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Abstract

This paper uses demand analysis to explore whether intrahousehold allocation of education expenditure differs between boys and girls in rural Sri Lanka. Contrary to most countries in South Asia a significant bias favouring girls is found in 1990/91 for the 5-9 and 17-19 age groups and in 1995/96 for the 5-9 and 14-16 age groups. The 5-9 age group captures the run-up to the Year 5 scholarship exams that are used to gain entry into better performing secondary schools. The 14-16 and 17-19 age groups capture those who read for important National level qualifications vital in the job market. The paper argues that these household level decisions are rational because wage returns to junior and senior secondary education have been higher for females than for males through the 1980s and 1990s.

1 Introduction

Developing countries have been a testing ground for the investigation of gender bias in the allocation of educational resources -mainly schooling expenditure- in a household (Burgess and Zhuang 2000, Rudd 1993, Kingdon 2003). The rationale for the exercise is often found in the hypothesis that girls maybe less favoured than boys (or even discriminated against) in terms of parents spending towards their education. Often macro data lends support to this contention with female schooling rates being significantly less than those for men. However, at the household level, the differential allocation of resources maybe an efficient decision if returns to schooling differ by gender. The empirical literature on labour market returns to schooling by gender in developing countries is mixed with studies such as Behrman and Wolfe(1984) for Nicaragua, Birdsall and Behrman(1991) for Brazil, Gannicot(1986) for Taiwan and Liu (1998) for China, amongst others, suggesting that market rates of return to schooling do not differ significantly by gender. Unfortunately most of these papers do not control for unobservable household and community endowments and focus mostly on earnings rather than wage rates per hour worked. A more recent paper by Behrman and Deolalikar (1995) that controls for some of these issues finds differential returns to schooling in Indonesia favouring girls. Similarly, Psacharapoulous and Patrinos(2004) who survey the empirical literature on returns to education (for both developed and developing countries) note that overall, the studies indicate that females have higher returns to secondary education than men. However, this sort of compilation based on the results of many studies should be viewed with caution since the original work is not strictly comparable due to differences in methodology and data sample coverage.

The case of Sri Lanka is interesting to look at both whether there are intra-household differentials in the allocation of education expenditure and whether such allocations are efficient in the context of returns to schooling. Sri Lanka is a developing country well known for her high achievements in male and female literacy and gender 'equality' in terms of school enrolment and exam completion.

Such 'equality' at the aggregate level does not say much about whether there is a significant favouring of boys or girls at the margin, when households invest in education. Such household biases in education expenditure are particularly important for Sri Lanka because there are several studies done for the 1980s suggesting that returns to schooling for females are higher than for males. So how do households respond to this market outcome? Does adding an extra girl increase the household education budget by more than adding a boy would, contrary to what might be expected in most developing countries? Could a gender bias–if it exists–be more a 'cultural' attitude rather than a market response?

This paper answers the above questions. The issue of intrahousehold resource allocation has not been investigated in Sri Lanka while estimations of returns to education have been looked at only for the 1980s. In the first part of this paper, I use demand analysis to try and understand if gender gaps exist in household education expenditure towards boys and girls in rural Sri Lanka over the decade beginning in the 1990s. The study uses 3 household income and expenditure surveys for 90/91, 95/96 and 2000/01 and Engel Curve method developed in Deaton and Muellbauer (1980), Deaton, Ruiz-Castillo and Thomas (1989) and Subramaniam (1995). After arguing that the ensuing results are not due to noisy or poor quality data or because of an inherent 'cultural' valuation of a daughter verses a son, I look at the labour market for any clues that may shed some light to household behaviour. In the second part of the paper I try to match the results of the Engel curve analysis with own estimations of returns to schooling for Sri Lanka from 1990-2000. I use the Mincerian wage function but adjust the estimations for selectivity as well as heterogeneity arising from unobserved household and community effects.

