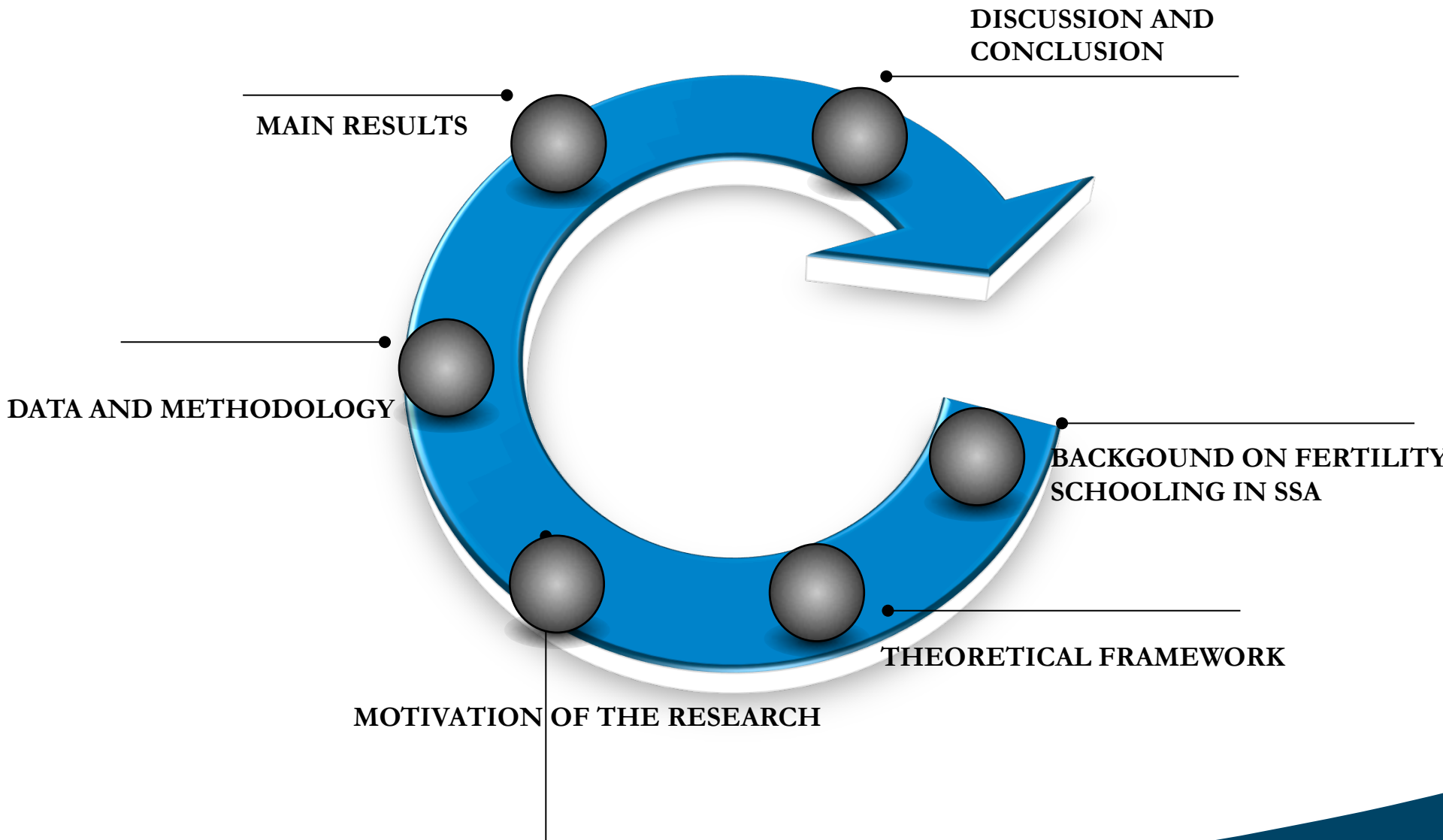
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Family size and schooling: testing the quantity-quality trade-off in Sub Saharan Africa

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Structure

DISCUSSION AND CONCLUSION

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DATA AND METHODOLOGY

BACKGOUND ON FERTILITY SCHOOLING IN SSA

THEORETICAL FRAMEWORK

MOTIVATION OF THE RESEARCH

1. Background on fertility and schooling in SSA

❖ Fertility is declining in SSA but is still the highest in the world.

❖ Schooling is improving but is still lowest in the world.

❖ Heterogeneity across country

❖ Overall, schooling negatively correlate with fertility in SSA at country level.

