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Why are boys falling behind? Explaining gender gaps in school attainment in Sri Lanka

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Abstract

A trend that is increasingly common in developed countries and middle income countries such as Thailand, South Africa, Malaysia, Indonesia and Sri Lanka is that females outperform males in terms of attainment at school and enrolment in higher education, on average. Alarmingly in countries such as Sri Lanka and Thailand, households also seem to allocate significantly higher resources towards girls' education rather than boys' (Himaz, 2010, Wongmonta and Glewwe, 2017). This paper looks at attainment in mathematics among a sample of 12 year olds in Sri Lanka to see to what extent parental aspirations, teacher attitudes as well as school-based management programs, *inter alia*, can explain gender differentials disfavouring boys. The paper finds that although teacher attitudes and parental aspirations are significantly lower for boys, these factors -as we measure them- do not sufficiently explain the attainment gap. Much of the gap remains 'unexplained' and is due to differences in *returns* to endowments. The paper argues that positive discrimination of men in the labour market and bottle necks in higher-education may be important in understanding the unexplained component.

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1. Introduction

An emerging trend in middle income countries such as Malaysia, Thailand, Sri Lanka, the Philippines, South Africa and Burma, matching similar trends in high income OECD countries, is the significant lagging behind of men compared with women, on average, in terms of enrolment in post-compulsory schooling, participation in tertiary education (see Appendix Figures A1-A2) and attainment at school. Disparities in Sri Lanka in this regard are particularly high. For example, evidence for Sri Lanka shows that 63 per cent of all state university enrolments in 2015 comprised females, across all disciplines including medicine, science, arts and management with the only exception being engineering where the female to male enrolment ratio was 35:65. Female participation was also high at other tertiary institutions with the female to male ratio being 61:39[1]. This divergence is clear at almost all levels of education in various dimensions. Senior secondary school completion rates, for instance, are higher for females than males and correspondingly the dropout rate for boys are higher at 33 per cent compared to 28 per cent in girls. Moreover, attainment at the end of junior secondary (grade 8) is lower for boys rather than girls based on standardised test scores for Maths, Science and English (Dundar et al., 2017). Even at the primary school level, girls seem to outperform boys in terms of attainment in mathematics and language (Sinhala or Tamil) with entrance scores based on the national grade 5 scholarship exam for the most prestigious girls' schools being higher than for boys' schools in the past few years. Quite notably (and perhaps alarmingly) in countries such as Sri Lanka and Thailand, households seem to allocate significantly higher resources towards girls' education rather than boys especially in the run up to major public exams(Himaz, 2010; Wongmonta and Glewwe, 2017). This may be contributing to the higher performance of girls whilst also being reflective of attitudes within households towards male versus female engagement in formal education.

There are various explanations offered in the literature, particularly those pertaining to OECD countries, as to why boys may be falling behind. The views draw from various subjects including neurology, psychology, pedagogy, economics, feminism, politics, history, geography and anthropology. They can be roughly grouped as pertaining to individual,

[1] Own calculations based on University Grant Commission 2015 data.

societal/labour market-oriented and school environment-related aspects. At the individual level, a key contributor to differential attainment between boys and girls may be due to them facing different cognitive and non-cognitive developmental timetables, on average, during infancy due to neurological and hormonal factors (Schore, 2017). Indeed by most measures of sensory and cognitive development girls are more advanced than boys during infancy with vision, hearing, memory, smell and touch all being more acute for girls than boys. Thus by the time they start school, girls tend to exhibit more 'readiness' for school with more developed language and non-cognitive skills compared to boys. These differences in early childhood may influence parental, teacher and even child attitudes setting boys up on a trajectory of lower attainment (Cornwell, Mustard, & Van Parys, 2013). Although environmental factors can accentuate or reduce differences in the attainment of skills, implicit biases can affect child outcomes even at the preschool stage (Gilliam, Maupin, Reyes, Accavitti, & Shic, 2016).

Contributing to differences in attitudes are societal factors and gender stereotyping. For example boys maybe subject to lower parental supervision (Goolamally and Ahmad's (2010) from (UNGEI, 2012)) and lower teacher expectations regarding 'responsible' behaviour ((Abdullah, 2009). Thus socially acceptable male behaviours may often be considered incongruent with academic achievement. Participation in education beyond compulsory years can also be lower for men if there is a higher expectation for men to contribute to household incomes rather than women.

Another less-researched explanation- particularly applicable to Sri Lanka and possibly other developing countries -is supply-side bottle necks in higher education that can also influence attitudes to education at a younger age. For example, if university places are very competitive and limited then investing time and effort to secure a place in higher education maybe seen as less preferable to seeking employment soon after compulsory education. Significant gender based variations in such attitudes to learning can occur if the alternative opportunities offered in the labour market vary by gender. Thus if men face a wider range of employment opportunities, are paid more for the same set of skills or have more opportunities to rent-seek through joining political organisations, it can all manifest in

lower educational outcomes, poorer attitudes to education and less incentive to participate in higher education on average among men compared to women.

Other explanations focus on classroom-level factors including learning styles, teaching styles, curriculum, teacher and student absenteeism as well as fewer male teachers (and therefore fewer male role models in education). There could also be more systemic factors such as how education is delivered. For example, centralised education systems may give schools less power and control to make decisions that suit their particular context, compared to decentralised education systems that provide a mechanism for collaboration between schools and local communities. School based management programmes, for instance, that transfer decision making authority of some aspects of school operations to local community members and stakeholders can support the improvement of boys' performance especially if their falling behind is recognised to be a concern in the local context[2].

There is little research specific to developing countries regarding the issue of gender gaps disfavouring boys apart from reports such as (UNICEF, 2006) that raise the issue and suggest free education and strategies to improve school attendance as ways forward, *inter alia*. The case of Sri Lanka offers a good opportunity to glean some insights into this issue. Education has been 'free' since 1948. Therefore some of the financial cost related issues pertaining to accessing education are lower in Sri Lanka compared to other developing countries. Moreover high enrolment and gender parity in school enrolment were targets

[2] Most of the insights as to how to improve the performance of boys also come from the literature pertaining to OECD countries. They focus mainly on influencing attitudes to reduce negative gender stereotyping within schools and communities. Thus specific strategies to improve boys performance include the use of peer groups, family and community to help smooth transitions over the school trajectory to reduce bullying and the setting in of negative stereotyping, early intervention programs through community based parenting efforts and the involvement of fathers/males and other school-based interventions that include attracting more male teachers (Hillman and Robinson, 2016; Younger, Warrington, & McLellan, 2005). There is also the recognition that focussing simply on education sector reforms is insufficient for what is a complex issue and policy efforts should be collaborative, encouraging coherence across policies including economic, labour, gender rights and finance policies (UNESCO, 2015).

achieved many decades ago. In spite of such strides, gender inequalities disfavouring boys have emerged and continue to rise. The Sri Lankan experience, therefore, can offer some useful insights to other developing countries in terms of what may matter the most when implementing gender sensitive policy.

The issue is complex so this paper uses two approaches to identify some of the underlying causes in the Sri Lankan context. It considers first whether specific household characteristics such as parental aspirations, teacher characteristics such as gender and attitudes and school characteristics such as whether the school based management initiative (the Programme for School Improvement, PSI) is implemented, can explain significant gender gaps in maths scores among grade 7 students (aged 12) in Sri Lanka. Oaxaca-Blinder decomposition analysis is used to further understand to what extent differences in endowments versus returns to endowments can explain the gap in attainment. The data used comes from two rounds of panel data (that follow the same schools rather than the same individuals) collected by the World Bank in 2012 and 2016. The second approach is to go beyond factors limited to the compulsory the school system and look at post-compulsory education and the labour market. Thus the paper uses data from the 2012/13 Household Income and Expenditure Survey collected by the Department of Census and Statistics to see what drives lower male enrolment beyond the compulsory years of schooling (age 14). This analysis also looks at gender-based asymmetries in the youth labour market and the higher education system. The results from the first and second approaches are then pieced together to draw insights as to what may explain why boys fall behind in the case of a developing country such as Sri Lanka.

The paper is organised as follows. The next section looks at the data used and provides descriptive statistics. Section 3 presents the empirical specification and results while section 4 concludes.