2 Intrahousehold Allocation of Education Expenditure

2.1 Engel Framework

If individual level data was available, then we could directly compare expenditure on education for males and females. However, given the lack of such individual level data, intrahousehold allocational differences have to be estimated indirectly. Data is available at the level of the household and therefore I try to detect gender-biases in education expenditure by investigating how the presence of individuals of similar ages but opposite sexes affect household expenditure on education. The Working-Lesser Engel form for demand analysis is used with a linear relationship assumed between the share of the budget on each good and the log of total household expenditure. Deaton and Muellbauer (1980, p.75) argue that such a relationship has the theoretical advantage of being consistent with a utility function and conforms to data 'in a wide range of circumstances'. As discussed in Deaton (1997:231), Working's Engel curve can be extended to include household demographic composition where age classes are denoted by n_j and are broken down by gender. Separate γ_{ij} coefficients can be calculated for males and females:

$$w_i = \alpha_i + \beta_i \ln(x/n) + \eta_i \ln n + \sum_{j=1}^{J-1} \gamma_{ij}(n_j/n) + \tau_i.\tilde{z} + u_i \qquad (1)$$

where w_i is the share of the household budget devoted to the i^{th} good (education expenditure in this paper) calculated as $p_i q_i / X$ with p_i and q_i denoting the price and quantity of good i (education) and x is total expenditure per household, n is household size, n_j is the number of people in age-sex class j (there are J such classes in total)[1]. The age categories adopted for children are important because each of it is the run up to an important national exam that

[1] The potential endogeneity of household expenditure per capita is checked for with the use of the instrumental variable approach. I use unearned income and its square as instruments.

qualifies a student to enter the next stage and even make the choice of entering an institution that is reputed for better performance than the one which he or she leaves. The vector $\tilde{z}$ contains other socio-economic variables such as the education of the household head, ethnic group, location (district) dummies. Finally, u_i is the error-term for good i (education). The coefficient β determines whether the good is a luxury or a necessity. If $\beta > 0$ then the good is a luxury with the budget share increasing with total outlay making the total expenditure elasticity greater than 1. The good is a necessity if $\beta < 0$ with an expenditure elasticity less than 1. Gender bias in the allocation of good i can be detected through a straight forward F test checking whether the coefficients $\gamma_{ij} = \gamma_{ik}$ where j and k reflect boys and girls in the same age group.

This paper fits the model on the sample of all households, as is conventional, regardless of whether the households incur a zero or positive budget share of a particular expenditure. Kingdon (2003) argues that this maybe one of the reasons as to why the Engel curve analysis may fail to pick up a gender-bias in schooling expenditure in India as in Subramaniam and Deaton (1991). She argues that a gender-bias in schooling can work through two possible channels: one through zero purchases for daughters and positive purchases for sons and secondly through higher expenditure for sons given positive purchases for both. If gender-bias works through just one of these mechanisms then averaging across them may lead to the conclusion of no gender bias. She therefore proposes a hurdle model that separates the households decision whether to incur any expenditure from how much is actually spent given that it is decided to incur expenditure. She finds that the basic discriminatory mechanism is via differential enrolment rates for boys and girls.

Unearned income comprise dividends, interest and rents. Roughly 13 per cent of the rural households in the HIES have some form of positive unearned income. The instruments are relevant with an F test on the joint significance of the instruments in an equation predicting the potentially endogenous variable being significant at the 5 per cent level. An overidentification test asserts that the instruments are valid. However, the Hausman-Wu test performed fails to reject the exogeneity of the log of expenditure per capita for all years 1990/91, 1995/6 and 2000/01 and I have therefore retained this variable in the wage equation.

In our data-set 54 per cent of the households incur a positive expenditure on child education. I have opted to use the Engel curve method with the model fitted on all households (whether the expenditure is positive or zero), instead of using a hurdle model because descriptive statistics do not suggest significant gender differences in school enrolment . Contrary to India and other developing countries, female school enrolment rates are the same or even higher in Sri Lanka than for males. However, differences are not statistically significant[2]. Moreover, households with a positive share of education expenditure are roughly the same (at 57 per cent in 1990/1, 53 per cent in 1995/6 and roughly 59 per cent) in the year 2000/01) whether the unit has all-male or all-female children aged 0-19. So the bias-if it exists-stems from higher expenditure on sons or daughters given positive expenditure on both[3].