2. Theories on family size – schooling relationship

Becker (1960)'s quantity-quality trade-off : budget constraint and resource dilution

Mister Elephant's family	Number of children	Resources available for education	1st child	2nd child			Investment /child
	2	//// ////	// //	// //			// //
VERSUS							
Mister Rabbit's family	Number of children	Resources available for education	1st child	2nd child	3rd child	4th child	Investment /child
	4	//// ////	//	//	//	//	//

2. Theories on family size – schooling relationship

Quality may also complement quantity (Qian, 2009).

Example 1 : Child labor (Mueller, 1984a). Socially accepted and common in SSA.

Mister Elephant's family	Number of children	Resources available for education	1st child	2nd child			Investment /child
	2	//// ////	// //	// //			// //
VERSUS							
Mister Pragmatic Rabbit's family	Number of children	Resources available for education	1st child	2nd child	3rd child	4th child	Investment /child
	4	//// //// + /// x 4	//+///	// +///	//+///	//+///	// ///

2. Theories on family size – schooling relationship

Example 2 : Chain arrangement (Mueller, 1984a)

Mister Elephant's family	Resources available for education	Resources available for education	1st child	2nd child			Investment /child
	2	//// ////	// //	// //			// //
VERSUS							
Mister Smart Rabbit's family	Number of children	Resources available for education	1st child	2nd child	3rd child	4th child	Investment /child
	4	//// ////	// //	// //	///	// + ///	// //

2. Theories on family size – schooling relationship

Example 3 : Economies of scale (Rosenzweig and Zhang, 2009)

Mister Elephant's family	Number of children	Resources available for education	1st child	2nd child			Investment /child
	2	//// ////	// //	// //			// //

<div align="center">VERSUS</div>

Mister Smart Rabbit's family	Number of children	Resources available for education	1st child	2nd child	3rd child	4th child	Investment /child
	4	//// ////	//	//	//	//	// //,

2. Theories on family size – schooling relationship

Relationship between family size and schooling : endogeneity issue. **Why?**

3. Motivation of the research

i.
- Extensive literature on Becker's quantity-quality trade-off

ii.
- Methodology in recent years : RCT in family planning, siblings' sex- composition, twin birth..

iii.
- No causal identification study to explore quantity-quality trade-off in SSA.
- SSA provides interesting settings (highest fertility, lowest schooling, high twinning rates…).

In a nutshell…

- Shed light on quantity-quality trade-off in the context of SSA countries

- Twin birth instrument to tackle endogeneity issue

- Discuss the mechanisms driving our results

Main findings : No evidence of a QQ trade-off. Our results suggest that family size positively affects schooling in the richer households. Economies of scale in children education is likely the underlying mechanism.

4. Data

86 Demographic and Health Survey (**DHS**) rounds in **34 SSA countries** over the period **1990-2014**

Sample : **456,068** siblings of schooling age (6-18) out of which **99,875** first and second born of 3+ families.

Schooling : completed years of education in age-standardized z-score

Family size : number of household head's children (of schooling age) living in the household

5. Methodology

❖ OLS and IV estimations controlling for a large bunch of child-level, parents-level and household-level characteristics

❖ For the IV : use of twin at 2nd, 3rd and 4th birth to instrument for family size.

❖ Validity of our instrument : confounding factors (Smits and Monden, 2011); exclusion restriction violation (Rosenzweig and Zhang, 2009); stability of estimates and R2 (Altondji et al. 2005); bound estimates (Conley et al. 2012; Bhalotra and Clarke, 2016).

❖ Account for SSA specific context : polygamy, out wedlock children

❖ Nine robustness checks : alternative samples/ changing the unit of decision/alternative definition of key variables/changing estimation techniques