2. Data and Descriptive Stats

The data used for looking at what explains gender-based differences in math scores amongst 12year olds come from two rounds of data collected by the World Bank in 2012 and 2016. The data set is longitudinal, following the same schools over time, collecting data in each school for a class of grade 7 students, their households, and teachers and school-level characteristics. The original purpose of the data collection was to assess the effectiveness of the PSI implemented by the Government. The rich dataset, however, enables us to see to what extent explanations such as teacher gender and attitudes, parental aspirations and other factors can explain differentials in male versus female mathematics scores in grade 7. The PSI and data collection methods will be discussed next before proceeding to discuss variables and their definitions.

The PSI is an initiative to decentralise school management by providing a mechanism such that key members from the local community (including parents) and schools can collaborate through the appointment of a school management committee. The PSI is expected to empower schools and build stronger partnerships with local communities facilitating fund raising opportunities, inter alia that can be used to improve student learning. Indeed, when implemented previously in 2006-8, the program was found to significantly improve math and English reading test scores among grade 4 students (9 year olds) and support schools to establish a list of priorities and use local fund raising efforts to implement projects[3]. If parents, teachers and the communities recognise that lower male attainment in education is an issue, then decentralised management can help to find local-level solutions to address it with success reflected in higher end line test scores.

The PSI was implemented in 36 schools across all 9 provinces in the country in 2012 which forms the treatment group. Another 36 schools were carefully selected to match the

[3] Aturupane, Glewwe, Ravina, Sonnadara, & Wisniewski, (2014) provides more details on the PSI itself. They also show that when the PSI was implemented in 2006 with follow up data collected in 2008, positive impacts were found on maths and English reading tests among grade 4 students. But there was no impact on the scores of grade 8 students or on any of the other teacher or school related variables they considered such as teacher absence, frequency of homework set or teacher's perception as to whether money was allocated for quality inputs. However the PSI appeared to have led schools to form School Development Committees, establish a list of priorities and use local fund raising efforts to implement projects.

treatment group in terms of number of students, school type (IAB, IC and 2)[4], school 'level'[5] and race (Sinhalese, Tamil, Muslim) to form the control group[6]. Table 1 below provides more details on the number of schools in the treatment and control groups by district.

Table 1: Sample Distribution of Schools Selected for Baseline Survey 2012 by District

Province	District	Total	Treatment	Control
Southern	Hambantota	5	5	-
	Matara	4	3	1
	Galle	5	-	5
Western	Gampaha	3	3	-
Sabaragamuwa	Kegalle	4	-	4
	Ratnapura	3	3	-
Northern	Jaffna	3	3	-
North Western	Puttalam	7	-	7
	Kurunegala	6	4	2
Central	Kandy	3	1	2

[4] Secondary schools can be type 'IAB', 'IC' or 2 in Sri Lanka. Type IAB offer curriculum streams science (including mathematics), arts and commerce that students can take for advanced level examinations. These schools teach grades 1-13. IC schools also teach grades 1-13 but offer only arts and commerce streams. Type 2 does not offer grade 12 or 13 classes. There are also small Type 3 schools that teach grades 1-5 or 1-8 but our sample does not contain any of these schools.

[5] There are five types of school 'levels': very congenial, congenial, uncongenial, difficult and very difficult.

[6] In more detail, the school selection process is as follows. Sixteen districts were chosen from the 9 provinces. In five of the provinces, two districts were picked with each either containing all treatment or all control schools to avoid possibilities of students switching schools once the program was implemented. It was assumed unlikely that the program would cause students to move school from one district to another.

	Nuwara Eliya	8	4	4
Uva	Badulla	5	1	4
North Central	Polonnaruwa	5	5	-
	Anuradhapura	5	-	5
Eastern	Ampara	3	1	2
	Batticaloa	3	3	-
	Total	**72**	**36**	**36**

Around 20 students were selected from each sample school, from the Grade 7 class, to participate in the baseline survey (pre-intervention)[7]. All schools are 'mixed', containing both boys and girls. Data collected for these children (the Student Survey) include test scores in Mathematics (with the same tests administered in both rounds of the survey), their perceptions of the quality of their maths teacher as being accessible, friendly, encouraging class participation and giving regular feedback. The survey also included a 'Teacher Survey' collecting data from 5 teachers per school including the Mathematics and English teachers who taught the class of grade 7 students in the Student Survey and three other teachers in language, Science, History/Geography and first language for the relevant Grade 7 class in each school. The questions asked were regarding their experience in teaching, motives for joining the profession, teaching styles and perceptions of class performance. In addition to this teacher survey a school-level survey was conducted with data gathered from the principal of the school regarding their own experience and qualification as well as school resources. Finally household level information for the 1440 children were gathered based on a separate household survey where the respondent was mainly the child's parent or parents. Each record for a student in the student survey corresponds to a unique household in the household survey (i.e., the sample contains one student per household). The same information was gathered in 2016 from students in grade 7, households, teachers and principal after the PSI was implemented.

[7] If the class size exceeded 20, simple random sample method was used to select the students. However in a few schools there were less than 20 students in Grade 7.

Table 2 shows, as expected, that PSI and non-PSI schools do not differ significantly in terms of baseline school characteristics that the randomisation was based on. It also shows that the baseline maths scores are not statistically significantly different between the treatment and control groups and that there are no differences even in terms of most other individual, household and teacher characteristics. In the regression analysis in the next section, we include some of these variables directly into the regression so that they are no longer a part of the error term. This also reduces the chance that the coefficients on the treatment and time dummies are biased, in the event that are correlated with these variables. Some of the other variables where significant differences exist are used in the robustness checks conducted later on in the paper to assess the validity of the parallel trends assumption.

Table 2: Selected baseline characteristics between PSI and non-PSI schools

	Comparison Group	PSI Schools	Difference in means
School Characteristics			
Offers Science grades 12/13[3]	0.167	0.194	-0.0278
Offers only arts/commerce grade12/13[3]	0.500	0.583	-0.0833
Classes only up to grade 11[3]	0.333	0.222	0.111
Principal's professional grade[4]	3.447	3.279	0.168
Male Principal	0.84	0.89	0.055
Observations (schools)	36	36	
Student Characteristics			
Standardised maths score	-0.0901	0.00823	-0.098
Missed days of school	13.23	12.27	0.962
Hours spent on leisure	302.5	291.0	11.51
No breakfast	0.433	0.258	0.175***
Participation in co-curricular	0.469	0.413	0.0569***

activities			
Household Characteristics			
Most educated (years)	9.649	9.378	0.271
Household size	1.585	1.590	-0.00423
Income (log)	9.807	9.768	0.0389
Observations (students/households)	643	681	
Teacher characteristics and perception[1]			
Male teachers (proportion)	0.346	0.307	-0.039
Teacher experience (years)	12.18	12.97	0.078
Teaching style[2]			
Explaining	8.172	8.422	-0.250
Blackboard	4.544	4.506	0.0389
Asking questions	5.672	5.700	-0.0278
Students reading textbooks	10.01	9.472	0.533
Discipline	2.128	2.322	-0.194
Feedback	3.850	4.006	-0.156
Observations (teachers, 5 per class/school)	630	630	

Notes: [1]Summary of characteristic for teachers teaching the student English, Math, Science, First Language and History/Geography [2] Minutes spent in a typical 40 minute lesson on the following activities [3]Secondary schools can be type 'IAC', 'IB' or 2 in Sri Lanka. Type IAC offer science (including mathematics), arts and commerce subjects that students can take for Advanced Level examinations (grades 11 and 12). IB schools offer only arts and commerce subjects. Type 2 schools do not offer grade 12 or 13 classes. [4]Highest professional qualification attained by the principal; ranging from 1 to 5: 1= certified teacher, 5=Ph.D. or MPhil in education. Significance of standard errors, *** p<0.01, ** p<0.05, * p<0.1

