Dynamic complementarities: Primary student responses to Free Secondary Education in Tanzania

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INTRODUCTION: In Tanzania, primary students hoping to advance to secondary school face both academic and financial constraints. If they don't score high enough on the Primary School Leaving Examination (PSLE), they can't be admitted to government secondary schools.[1] But even if a student can score high enough to be admitted, she will not advance to secondary school if she can't afford to pay the school fees.

Neither of these future constraints should affect students' investment in *primary* schooling if the returns to education are decreasing, as held by the scholarly consensus until recently (Psacharopoulos & Patrinos, 2010). Under this paradigm, a student who doesn't expect primary school to pay off certainly won't expect secondary school to pay off. However, more recent evidence suggests that in many contexts the returns to schooling are convex – and Mincer regressions suggest this is the case in Tanzania. Under these conditions, students' decisions about investments in primary school may be affected by the constraints on their secondary education.

THE POLICY: In 2015, Tanzania reduced the cost of secondary schooling by creating a Free Secondary Education (FSE) program which abolished public secondary school fees. In this paper, I show that the policy affected primary school students' educational investments, as proxied by their PSLE test scores. Thus a policy designed to alleviate financial constraints also affected students' academic constraints.

It can be challenging to identify causal effects of nationwide policies. I use two complementary identification strategies – at the school and household level – drawing on the universe of high-stakes PSLE scores from mainland Tanzania between 2013-2018.

SCHOOL-LEVEL TREATMENT INTENSITY IDENTIFICATION: First, following the literature on free primary education (e.g. Mbiti and Lucas (2012)), I measure primary schools' "intensity of treatment" by the fraction of their students who dropped out between primary and secondary school before the reform, under the assumption that schools where most students could expect to advance to secondary school were less impacted by the FSE program than schools with high primary-secondary dropout rates. In a difference-in-difference framework, I compare whether higher pre-reform-dropout-rate schools saw differential results after the FSE policy was instituted in 2015

Table 1 shows the results for student-level outcomes. The three outcomes I examine are students' raw PSLE scores (converted to a 4-point GPA scale), their percentile in the Tanzania-wide distribution of PSLE scores, and whether they went on to take the first national test of secondary school, the Form Two National Assessment (FTNA), a proxy for secondary school enrollment. As shown in the third row of the regression table, students from high-dropout schools saw disproportionate jumps in all these outcomes after the institution of the FSE policy, indicating that students in these schools may have invested more in primary education in response to the increased access at the secondary level.

[1] Private secondary schools can admit students who are willing to pay tuition, regardless of their PSLE scores.

Table 1: Diff in diff by school's pre-reform continuation: Student-level outcomes rate

	Average GPA		Ptile in global distribution		Took FTNA	
2013 dropout rate $\geq$ median (94%)	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)
Post-2015	-0.353***	-0.347***	-0.018***	-0.014***	0.111***	0.107***
	(0.007)	(0.007)	(0.002)	(0.002)	(0.003)	(0.003)
2013 dropout rate $\geq$ median (94%) $\times$ Post-2015	0.051***	0.051***	0.025***	0.021***	0.016***	0.028***
	(0.007)	(0.007)	(0.002)	(0.002)	(0.004)	(0.004)
Year	0.185***	0.188***	-0.001	-0.003	0.044***	0.044***
	(0.002)	(0.008)	(0.001)	(0.003)	(0.001)	(0.009)
N	4354495	4354495	4354495	4354495	2954216	2954216
Mean (pre-reform)	1.655	1.655	0.500	0.500	0.160	0.160
FE?	School	School	School	School	School	School
Trends	None	District	None	District	None	District

Standard errors clustered by school. schools are defined as those where the number of 2013 test takers who showed up in the secondary school test two years later is below the median (94%).

* p<0.10, ** p<0.05, *** p<0.01

HOUSEHOLD-LEVEL TREATMENT INTENSITY IDENTIFICATION: I complement the above with a household-level strategy, matching pupils with the same last name who took the PSLE in successive years at the same school (I call these matched pupils "siblings"[2]). Dropout outcomes are correlated withing households; students whose older siblings dropped out are likelier to drop out themselves. I therefore consider more intensely treated households to be those in which older siblings were more likely to drop out compared with peers at the same school in the same year who got the same grades. I identify primary school students whose pre-reform siblings *did* vs. *didn't* continue on to secondary school, and compare how the difference in these two groups' test scores changed after the reform.

Table 2 shows the results.

[2]While Tanzania is a place where siblings share the same last name, I have no way of knowing whether students with the same last name who go to the same school are really from the same family. In this analysis I limit the sample to students who share a last name with someone whose last name was unique within their school's 2013 PSLE cohort.

Table 2: Student level: Diff in diff by siblings' continuation

	Average GPA	Z-Score: Average GPA	Continuation to 2ndary
Older sib dropout	-0.030***	-0.040***	-0.047***
	(0.005)	(0.006)	(0.003)
Post-2015	-0.402***	-0.037***	-0.048***
	(0.009)	(0.011)	(0.005)
Older sib dropout × Post-2015	0.024***	0.036***	0.007
	(0.006)	(0.007)	(0.004)
Year of younger sibling's PSLE	0.216***	-0.002	0.108***
	(0.003)	(0.003)	(0.003)
N	447650	447650	274948
Adj. R^2	0.313	0.287	0.167
Mean (pre-reform)	1.701	0.000	0.383
School FE	Y	Y	Y
Older sib's GPA FE	Y	Y	Y

Standard errors clustered by school.

Sample limited to 2014-2018 PSLE takers who have the same last name as a 2013 PSLE taker whose last name is unique within her school

* p<0.10, ** p<0.05, *** p<0.01

The introduction of FSE erased the grade gap between the younger siblings of dropout vs. non-dropouts (including GPA and school fixed effects). However, it did not affect the gap in the dropout rate of younger siblings. This shows that much of the relevant variation in secondary continuation is at the school level.

CONCLUSION: Both complementary identification strategies show that pupils with low pre-reform prospects of secondary school saw a larger increase in their scores after the reform. Across differentially treated schools, the reform made students at schools with higher dropout rates differentially more likely to score highly in the national distribution, and less likely to drop out before taking the next high stakes exam in secondary school, two years later. This is consistent with survey evidence showing convex returns to schooling, and suggests that financial constraints on *secondary* school dampened investments in *primary* schooling prior to the FSE reform.

References

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