Another issue to consider is whether the Engel curve is indeed linear, as assumed, or if it maybe non-linear with households considering education a luxury at lower levels of income and a necessity at higher levels of income. In the regression analysis, this would be reflected by the coefficient on the log of household expenditure being positive for the lower income groups and negative for the higher income groups when the analysis accounts for household socio-economic status. This is not the case, as seen in results discussed later, education is a luxury across all income groups with an elasticity of 1.02, 0.85, 0.88 and 0.67 in 1990 across the poorest to the richest quintile; 1.09, 1.08, 1.07 and 1.06 in 1995 and an almost equal elasticity of 0.8 across all groups in 2000/01. Even simple descriptive statistics (unreported) of the budget share of education expenditure by expenditure quartile show a positive correlation. This is a sign that education is a luxury with the budget share devoted towards it increasing with income(expenditure). I therefore work with the assumption

[2] For the 5-9 age group enrolment rates are 100 per cent for both b0ys and girls. For the 10-13 age group it is 94.8 and 95.4 per cent for boys and girls respectively. For the 14-16 age group the corresponding figures are 83.2 and 80.5 and for the 17-19 age group 49.8 and 50.8.

[3] Another way to handle zero education expenditure is to use a Tobit model. This, however, is subject to the potentially severe problem of heteroskedasticity (Deaton 1997).

that the Engel curve is linear.

2.2 Data

The data comes from three cross-section Household Income and Expenditure Surveys (HIES) for 1990/91, 1995/6 and 2000/01 carried out by the Department of Census and Statistics (DCS), Sri Lanka. The DCS conducts the HIES once every 5 years. Data collection is done in twelve equal monthly rounds to capture seasonal variations in income and expenditure. A two stage stratified random sample design is used with urban, rural and estate sectors as the domains for stratification. The primary sampling unit is a census block and the secondary sampling unit are the housing units within the selected census blocks.

Each housing unit was visited three times in a given week. The first visit was made on a Monday to collect demographic and income related data, and the members of the household were informed as to how consumption of different items should be recorded and reported at subsequent visits. A separate sheet was provided to report the consumption and expenditure of items on a daily basis and the previous days consumption was added into the sheet by the enumerator directly following an interview. The consumption for the rest of the week was reported in the sheet by members of the household. A second visit was made during the middle of the week to supervise the households progress in reporting. The report was then collected from the households after cross checking with members regarding unclear entries on a visit made the following Sunday. Thus the food consumption data is based on the 'diary method' rather than the 'recall' method. The former is thought to be more accurate than the latter and subject to less measurement error (Battistin 2004) although there are arguments to the contrary (Lydberg and Kasperzyk 1991). Expenditure on education, housing, fuel, non-durables and consumer durables are recorded as an average for the previous month. This, therefore is based on the recall method.

The overall quality of the HIES is quite good with high response rates and

a coverage that is consistent with other independent surveys carried out on the same population. Let us discuss these two survey quality indicators separately. The 1990/91 and 1995/6 surveys have a 95 per cent response rate while the 2000/01 survey has a 91 per cent response rate. Non-response is due mainly to respondents being unable to complete the schedule, refusing to do so, being temporarily away or due to some unspecified 'other' reason. The incidence of non-response showed no significant seasonal variation–i.e., the amount of non-response was roughly the same during all 12 months of the year. These response rates compare quite favourably with those of several other countries. For example, six popular US government household surveys conducted during the 1990-1999 period indicate an initial response rate between 84 per cent to 95 per cent while UK's General household survey, which is also based on face-to-face interviews, records response rates averaging 80 per cent over the decade.

The coverage rate compares the estimated number of people from the HIES in a specific demographic group to the same estimate from an independent population total–usually Census estimates. For example, the under 17 population by race and gender. The DCS carried out an all-island Census in 1981 and 2001. The HIES 2000/01 results are consistent with the Census 2001 results in terms of demographic composition with the main limitation that the HIES excludes several areas in the North and East of the country, due data collection problems in these war-torn areas. The broad composition of the HIES is also similar to that of the Consumer Finance Survey carried out by the Central Bank of Sri Lanka during the 1990s. The two surveys gather similar information and have roughly the same demographic and ethnic composition. No groups are noticeably under or over-represented compared to the Consumer Finance Survey that also excludes areas in the North and East in their work.