7. Results

Figure 1: Effect of family size - OLS regressions with 3+families
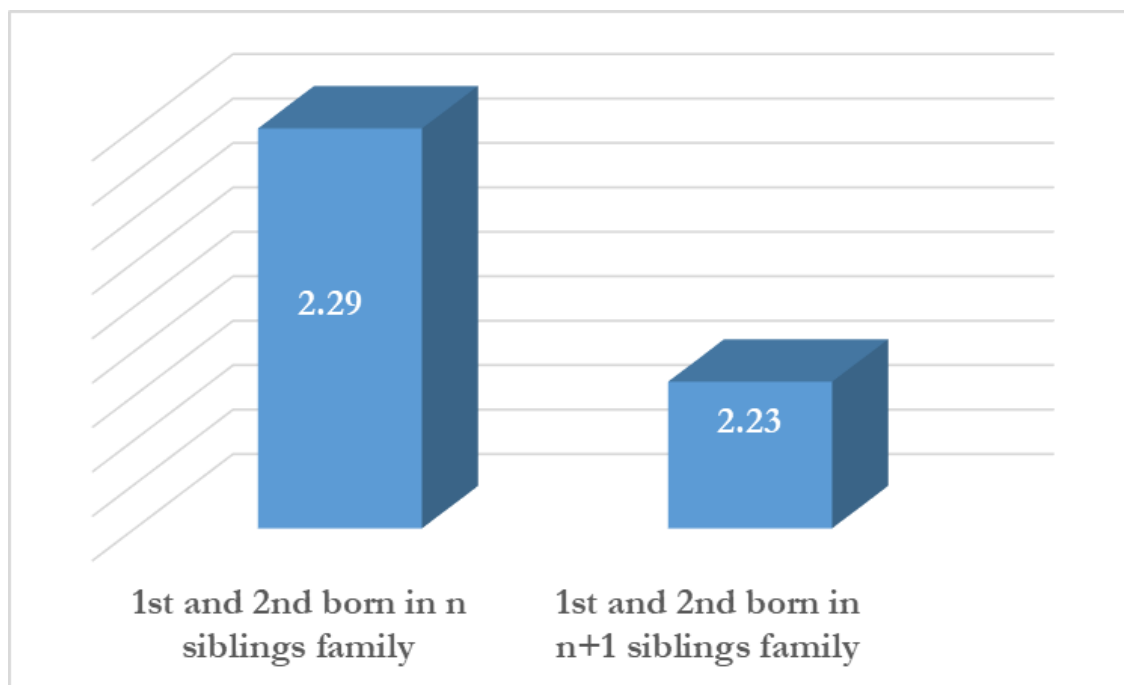
Average completed years of education : 2.29

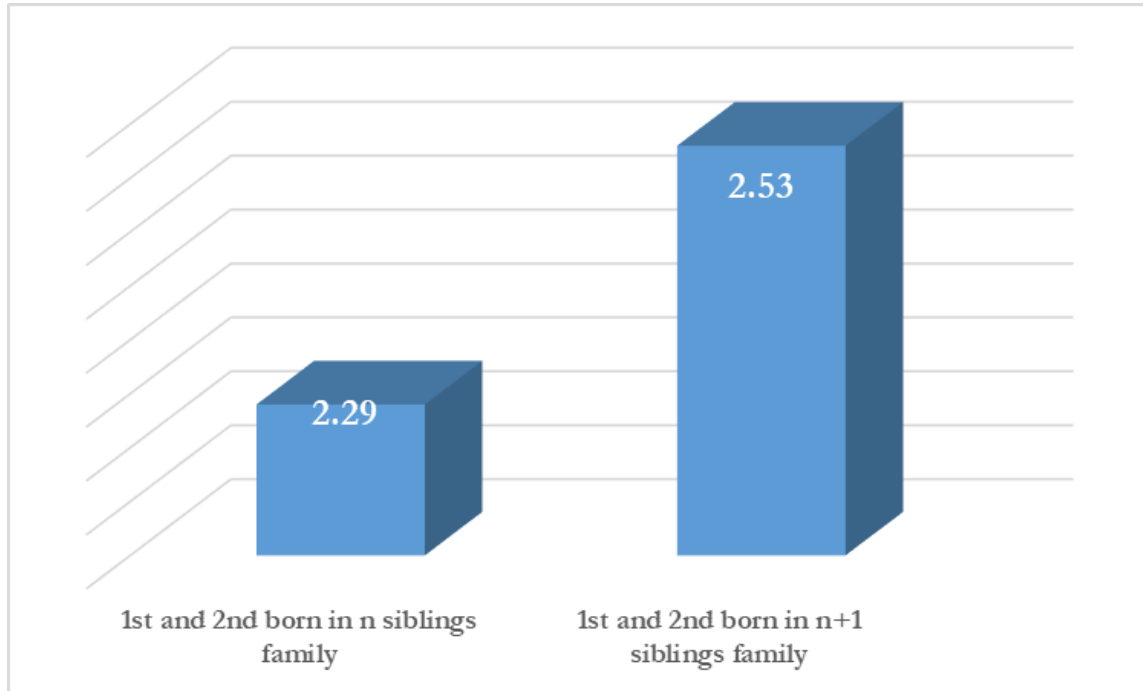Decrease in the education of a representative child in our sample by 0.06 year

7. Results

Figure 2: Second stage IV estimates – 3+ Families

Average completed years of education : 2.29 in 3+Sample

Increase in the education of a representative child in our sample by 0.24 year

7. Results

Table 1: Bounds' estimates of family size effect on children schooling using Conley's UCI and LTZ approaches

	Union of confidence interval (UCI)		Local to zero (LTZ)		
	Lower bound	*Upper bound*	*Lower bound*	*Coefficient*	*Upper bound*
2+ Families	-0.108	0.127	-0.109	0.020	0.149
3+ Families	-0.002	0.176	0.017	0.119**	0.221
4+Families	-0.196	0.048	-0.162	-0.033	0.095