Table 3 provides summary statistics for the key variables used in the ensuing regressions, by gender, for the full sample of around 2600 children for whom complete data is available from both rounds of data. Quite noticeably, math scores are significantly lower for boys compared to girls at 22.71 versus 26.60[8]. Another significant difference lies in aspirations regarding whether the child will pursue education beyond the compulsory schooling age of 14, as reported by the parents. This is likely to be influenced by a student's prior attainment as well as labour market opportunities and gender-stereotyping. Although the measure captures some of the implicit gender based biases and future opportunities it is crude not the least because 14 per cent of the parents (divided equally between boys and girls) were unsure about future plans and have been assigned category 1, arbitrarily, to avoid loss of observations. There is also a significant difference at the 10 per cent level in boys' rating their maths teachers compared to how girls rate their teacher. The rating was based on answers for five questions that asked the children how friendly and accessible teachers were within and outside class room, their perception on how knowledgeable the teacher is regarding the subject matter, the teacher giving regular feedback on work, using different types of methods to teach in class and encouraging class participation. A comparison of responses to these questions showed that girls score teachers significantly higher on accessibility, knowledge of subject matter and providing regular feedback than do boys. We consider the student responses to these questions as being reflective –although imperfectly- of teacher attitudes towards them. Thus the rating is considered a proxy for teacher attitudes and gender differences in this rating maybe indicative of implicit biases in the classroom favouring girls. Around 40 per cent of the maths teachers in the full sample are male. There are no significant differences teacher's experience (measured by in-service grade) and the school characteristics experienced by boys versus girls. The table also shows that significant differences between boys and girls exist in terms of time use: Boys tend to spend significantly more time with friends or watching TV compared to girls. This corresponds somewhat to teachers' observation in a case study conducted in Sri Lankan schools that suggests parental supervision is lower for boys ((H Aturupane, Shojo, &

[8] Another point to note is that scores are low overall for both boys and girls for a test marked on a 100. This corresponds with several other studies that note how student attainment in Sri Lanka is low by international standards in spite of high enrolment ((Dundar, et al., 2017) .

Ebenezer, 2018). Spending more time in 'leisure' may also be indicative of lower motivation and lower prior attainment. However, there are no differences in the hours spent on taking extra tuition (i.e., participating in shadow education). Children in the sample spent on average 3.5 hours taking extra tuition outside school hours in a typical week. The survey does not ask what subject extra tuition was taken in. Overall, child energy levels at school are likely to be low with 33 per cent of girls and 37 per cent of boys reporting not having had breakfast at least a few times over the past week and around 20 per cent of the children reporting that there were several days over the past year with no food at home for lunch after school.

Table 3: Mean Individual and household characteristics by gender, pooled sample of grade 7 students (2012 and 2016)

Variable name	Variable description	Girls	Boys	Differences in means (1)-(2)
Individual and Household characteristics				
Maths test score (standardized)	Standardized score in mathematics exam	0.099	-0.102	0.202***
Maths test score (%)	Non-standardized percentage score	26.49	22.71	3.472***
Parental aspiration	Response to question asked from parent: 'What is your child's plan after Compulsory (Basic) Education?' 1=stop after compulsory education, 2=compulsory education + vocational course 3= Complete grade 11 4= complete grade 11+vocational course, 5= complete	5.756	5.467	0.289**

	grade 13, 6= complete grade 13+ vocational, 7=complete A/Professional, 8=complete a degree. Those respondents, who say they are 'unsure', have been coded as 1 (14 per cent).			
Teacher rating	Average of the student's rating of his or her maths teacher ranging from 1 (strongly disagree) to 5 (strongly agree) on each of the following 5 aspects: Teacher is very friendly and approachable in class and outside; Teacher uses different methods to teach (e.g. Discussions, group work, field visits etc); Teacher encourages group activities in class (discussion/ project etc); Teacher seems to have a good knowledge about the subject Teacher gives you feedback on your assessments	4.10	4.05	0.04**
hhsize	Log of household size	1.588	1.560	0.0283**
Income	Log of total monthly household income	9.931	9.965	-0.0339
mosteduc	Education level of the most educated parent in the family, ranging from 0 (no education) to 16 (Ph.D. or post graduate study)	9.500	9.710	-0.210
Sinhala	Ethnicity of household head is Sinhala	0.653	0.670	-0.0175
Tamil	Ethnicity of household head is Tamil	0.194	0.225	-0.0310

Time play	Total time (in minutes) a student spends in a typical week on playing on his/her own or with friends and on TV/computer entertainment.	269.8	302.6	-32.82***
Tuition hours	Average number of hours per week during the school year spent attending tuition classes outside school hours (taken from the student questionnaire)	3.406	3.421	-0.0158
No breakfast	=1 if student's response is 'yes' to at least one of the following questions (and 0 otherwise): 'During past week were there several days you did not have a breakfast?'	0.330	0.375	-0.0454*
Co-curricular activities	The mean of 8 dichotomous responses as to whether the student participation over the past year in school sports, clubs and societies, cultural/religious activities, drama, cadetting/scouting, creative activities, community development work, other.	0.453	0.454	-0.00132
Mathematics class/teacher characteristics				
Separate class	Taught in a separate class room	0.471	0.485	-0.0142
Teacher gender	Gender of maths teacher (=1 if male)	0.413	0.458	-0.0451*
incentive	An incentive mechanism is present for encouraging better student performance (1=not at all, 2=sometimes, 3=most of the time,	2.957	2.900	0.0572

	4=all the time)			
experience	In service grade of teacher	2.869	2.856	0.0131
Number of Obs.	Total number of grade 7 students from the 2012 and 2016 surveys.	1356	1240	

Significance of standard errors, *** p<0.01, ** p<0.05, * p<0.1

Table 4 presents maths scores for boys and girls separately by year. In both the baseline and end line years, math scores for girls are significantly higher than those for boys. The average scores increased for both boys and girls over time. The change from 0.048 in 2012 to 0.14 in 2016 is positively significant at the 10 per cent level for girls. However, the increase in boys' scores is not statistically significant.

Table 4: Standardised math scores by age and year

	Boys			Girls			
	N	Mean (1)	Standard deviation	N	Mean (2)	Standard deviation	Difference in mean (1)-(2)
2012 (baseline)	619	-0.145	1.038	722	0.048	0.965	-0.194***
2016 (end line)	632	-0.062	0.096	672	0.140	1.00	-0.202***
Change over time		0.083			0.091*		

Significance of standard errors, *** p<0.01, ** p<0.05, * p<0.1

3. Explaining the gaps in attainment and enrolment

3.1. Gaps in math scores at age 12

The impact of the PSI on grade 7 standardised maths test scores (the average treatment effect) is estimated using a standard difference in differences strategy that compares the change over time the observed test scores of those in schools where the initiative was not implemented with those where it was ((Angrist and Pischke, 2008; Lechner, 2011). Thus the basic empirical model estimated is as follows:

$$y_{ist} = \propto + \beta_1 X_{it} + \beta_2 year_{2016} + + \beta_3 (PSI_s * year_{2016}) + \beta_4 \boldsymbol{D}_s + \varepsilon \qquad (1)$$

where y_{is} refers to the non-standardised maths score (or English score) of child i from school s during time period t (with t can either be 2012 or 2016), $\boldsymbol{X}$ is a vector of individual and household characteristics (gender, ethnicity, household income per capita (in 2012 prices) and the education level of the most educated in the household). The time period dummy $year_{2016}$ that equals 1 if the year is 2016 and 0 if it was 2012 captures changes in y over the two periods even in the absence of the intervention. PSI is a dummy that equals one if the school received treatment and zero otherwise and this is interacted with year to capture the average treatment effect (ATE). All school characteristics are linearly controlled for by adding school level fixed effects D_s - Adding these fixed effects as well as student level variables increase the precision of the estimates while also accounting directly for characteristics that may be different between PSI and non-PSI schools that may violate the parallel trends assumption. Internal validity of the estimations depend critically on the parallel trends assumption holding. This assumption requires that difference between the two groups is constant over time, in the absence of the treatment: i.e., the error term is uncorrelated with other terms in the equation). Other assumptions are that the composition of the two groups is stable for repeated cross-sectional design and there are no spill over effects. Standard errors are clustered by school to account for correlation of error terms within a given school.

Table 5 columns 1-3 present results for (1) estimated together for boys and girls and for each gender separately. Column 1 shows that gender matters significantly to scores with boys scoring significantly less than girls, as expected, by about 0.25 standard deviations on

the standardised math score. Education level of most educated significantly influences math scores for both boys and girls but household per capita income and Tamil ethnicity affect specifically girls' scores. The PSI intervention has no impact on scores of either gender assuming that the parallel trend assumption holds. We test for this assumption in the next subsection and do not find evidence to suggest that the assumption has been violated. The result that the PSI has no impact on grade 7 maths scores is similar to (H. Aturupane, et al., 2014)'s finding in a previous run of the PSI during the 2006-2008 period in Sri Lanka that showed the PSI had no effect on any of the test scores of grade 8 students.