Table 1 contains summary statistics for the variables used to estimate the education Engel curves for rural areas. Education expenditure as a share of total expenditure is not large at around 2 per cent in the 1990s, with the share growing, albeit slightly, over the decade. In rupee terms, the average rural household education expenditure was around Rs. 50 in 1990 and Rs. 324 a

month by the year 2000. The rather small share of education expenditure is unsurprising because education is basically 'free' in Sri Lanka. However, there is still a cost and specially an opportunity cost to education. If a child attends a state school (as do a majority of children in rural areas), text books and uniform material as well as a mid-day meal in the case of a few schools was provided during the decade beginning in the 1990s. However costs of private tuition fees, exercise books, travelling, equipment and additional costs of uniforms (such as shoes, socks, etc.), a nominal school fee etc. was still to be borne by households. As children approach their teens, especially mid teens, there is an opportunity cost to be borne as well in making the choice between schooling and full-time employment. The problem is more acute in rural areas where poverty rates are much higher than in urban areas, and additional income is important. The various categories of education expenditure have been aggregated and it is assumed that separability is not an issue since the composition of various expenditure categories over time has remained roughly the same.

2.3 Results

Equation 1 is used to run OLS regressions for the budget share of education in rural areas for 1990/91, 1995/6 and 2000/01 (Table 2). F-tests for the equality of γ coefficients are presented at the bottom of the tables.

The goodness of fit of the linear Engel curve is around 0.16 for all 3 years. The coefficients on log expenditure are positive and close to unity in some cases showing that education is treated as a luxury. The elasticity is highest in 1995 at 0.95 when the country's poverty rates were the highest during the decade at 33 per cent (see DCS 2005). The lower elasticity of 0.73 for 2000 suggests that education has become to be treated as less of a luxury towards the end of the decade with the country's economy picking up and poverty rates dropping to 25 per cent in rural areas[4].

[4] Unfortunately no previous study exists for Sri Lanka pertaining to a similar analysis to compare these education expenditure elasticies. Kingdon(2003)'s estimates for India for 1994 show that for most States the elasticity is close to or above unity. Subramaniam (1995)

The coefficient on household size is significant and positive for all three years and somewhat constant at 0.8. This matches theoretical arguments that suggest that larger households will be better off due to economies of scale that accrue from shared public goods, at any given level of per capita resources. The evidence on economies of scale found in this paper is noteworthy given its usual elusiveness (Deaton and Paxton 1998). However, note also that household size may be endogenous because parents with a higher taste for schooling may choose to have smaller families and a higher education budget share. Unfortunately we do not have data on households across time in order to capture household level fixed effects and so address the issue of the potential endogeneity of household size.

The education of the household head is also positively significant for all three years. This indicates a higher demand for schooling among households with more educated heads. Ethnic group is also significant with being a Tamil household affecting the budget share negatively.

The most important result for this paper is to note the coefficients against the age-cohort variables and the F tests at the bottom of the table that compare these coefficients between boys and girls of the same age group Compared to the omitted category of females aged 30 to 54, children in age categories between 5 and 19 exert a significant positive impact on a household's budget share on education. This is not surprising. What is particularly interesting to note, however, is that the coefficients are higher for girls than for boys for most age groups especially in 1990 and 1995. In 1990, for instance, if a child had been a girl rather than a boy in the 5-9 age group within the same household, 1 percent more would have been spent on her towards education, once controlled for other factors such as household size, etc. The corresponding figure for 1995 was 1.35 per cent. Similarly, in 1990, adding an extra girl in the 17-19 age group increased the household education budget by 1.7 per cent more than adding a

reports elasticities ranging between 1.3 and 2.75 for some of India's poorest States for the mid 1980s. In comparison to these figures, Sri Lanka's rural sector seems to treat education as less of a luxury than most Indian States.

boy of the same age group. The F-tests at the bottom of the table summarise these results by highlighting the significant biases. In 1990/91, statistically significant biases favouring girls are indicated for the age cohorts 5 to 9 and 17 to 19 and in 1995/96 for age cohorts 5 to 9 and 14 to 16. In 2000, this girl bias disappears.