Note.—*The bound estimates are derived using the 'Plausexog' command in Stata and are based on the prior that being from a twin family has a direct effect $\gamma=0.005$ on educational outcomes (which for UCI bounds, is more conservative compared to the 0.004 used in Bhalotra and Clarke, 2016 for developing countries). The UCI bounds are derived based on gamma-min =0.000 and gamma-max =0.010 while the LTZ bounds are derived based on $\gamma = 0.005$ with a sd of 0.007 (the sd results from 100 replications bootstrap estimations and we perform test of normal distribution of γ; see details in Table A3 in Appendix). Since the LTZ does not allow for factor variables, we exclude mother's ethnicity from the equation and all other variables enter as continuous variables. When applied to the baseline specification, this does not qualitatively change our results.*

7. Results

Heterogeneity in the effect of family size using twin at 3rd birth instrument :

	Positive effect (+ 0.28 year)
	No effect
	No effect
	Positive effect (+0.45 year) Positive effect (+ 0.32 year)

 Positive effect of family size on children schooling, especially in richer families of 3+ Sample stable across all nine robustness checks.

8. Discussion

❖ Causes of increase in schooling in 3+Sample: increased enrolment ? early enrolment ? lower dropout of the first born and/or the second born?

❖ In response to an exogenous increase in family size at third birth order, *relatively wealthy households send their second born earlier to school when the age difference with the first born is small.*

❖ Possible motivation : pool schooling inputs to take advantage of **economies of scale**. Within reach of the more wealthy households but not of poorer families.

❖ In line with previous findings (e.g. Qian, 2009; Rozenszeig & Zhang, 2009).

❖ **Child labor** and **chain arrangement**: less in line with our findings.

Conclusion

❖ Overall, no evidence of quantity-quality trade off in SSA, casting doubt on the generally assumed negative causal relation between family size and schooling.

❖ In the subsample of first and second born from relatively rich households with 3 or more children : positive effect of family size on schooling and this effect survives various robustness checks.

❖ This positive effect is likely driven by economies of scale. However, we cannot conclusively rule out alternative explanations, such as the chain arrangement.

Main limitations

❖ Focus on outcomes of the first- and second- born : findings cannot be generalized (Qian, 2009).

❖ Capture a process in motion, not a long term equilibrium. In the longer run, the positive effect of family size on schooling in non-poor households might fade away.

❖ Economies of scale mechanism needs further tests with household consumption data. The short-term horizon does not allow for explicitly testing of the chain arrangement.

THANK YOU FOR YOU KIND ATTENTION.

Table : Summary of robustness checks using 3+Sample

Check	Table	Description	Coefficient on number of children		
			All families	**Poor families**	**Non-poor families**
1	Table A4	Heterogeneity of twin at 3rd birth			
		Interaction with Rural	*0.098***		
			(0.047)		
		Interaction with Mother is Muslim	*0.092***		
			(0.046)		
		Interaction with Rural West&Central Africa	*0.094***		
			(0.047)		
2	Table A5	Partially missing instruments with non-linear specification			
		Number of children>3	*0.275***	*0.189*	*0.473***
			(0.127)	*(0.180)*	*(0.194)*
		Number of children>4	*-0.104*	*-0.144*	*-0.239*
			(0.115)	*(0.153)*	*(0.184)*
		Number of children>5	*0.023*	*0.019*	*0.124*
			(0.129)	*(0.179)*	*(0.229)*
3	Table A6	Expand sample incl. households in which some school-aged children reside outside the household	0.091*	0.092	0.111*
			(0.048)	(0.090)	(0.061)
4	Table A7	Decentralized approach (mother as decision unit)	0.067	0.047	0.136**
			(0.043)	(0.066)	(0.061)

Table : Summary of robustness checks using 3+Sample

5	Table A8	Alternative definition of the number of children (as the total number of births given by the household head's wives)	0.092* (0.045)	0.054 (0.076)	0.136** (0.060)
6	Table A9	Education Z-score calculated with censored completed years of education (to the child's age minus 6 at most)	0.113** (0.041)	0.115 (0.076)	0.130*** (0.050)
7	Table A10	Completed grade (years of schooling) as outcome variable	0.144* (0.079)	0.027 (0.141)	0.254** (0.101)
8	Table A11 Panel A	Region of residence of the household instead of mother's ethnicity FE	0.063 (0.041)	0.025 (0.079)	0.107** (0.053)
	Panel B	Country-by-urban/rural instead of mother's ethnicity FE	0.097** (0.044)	0.074 (0.070)	0.139** (0.055)
9	Table A12	Alternative definition to discriminate between poor and non-poor families	-	0.034 (0.073)	0.138** (0.059)