Columns 4-6 show results for specification 2: a less parsimonious version of specification 1 with other variables included such as parental aspirations, teacher attitude, teacher gender and teacher experience- all identified in the literature as being potentially important. Before including these variables we checked first that these extra variables themselves are not affected by the treatment[9]. The results confirm that the education level of the most educated in the household exerts a significant positive impact on the attainment of both genders. In addition, parental aspirations and teacher experience are significant for both boys and girls while teacher attitudes are significant for girl's performance. The results do not support the notion that teacher gender is significant in explaining attainment. Although unreported, results from another specification that included class room level variables pertaining to teaching style such as having clear incentive structures for the more able performers and safety nets for poorer performers (as reported by the teachers) showed that neither of these variables are significant[10].

[9] To check for this possibility we estimated specification 1 with parental aspiration, student rating of teacher, teacher experience and teacher gender in turn as dependent variables with PSI, PSI*year2016 and school fixed effects as independent variables. The unreported results confirm that the PSI had no impact on these variables

[10] In other estimations, we included variables such as time spent on leisure activities (e.g., watching TV) to note it has a significant negative impact on scores of both boys and girls. Replacing this variable with hours spent taking extra tuition shows that tuition exerts a positive significant effect on maths scores, again for both genders. As stated previously, the questionnaire does not ask the children as to the subject they receive extra tuition but it is likely that it is mostly in mathematics, science and English. It may also be possible that some of these variables such as hours spend in extra tuition in particular maybe affected by the treatment. We checked for this possibility by including all these additional variables in turn as outcome variables in specification 1 to find no significant ATE. But including these additional variables may also be problematic if they are correlated with the error term. For example, unobservable such as ability, motivation and attitude may be correlated with both extra tuition and time spent in leisure and if that is the case the coefficients on these variables will be biased and we therefore do not report these results.

Table 5: Grade 7 math scores (school level fixed effects with clustered standard errors).

Dependent variable: Standardised maths score

	(1)	(2)	(3)	(4)	(5)	(6)
male	-0.26***			-0.24***		
	(0.04)			(0.04)		
income	0.02	-0.01	0.04*	0.01	-0.01	0.03
	(0.01)	(0.02)	(0.03)	(0.01)	(0.02)	(0.03)
mosteduc	0.08***	0.07***	0.08***	0.07***	0.06***	0.07***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Sinhala	-0.11	-0.05	-0.06	-0.16	-0.04	-0.20
	(0.14)	(0.21)	(0.22)	(0.14)	(0.22)	(0.20)
Tamil	-0.23*	-0.19	-0.17	-0.30**	-0.19	-0.31**
	(0.13)	(0.23)	(0.13)	(0.12)	(0.22)	(0.14)
y2016	0.02	0.05	0.02	0.07	0.10	0.09
	(0.10)	(0.11)	(0.15)	(0.11)	(0.11)	(0.15)
y2016*psi	0.07	0.04	0.04	0.05	0.05	-0.01
	(0.14)	(0.15)	(0.19)	(0.13)	(0.15)	(0.18)
aspirations				0.04***	0.04***	0.04***
				(0.01)	(0.01)	(0.01)
teacher rating				0.07*	0.05	0.12**
				(0.04)	(0.05)	(0.05)
teacher experience				0.12**	0.11*	0.15**
				(0.05)	(0.06)	(0.07)
teacher gender				0.08	0.01	0.12
				(0.09)	(0.10)	(0.13)
Constant	-0.72***	-0.73**	-1.01***	-1.41***	-1.38***	-1.83***
	(0.22)	(0.32)	(0.28)	(0.29)	(0.42)	(0.37)
Observations	2,617	1,241	1,376	2,597	1,241	1,356
R-squared	0.32	0.35	0.32	0.33	0.36	0.34

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Indirect tests of parallel trends assumption

The results pertaining to the effectiveness of the PSI hold correct only if the parallel trends assumption holds. This assumes that in absence of the treatment the difference between

the treatment and control groups are constant over time. If the PSI schools were already on a 'lower than average' trajectory for reasons other than the intervention and if the regression does not control for these reasons, then the coefficient on $PSI_s * year_{2016}$will be biased and possibly an underestimate. In order to check whether the other reasons violated the parallel trends assumption we could interact these variables with the time variable $year_{2016}$ and re-estimate the specifications used to produce the results in table 4 and see if it affects the estimated coefficient on $PSI_s * year_{2016}$. Six such variables that are school level averages of household income, education level of most educated member of household, household spending on education (in 2012 prices), children's level of nutrition (proxied loosely using the 'no breakfast' variable), time spend on extra-curricular activities and hours of extra tuition are interacted with the year variable and the results for the coefficient on $PSI_s * year_{2016}$ are produced in Table 6. None of the newly estimated coefficients are different in sign or significance to the original estimations. Thus this indirect test does not find evidence to contradict the parallel trends assumptions. The interactions also do not affect the sign and significance of the unreported coefficients.

Table 6: Indirect test of parallel trends assumption

	Specification 1			Specification 2		
	Full sample	Boys	Girls	Full sample	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)
Original estimates (from Table 4)						
PSI	0.10	0.06	0.09	0.09	0.08	0.05
	(0.14)	(0.15)	(0.19)	(0.13)	(0.15)	(0.19)
Add interaction of $year_{2016}$ with school level average of household income						
PSI	0.12	0.09	0.09	0.07	0.11	0.02
	(0.13)	(0.14)	(0.19)	(0.13)	(0.14)	(0.19)
Add interaction of $year_{2016}$ with school level average of most educated in household						
PSI	0.10	0.05	0.08	0.06	0.07	0.02
	(0.14)	(0.15)	(0.19)	(0.13)	(0.14)	(0.19)
Add interaction of $year_{2016}$ with school level average of household spending on education						

PSI	0.10	0.04	0.09	0.06	0.06	0.01
	(0.14)	(0.15)	(0.19)	(0.13)	(0.14)	(0.19)
Add interaction of $year_{2016}$ with school level average of nutrition						
PSI	0.13	0.06	0.13	0.11	0.09	0.05
	(0.15)	(0.19)	(0.21)	(0.15)	(0.17)	(0.21)
Add interaction of $year_{2016}$ with school level average of hours spent on extra tuition						
PSI	0.10	0.04	0.08	0.06	0.04	0.01
	(0.14)	(0.15)	(0.19)	(0.13)	(0.14)	(0.19)
Add interaction of $year_{2016}$ with school level average of hours spent on co-curricular activity						
PSI	0.11	0.08	0.09	0.08	0.12	0.02
	(0.13)	(0.15)	(0.19)	(0.13)	(0.14)	(0.19)

Decompositions

The Oaxaca-Blinder technique can be applied to divide attainment between males and females into a part that is explained by differences in endowment (i.e., the determinants of attainment such as household income, parental aspirations, etc.), and a part that cannot be explained by such group differences (Jann, 2008). Thus the expected difference in attainment between boys and girls

$$A = E(y_{boys} - y_{girls}) \quad (2)$$

Where E(Y) denotes the expected value of the outcomes, can be accounted for by group differences in the predictors in (1), written below as

$$y_l = \propto + \delta_l Z_l + \varepsilon_l, \qquad E(\varepsilon_l) = 0, \quad l \in \{boys, girls\} \qquad (3)$$

where Z is a vector containing all the predictors in (1) and a constant, δ contains the slope parameters and intercept. The mean outcome difference between boys and girls can be expressed as the difference in the linear prediction at the group specific means of the regressors:

$$A = E(y_{boys} - y_{girls}) = E(Z_{boys})\delta_{boys} - E(Z_{girls})\delta_{girls} \qquad (4)$$

Since

$$E(Y_l) = E(Z_l\delta_l + \varepsilon_l) = E(Z_l\delta_l) + E(\varepsilon_l) = E(Z_l)\delta_l$$

With $E(\delta_l) = \delta_l$ and $E(\varepsilon_l) = 0$ by assumption.