In order to get a better understanding of what component of education expenditure actually causes the bias, I disaggregate education expenditure into expenditure on books, fees, travelling and other expenses, and calculate the budget share of each of these components. I then replace the left-hand-side of equation 4.1, i.e., w_i with each of these budget shares separately and re-estimate 4.1 and carry the F test to check whether the gender bias is more obvious in any one component of education expenditure. The unambiguous result is that in 1990/1 and 1995/6, it is expenditure towards books that cause a significant bias. Expenditure in other categories such as fees are often higher for girls than boys but is not statistically significant.

As a robustness check, I re-run the estimations for households with only boys or girls to see if the results are similar to that of pooling all households together. Around 20 per cent of the households have only boys and 20 per cent only girls. Descriptive statistics for these two groups show that their mean values for budget share of education expenditure, household expenditure, household size and siblings are statistically the same, as the t-value testing the means to be different is rejected in all cases. The regression analysis for this sub-sample of households indicate results that match that of all households. In other words, age categories 5-9, 14-16 and 17-19 still indicate a significant girl bias, as the F-tests reveal (results unreported).

These results remain robust even when the age-composition of children is changed in order to make sure that the regression outcomes are not due to simply to the way I split the age categories up. For example, the age categories were changed to (a) 5-9, 10-14 and 15-19 and (b) 5-14, 15-19 and yet again as (c) 5-9, 10-16 and 17-19. For 1990/91 the significant category(ies) were (a) 5-9 and 15-19 and (c) 5-9 and 17-19. Thus the ages for which there was a girl bias

is 8/9 and 17/18. For 1995/96 it was (a) 5-9, 15-19 (c)5-9 and 10-16 with the most significant ages being 8/9 and 14/15/16. There was no significant bias in 2000/01 regardless of how the age categories were split.

Do the baseline results of a significant bias favouring girls in 1990/1 and 1995/6 result hold across expenditure groups or is it something that it driven by the poor (non poor)? For all three years, the budget share of education increases as the household group becomes richer. For example, in 1990, the poorest quartile spend 1.47 of their budget share on education, the second poorest 1.5, the third poorest 1.5 and the richest 1.96. In 1995 the corresponding shares are 1.34, 1.43, 1.66 and 2.25. In 2000 it is 1.55, 1.81, 1.93 and 2.22. Household size decreases by expenditure group. None of the other regressors vary notably between income quartiles. To see if baseline results hold across expenditure groups, I interact the age cohort variable with a dummy indicating whether the household belongs to the poorest quartile and re-regress the education Engel curve. I then interact the age cohort variable with a dummy indicating whether the household belongs to the richest quartile. The results of the F-test for this exercise (unreported) indicate that as in the baseline case, there are no significant girl-boy biases for the year 2000 in any expenditure group. However, there are biases in 1990 and 1995. In 1990, the poorest and the second richest quartiles indicate a bias in the age group 17-19. The bias in the 5-9 category is indicated in the two middle-income groups. In 1995 girls in the 14 to 16 age group among the poorest quartile were favoured at a 1 per cent level of significance while it was around 12 per cent for the richest quartile. The age group where the bias arises varies with the income group but what is common is that the biases always favour the girls.

Let us now discuss the findings regarding a girl-bias in 1990/91 and 1995/6, for the 'baseline' results in more detail.

Each of the age cohorts 5 to 9, 14 to 16 and 17-19 run-up to and culminate at important State examinations. The age cohort 5 to 9 culminates in the Grade 4 scholarship exams, a competitive national exam, the results of which can be used to gain entrance to better-performing secondary schools. The

age group 14-16 is the senior secondary level ending with the Ordinary Level (O/L) examinations. It is an important educational milestone that completes secondary education and is needed to gain entrance to better performing schools and to qualify for high-school education. High school education is captured by age group 17-19 that culminates with students reading for the Advanced Level (A/L) examinations qualifying them to enter university.