Re-arranging (4) as in Jann (2008)[11] gives a 'three-fold' decomposition of the outcome difference:

$$A = [E(Z_{boys}) - E(Z_{girls})]\delta_{girls} + E(Z_{girls})(\delta_{boys} - \delta_{girls}) + [E(Z_{boys}) - E(Z_{girls})](\delta_{boys} - \delta_{girls}) \qquad (5)$$

where the first summand on the right hand side of the equation refers the 'endowment' effect. This is the part of the differential that can be attributed to group differences in the explanatory variables. The second component refers to the 'coefficient' effect. This measures attainment differentials that can be attributed to differences in returns to the endowments. The last component is an interaction term accounting for the fact that differences in endowments and coefficients exist simultaneously. The fixed effects in the specification are explicitly accounted for as being fixed rather than stochastic to avoid inflation of standard errors . However, we also run the decomposition excluding the school fixed effects but including directly school specific characteristics such as type of school, principal characteristics to see whether it affects the results. Table 7 presents the results of this decomposition. The predicted female attainment is 0.12 while it is significantly lower for males -0.10. The decomposition results also show that if males had the same characteristics as females the consequent change in attainment is around 0.01, although statistically insignificant. This is unsurprising as the section 2 already showed how males and females

[11] Jann (2008) cites Winsborough and Dickinson 1971, Jones and Kelly 1984 and Draymont and Andrisani (1984).

do not differ significantly in terms of most observed contemporaneous household characteristics apart from parental aspirations and teacher rating. The detailed decomposition analysis (unreported) does confirm that aspirations are significant and that if boys had the same endowment of parental aspirations as girls' their scores will increase by 0.1 (significant at 5 per cent level). But these differences do not explain significantly the overall gap in attainment. The difference in attainment is explained almost entirely by the coefficient effect –or 'discrimination' as conventional decomposition literature would term it. Thus the change in male attainment if females' coefficients were applied to male characteristics is 0.23 standard deviations. The table also presents results for a two-fold decomposition that uses average coefficients over both groups (Reimers, 1983), assuming that 'discrimination'-positive or negative- is not specific to boys or girls. The results confirm those of the threefold analysis.

Table 7: Oaxaca-Blinder decomposition of differences in math scores between boys and girls

	Threefold decomposition		Twofold decomposition (weight=0.5)	
	With school fixed effects[1]	No school fixed effects[2]	With school fixed effects[1]	No school fixed effects[2]
Prediction females	0.12***	0.12*	0.12***	0.12*
	(0.02)	(0.06)	(0.02)	(0.06)
Prediction males	-0.10***	-0.10	-0.10***	-0.10
	(0.01)	(0.06)	(0.01)	(0.06)
Difference	0.21***	0.21***	0.21***	0.21***
	(0.02)	(0.04)	(0.02)	(0.04)
Decomposition				
Endowments	0.00	-0.01	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Coefficients	0.23***	0.22***	0.23***	0.22***
	(0.01)	(0.03)	(0.01)	(0.03)
Interaction	-0.02	-0.00(0.11)		

	(0.01)*			
Observations	2597	2597	2597	2597

1.Estimation uses variables in specification 2 with standard errors accounting for fixed regressors (i.e., the school dummies). 2.Estimation excludes school dummies but includes following school level characteristics: principal gender and professional grade, school type (science, arts, only up to year 11). Robust standard errors adjusted for 72 school clusters in parentheses*** p<0.01, ** p<0.05, * p<0.10

In summary, the education level of the most educated, parental aspirations and teacher experience (but not gender) are the most significant factors contributing positively to attainment of both boys and girls in our sample. However, for girls in particular, teacher attitudes are important. Although parental aspirations and teacher attitudes are lower for boys that they are for girls, these differences in endowments –using our imperfects proxies- don't explain any of the attainment differences. Almost all of the test score differences between boys and girls is unexplained. Put differently it is due to differences in returns to endowments rather than the endowments per se.

So what may be driving the differences in returns to endowments? The literature on decomposition often attributes it to 'discrimination' and the next section looks beyond compulsory schooling to seek sources of possible discrimination that may have an indirect impact on attainment.

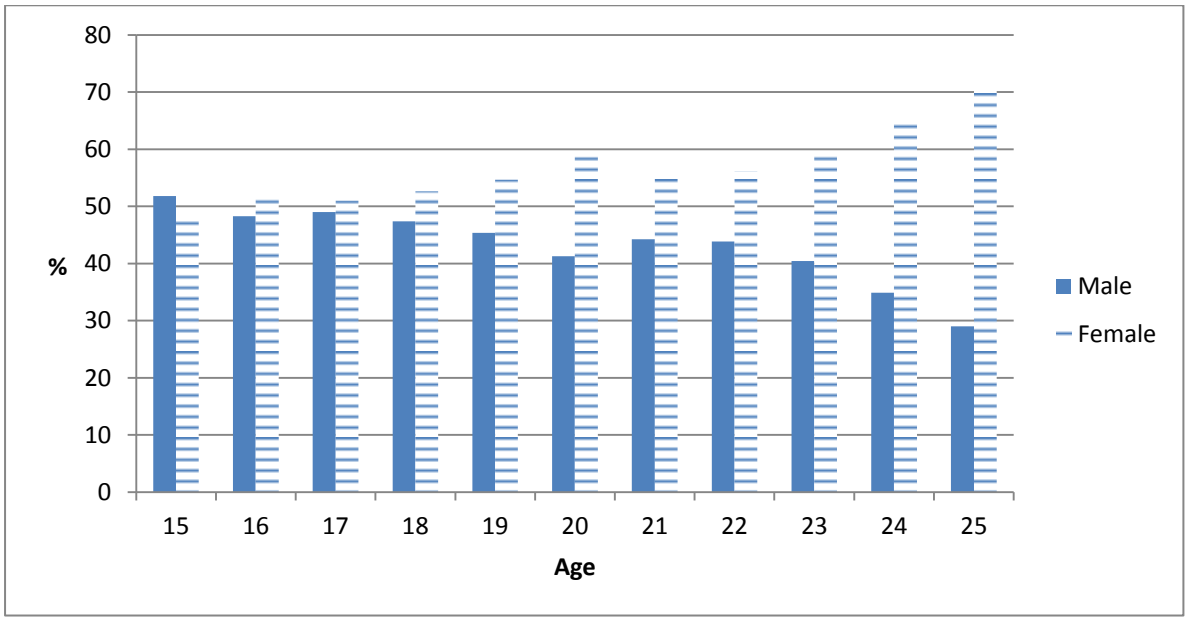
3.2. Gaps in enrolment beyond compulsory schooling and labour market asymmetries

This section looks at what maybe driving the lower enrolment of boys beyond the compulsory age of 14, compared to girls. It is likely that the key explanatory factors have a recursive effect on boys own attitudes to learning at younger ages. As can be seen in Figure 1, the proportion of women in full time education is much higher amongst women than men at almost all ages between 15 and 25. Ages 15-16 corresponds to when a major public exam at the end of junior secondary school is undertaken (O Levels), age 18-19 corresponds to when A Levels are taken (a major public exam at the end of senior secondary school that

allows a student to qualify for university entrance), age>20 corresponds broadly to when university or tertiary education is undertaken. The figure also shows that the proportion of men in full time education falls rapidly after the A Level examination.

The data for this graph and the remainder of the analysis for this section comes from the Household Income Expenditure Survey carried out by the Department of Census and Statistics for the 2012/13 period. The sample is representative of the population, containing information gathered from 25000 household from all the districts in the country including those in the North and East that had been excluded from the survey for nearly three decades due to the civil war in the country from 1983-2009.

Figure 1: Percentage of males versus females in full time education between ages 15-25



Notes: Compulsory schooling is only up to age 14. Thus the horizontal axis represents education beyond the age of compulsory schooling.

Table 8 shows that there are significant differences between males and females in the 15-25 age group in terms of selected individual and household characteristics. The most notable, apart from significant differences in enrolment in education beyond schooling, is average earnings and income. Average earnings include all income obtained through employment (including self-employment). Average individual income includes all earnings plus income

through dividends, rents, social security payments, remittances (local and foreign) and in-kind income.

Table 8: Mean characteristics of 15-25 year olds in the sample

	Females (1)	Males (2)	Difference in means (1)-(2)
Enrolment in full time education	0.44		
Ages 15-25	0.44	0.44	0.00
Age 20-25	0.18	0.14	0.04***
Unemployment rate =unemployed/(employed+unemployed)	0.38	0.27	0.12***
Labour force participation =(employed+unemployed)/total	0.26	0.52	-0.26***
urban	0.265	0.267	-0.00223
Sinhala	0.618	0.610	0.00784
Muslims	0.125	0.123	0.00136
Wealth index	0.550	0.546	0.00387
earnings	295.47	895.63	-600.16***
income	3747.0	7143.0	-3396.0***
Observations	6870	6191	

The following model is estimated to understand more about what drives an individual to invest an extra year in formal education beyond compulsory education:

$$y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \varepsilon \qquad (6)$$

where y refers to the enrolment status of individual i in post compulsory education between ages 15 and 25 (=1 if the individual is enrolled and 0 otherwise), $X_1$is a vector of individual and household characteristics such as gender, age, ethnicity, household size and

household wealth[12] that influences the schooling decision, X_2 a vector of variables measuring school quality (proxied imperfectly buy district-level indicators of school quality such as the experience of teachers and the number of IAC schools[13]) and X_3 a vector containing the opportunity cost of taking up an year in education proxied by the earnings forgone, calculated as the log of average earning by gender, age and current education level for the district the individual lives in. It also contains geographical features that affect the enrolment decision by including indicator variables for the province of residence.

To see if factors such as household wealth, opportunity costs and school quality affect males differently to how it does females, the specification also includes several interaction terms.

The results obtained using the probit estimator are presented in Table 9 column (1). It shows that the chance of being enrolled in further education goes down significantly with age, the larger is the household size, the higher is the foregone earning and the gender being male. Wealth, teacher experience, a higher availability of IAC schools in the district all play a significantly positive role. Do any of these factors matter more for males than it does females? The interaction terms show that foregone earnings as a result of engaging an

[12] The wealth index is a composite measure of a household's cumulative living standards, and is thus not subject to issues of endogeneity as much as an indicator for the household's monthly income or consumption maybe. The wealth index is calculated as the simple average of three sub-indices: the housing quality index, the access to services index and the asset index. The housing quality sub-index is reflects the welfare of household members in terms of housing-related comfort by looking at materials used in constructing the family's dwelling (walls, roof, and floor), and household density (number of rooms per person excluding the bathroom, kitchen and hallways). Equal weights are assigned assuming equal importance between indicators and the simple average of the four indicators in calculated. Wall quality is 1 if the walls are made of 'good' material such as brick, cement blocks or cabok and 0 otherwise; roof is 1 if made of asbestos, tiles or concrete and 0 otherwise; floor quality is 1 if material is cement, tiles or terrazzo and 0 otherwise. The rooms per person index is calculated as follows for household i, $\frac{(rooms_i - \min\_rooms)}{\max\_rooms - \min\_rooms}$ where min_rooms and max_rooms are the range of bed rooms in the dataset and $rooms_i$ refer to the number of rooms in the household. The access to services sub-index measures the household's ability to meet functional requirements of sound shelter. Again it is calculated as the simple average of four indicators: access to electricity (=1 if the household has electricity and 0 if not); access to safe drinking water (=1 if water comes from protected wells or piped from a mainline and 0 otherwise); access to a safely managed sanitation
Service (=1 if the type of toilet used is connected with water seal and 0 otherwise) and access to adequate fuel for cooking (=1 if gas, kerosene or electricity). All four indicators are considered to have equal weight. The consumer durables sub-index is a measure of the household's ownership of common household durable goods and assets (such as TV, radio, bicycle, cars). The index counts a long list of items (regardless of its monetary value) that the household has ($assets_i$) and converts it into and index as follows: $\frac{\sum assets_i - assets\_min}{assets\_max - assets\_min}$ where $assets\_min$ and $assassets\_max$ is the range of these items in the dataset.

[13] This data is taken from the Ministry of Education's data on 'Teachers in national schools by age, 2013' http://www.moe.gov.lk/english/images/Statistics/sri_lanka_education_information_2013.pdf. Teacher experience is proxied by the proportion of teachers over 41 years of age, assuming older teachers have more experience (note that a majority of teachers in national schools enter the profession soon after leaving school).

extra year at school matters more to males. Similarly wealth interacted with being male is also significant indicating that the poorer is a household the more likely it is for males to drop out of further education. In column (2) the measure for opportunity cost is replaced by the log of total income to note that the conclusions remain the same.

Table 9: What influences enrolment beyond compulsory years among 15-25 year-olds?

Dependent variable: enrolled=1, 0 otherwise

	(1)	(2)
age	-0.10***	-0.12***
	(0.00)	(0.00)
male	0.17**	0.33***
	(0.08)	(0.10)
hhsize	-0.02***	-0.02***
	(0.00)	(0.00)
urban	-0.02	0.02*
	(0.01)	(0.01)
Sinhalese	0.14***	0.15***
	(0.02)	(0.02)
Muslims	0.02	0.00
	(0.02)	(0.02)
Wealth index	1.01***	1.03***
	(0.06)	(0.06)
Wealth index*male	0.07	0.19**
	(0.09)	(0.09)
Oppcost	-0.07***	-0.09***
	(0.01)	(0.01)
Oppcost*male	-0.00***	-0.06***
	(0.00)	(0.01)
teacher experience	0.38***	0.34***

	(0.12)	(0.11)
teachexperience*male	-0.33**	-0.02
	(0.14)	(0.13)
IAC school	-0.39	-0.56**
	(0.28)	(0.27)
IACSchool*male	0.58	0.57
	(0.35)	(0.35)
Observations	11,053	13,059

Estimation also includes 9 province dummies. Oppcost in column (1) is based on total individual earnings while in column (2) it is based on total income. Probit marginal effects reported. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Thus for men, the opportunity costs of education has a significant negative bearing on the decision to pursue an extra year of education compared to women. This maybe partly due to societal norms (i.e., a higher expectation for men to contribute to household incomes rather than women). But it may also be because for every occupational category, the average earning by men is significantly higher than those for women (Table 10, columns 1-3).

Table 10: Average Education Levels and earnings by Occupation category for those aged 15-30 in 2012/13

Occupational categories	Earnings in rupees			Education in years			Ratio women: men	Women as a proportion of all employed women	Men as a proportion of all employed men
	Women	Men	Difference (1)-(2) (Standard errors)	Women	Men	Difference (4)-(5) (Standard errors)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
managers	3882	3441.73	440(710.89)	12.5	11	1.5(0.7)**	2.33	0.003	0.004
professionals	2866	5732.47	-2867(967.6)***	12.72	11.95	0.76(0.2)***	0.81	0.21	0.09
Clerical support	2626	3403.84	-779(217.7)***	13.09	11.94	1.15(0.1)***	1.53	0.15	0.12
sales	2592	2773.75	-181(140.6)	12.78	12.23	0.55(0.1)**	0.62	0.16	0.05
Skilled agri/fish	1895	2480.42	-585(250.9)***	11.18	10.43	0.75(0.1)***	2.59	0.12	0.16
Skilled craft	862	2277.26	-1415(313.5)**	10.02	9.28	0.74(0.2)***	3.99	0.08	0.16
Plant and machine	1458	2538.71	-1081(132.5)**	10.16	9.62	0.54(0.1)***			
operators							2.14	0.22	0.25
elementary	1665	2792.69	-1128(389.27)*	10.22	9.73	0.49(0.2)**	4.95	0.06	0.16
Overall				10.58	10.08	0.49(0.0)***	1:1.90	1.00	1.00

Table 10, columns (4)-(6) also show that for every occupational category, the average education level of men is significantly lower than those of women. This maybe reflective of men having a lower 'taste' for education or positive discrimination in the labour market where men have to be less educated than women, on average, to secure the same job. Himaz (2010) argues that it is incorrect to suppose that women have a higher 'taste' for education as pro-female biases in within household education expenditure occur only close to key public exams. If acquiring higher level of education was down to taste, then more should be spent on girls at every stage of education. Thus girls acquiring more education –or boys acquiring less- is unlikely to be down to 'taste'. It is more likely that there is discrimination in the labour market that requires women to acquire more qualifications in order to vie for the same role as a man. There is also some evidence that returns to education are quite low for women at education levels below 13 years of education (i.e., below 'passing advanced levels') while for men the returns for comparative grades are much higher[14]. This again maybe another reason as to why parental aspirations are lower for men than women.

[14] A basic Mincerian equation to estimate returns to education takes the form $y_i = \beta_0 + \beta_1 X_i + \sum_{j=0}^{4} \beta_2 s_{ij} + \varepsilon_i$ where y is log of earnings, X is a vector of individual and household characteristics (age, square of age, wealth index, household size, rural residence and province of residence) and $s_0 \ldots s_4$ are dummy variables reflecting level of schooling numbered in the following order:0=no schooling, 1=compulsory education(grades 1-9), 2= passed o-levels, 3=passed-a-levels and 4=gained a post-school qualification (a degree, professional or vocational qualification after reading for a-levels), with no schooling omitted in the estimations. The coefficients on the school level can be used to estimate the return to education. We estimated this for men and women aged 18-55 separately using Ordinary Least Squares (OLS) regression. The results show that for men, compulsory, passed o-levels, passed a-levels and degree have a return of 1.8, 1.6, 2 and 3.5 per cent while for women it is 0.8, 1.0, 1.8 and 6.7 per cent, compared to having no education. The results of course have biases as we have not controlled for ability bias for both or sample selection bias. Previous studies that correct for such biases such as (Himaz and Aturupane, 2016) argue that OLS results are an overestimation. A study that addresses these issues based on the 2012/13 data is beyond the scope of this investigation and the OLS results are provided briefly in this footnote as being merely indicative.

Another trend observable in Table 10 columns (7)-(9) is that over half of young employed women aged 15-30 work in occupations strongly associated with formal education such as professional and technical occupations (e.g., teachers, doctors, engineers, and draughts persons), clerical support and sales related jobs. Only a quarter of young men are engaged in this type of occupation. The professional roles arguably offer better working conditions, job security (particularly if employed in the state sector) and benefits in kind (such as more holidays if employed in teaching although the remuneration is low). Nearly 75 per cent of young men are engaged in skilled agriculture and fisheries, plant and machine operator roles (a third of who are bus or three-wheeler drivers, roughly 5 per cent of all employed males), craft and related roles (building and related works, electrical and electronic trades, etc) and elementary occupations. Thus significantly fewer men are employed in occupations in the managerial, professional, technical, clerical and sales categories. This may be due to men having acquired lower education than women and therefore being crowded out of the market for professionals and technicians or that men have a preference towards occupations that require lower schooling. Or it may be that for men, average wages are higher than those for women- so much so that even the average wage of the lowest paying category for men, 'crafts' is Rs. 2277 where average education is 9.28 years (completed compulsory schooling), compared to 'sales' among women that has an average wage of Rs. 2592 but requires 12.23 years of education). This observation is supported by (Gunawardena, 2015) who notes that males are treated more favourably in the labour market in spite of similar non-cognitive skills but lower measured cognitive skills compared to women, particularly in the 20-29 group . Not only are men less unemployed, they also engage in a wider set of occupations- indicative of a wider choice- compared to women (Appendix Figure A4).

Thus wide differentials in how the labour market values education between men and women may be at the root to why attitudes to learning and returns to endowments are significantly different between boys and girls. Possible contributors to this are supply-side bottle necks in higher education. Places in state universities, for instance, are highly competitive and only 17 per cent of those who qualified for entrance via the Advanced Level examination went on to being admitted to university in 2013 . In spite of this tough competition to secure a place at university, the return to tertiary education is low with 70

per cent of university graduates employed in the government or semi-government sector, over 60 per cent of whom take up teaching. The jobs offer security and other benefits but are low in terms of returns. Those courses in higher education that enjoy a higher return such as IT or medical degrees face severe supply-side bottlenecks and when offered by the private sector can be prohibitively expensive. It is likely that these bottlenecks and constraints in higher education, relative return structures as well as labour market asymmetries all play a strong role in causing returns to endowments to vary significantly by gender at the school level, and be realised in terms of lower attainment for boys compared to girls.

4. Conclusion

This paper looked at whether the lower attainment in math scores among boys in grade 7 in Sri Lanka can be explained by boys responding significantly differently than do girls to parental aspirations, teacher attitudes, teacher gender, household characteristics and decentralised, school-based management. The paper found that the attainment of both boys and girls were affected significantly by the education level of the most educated, parental aspirations and teacher experience (but not gender), with girls particularly sensitive to teacher attitude (i.e., a child's rating of how accessible and supportive the teacher is). On average, parental aspirations and teacher attitudes, *al be it* imperfectly proxied, were significantly lower for boys than for girls. Thus there are implicit biases disfavouring boys that affect parental aspirations as well as teacher attitudes. But a decomposition analysis showed that differences in endowments, as we measure them, explained almost none of the difference in scores between boys and girls. Instead, the differences were 'unexplained' driven by returns to these endowments. In the decomposition literature, this is often attributed to 'discrimination'. In order to investigate the source for this 'discrimination', against boys as it would seem, we looked for explanations beyond compulsory schooling.

The second result of the paper noted that males were more sensitive to foregone earnings in their decision to participate in education beyond compulsory years, even after controlling for household wealth. Men earn on average more than women in Sri Lanka for every level of education in every occupational category and have a wider choice of occupations to

engage in compared to women. Moreover, state university places are competitive, limited and often offer low returns, while private sector higher education options are expensive. So the time, effort and resources required to secure a place in higher education maybe seen as less preferable to seeking employment soon after compulsory education especially for men who have higher forgone earnings. Thus asymmetries in the labour market favouring men may and bottle necks in higher education may all have a role in creating a situation where the returns to endowments are lower for men at the school level that is realised in lower attainment. Put differently, boys, their parents and teachers realise that boys can put in less effort and attain less at school but still enjoy labour market outcomes that are more favourable than those experienced by their female counterparts. The source for the unexplained element of the decomposition result for school-level attainment disfavouring boys, therefore, may lie partly in positive discrimination favouring boys in the labour market. Although these aspects need further research a strong implication then is that the differences in attainment and enrolment may well be a rational response to asymmetries in the labour market and higher education system.

So if men are positively discriminated in the labour market, does the poorer attainment and lower enrolment levels of men matter in the long run? We believe is matters very much as the disparity is a symptom of deeper structural problem and is as important as it would be if the trends were reversed. At one level, having to acquire more years of education than men to end up earning less is in itself discriminatory for women. But at a broader level, a breakdown of male occupations showed that in spite of being employed, such employment is mainly in low or semi-skilled work. The lower accumulation of numerical and other skills on the part of males inhibits their hierarchical movement in the occupational ladder and taking up more productive roles. The disparity is also indicative of a mismatch in the labour market between what is demanded by employers and what is supplied by the education system that males respond to by acquiring less human capital than what maybe socially optimal . It may also reflect the fact that talent allocation in the labour market is not based on education either due to corruption or due to education taking on more a signalling role rather than a productivity enhancing role, and gender based reactions to this are different due to asymmetries in the labour market. Thus a key insight our analysis provides is the importance of looking beyond simply school-based reforms to improve more gender parity

in attainment and enrolment. The Sri Lankan case suggests the importance of higher education and labour market policy reforms are needed to address the issue of gender imbalances in attainment.

Quite apart from labour market related aspects, the widening gap is also a grave concern for the destabilising effects the widening horizontal inequities can entail such as unrest, war, frustration, corruption. There could also be important implications for relationships and family formation as women are less likely than men to form families with a less educated spouse (Grow and Van Bavel, 2015; Schwartz and Han, 2014; Therborn, 2004). Overall there may be important risks associated with males' disadvantage in educational attainment just as there were disadvantages associated with females' lower participation in the past. These aspects also warrant further investigation.

Appendix 1

Figure A1 Net enrolment in Secondary Education

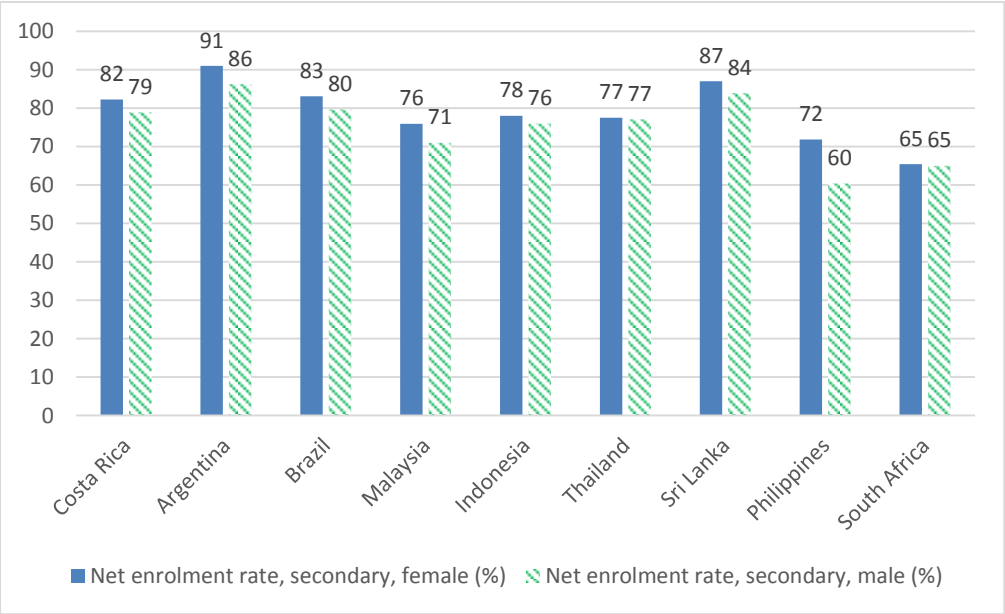


Figure A2 Net enrolment in Tertiary education

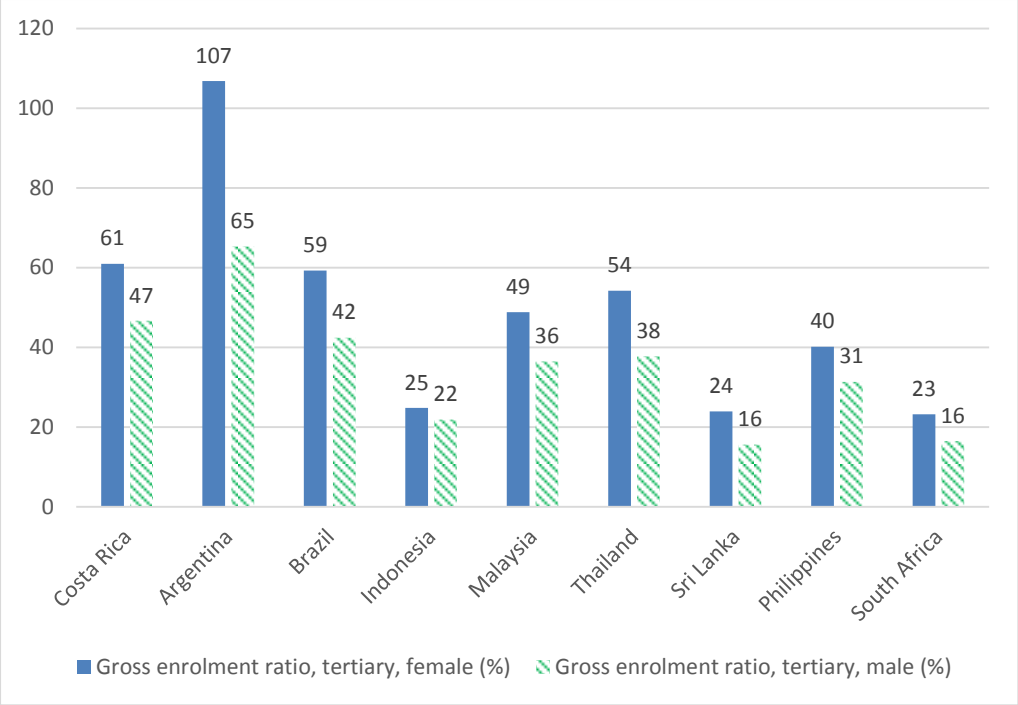
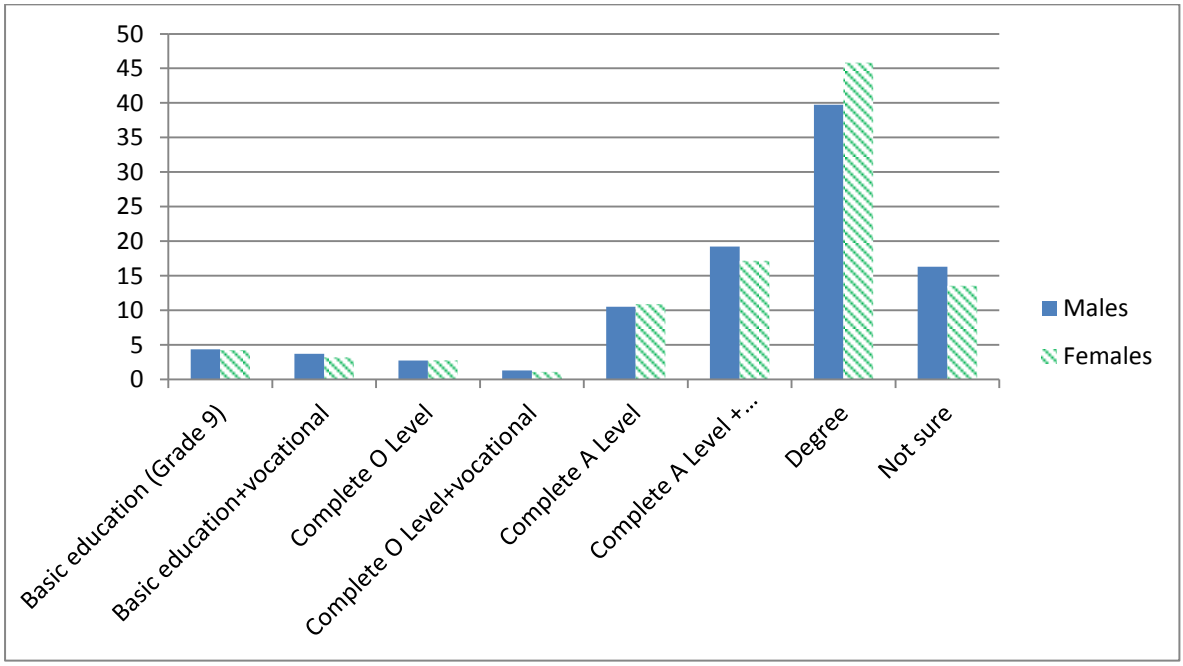
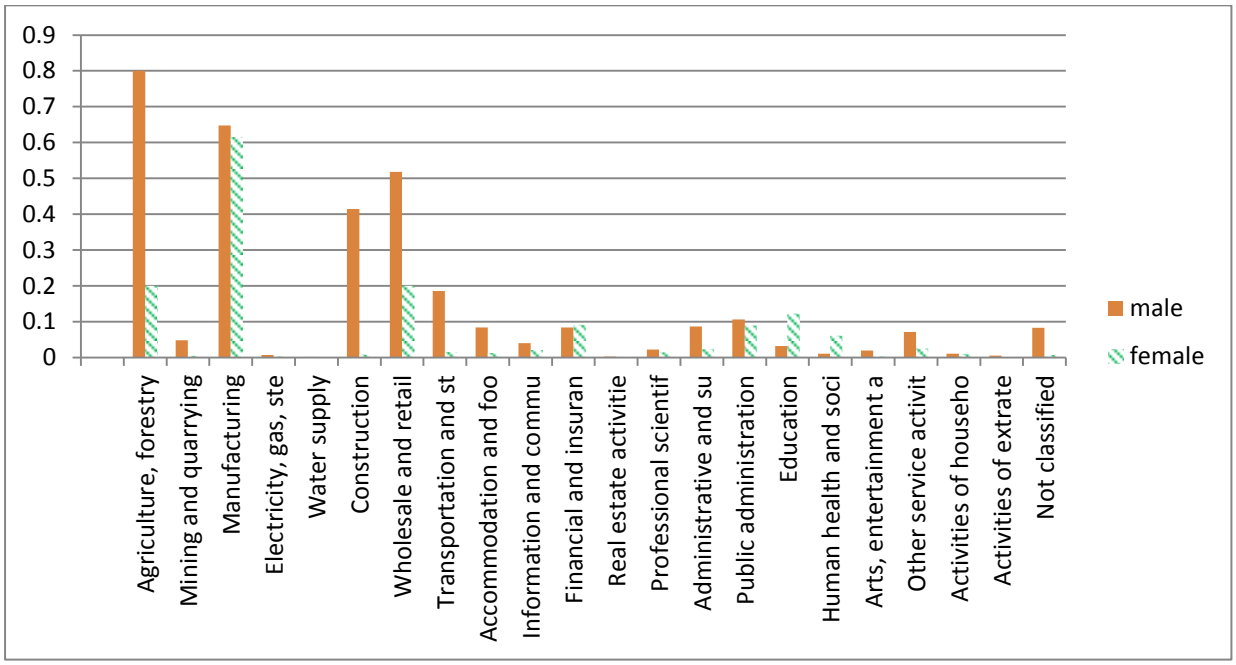


Figure A3. Parental/child aspirations for child's education



Response to question 'What is your child's plan after Compulsory (Basic) Education?' asked from child's parent or guardian in 2012, when child was in grade 7 (age 12).

Figure A4: Occupational variation by men and women between ages 15-25.



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