The results show that according the Engel curve methodology, rural households allocate the extra rupee towards daughters at age cohort 5-9 (primary school) and 17-19 (A/Ls) in 1990/91 and 5-9 and 14-16(O/Ls) 1995/6. The girl bias does not seem to be indicative of any cultural norm or attitude favouring girls since the Engel curve estimated for food and health shares separately (unreported) do not indicate any significant boy-girl bias. The bias exists only in terms of education expenditure. Higher investment at the primary school level may mean daughters can gain entry to better performing secondary schools. Higher investment at the senior secondary and high-school level will, most probably, bring about better performance at the State examinations. This bias does not exist in the year 2000.

So why does an extra girl increase the household education budget more than a boy does in 1990 and 1995 and why does this tendency disappear in 2000? It could be noise in the data that gives us these results. We have, however, noted in the discussion in section 2.2 that the overall quality of the data is quite good as judged by the coverage rate and non-response rate and the care with which it has been gathered and cleaned. It was also argued previously that the results are not sensitive to the way we break-up the age-cohorts. Thus it is not noisy data that explains our results. It seems that the addition of a girl child in certain age-cohorts genuinely increased the household education budget share more than adding a boy of the same age group.

The girl-bias maybe due to returns to education being higher for girls than boys (at least in the 1980s) backed by the fact that the opportunity cost of leaving school was higher for a girl than a boy, given higher youth unemployment rates among girls with longer waiting periods (Salih 2001).

Did higher returns to education for girls persist into the 1990s? If it did, the household level girl-bias maybe seen to be an efficient allocation of resources and the decision itself may probably be a response to market outcomes in an economy, where females are economically active, assuming that a household's decision to invest in their children's education is guided by returns to education for adults at any given time. We shall turn to this issue next.

3 Returns to Education

Are returns to education higher among secondary or A/L qualified girls rather than it is to boys that make the household bias favouring girls rational? Several studies done using Sri Lankan data for 1980/81, 1985 and 1990 suggest that it is. The studies include Gutkind (1984), Glewwe (1985), Sahn and Alderman (1988), Aturupane (1993), Gunawardane (2002). Most of these works use the Mincerian earnings or wage function and some (i.e.,Aturupane, Sahn and Alderman) correct the estimates for selectivity using the Heckman procedure to find that returns for females for secondary and A/L qualifications are higher than those for males and the direction of the effects remain unchanged when corrected for sample selection. What is important to note is that both with earnings and wages and the dependent variable, returns to completing secondary education are higher for females than for males in the 1980s and early 1990s. In rural areas female returns are higher for senior secondary (i.e., completing the advanced level examinations) as well. This means that if a girl stays on at school for an extra year at the secondary level or stays on to complete her education at the high-school level (A/Ls), the extra amount that she earns is higher than that for a boy.

These tendencies for the 1980s may well have adjusted parental expectations about what is to happen in the 1990s and thus caused them to favour girls in terms of education expenditure. However, in order to verify what happens in the 1990s, I estimate Mincerian wage functions for males and females by level of education for 1995 and 2000. The choice of the standard Mincerian wage

equation fine-tuned to account for household level unobserved heterogeneity has been adopted mainly for purposes of comparability with other recent studies done for Sri Lanka.

3.1 Methodology and Data

Education is an investment of current resources in exchange for future returns. The optimal investment decision therefore is one where an investment in the s^{th} year of schooling offers an internal rate of return higher than the market rate of interest (Becker 1967). If the cost of education are zero and the working life of an individual is long, the standard Mincerian wage function can be used to estimate returns to schooling for males and females. The function estimated is:

$$\ln y_i = \alpha + \sum_{j=0}^{6} \delta_i s_{ij} + \delta_2 x_i + \delta_3 x_i^2 + \delta_4 \tilde{z}_i + \varepsilon_i \tag{2}$$

where $\ln y_i$ is the log of money wages y_i earned in an individual's main occupation over the past month, $s_0 ... s_5$ are dummy variables for the level of schooling with no schooling (0 years) being the base line, and the other years of schooling and university level education collapsed into groups numbered 1-5 in the following order: primary schooling (1-5 years of education), secondary level (6-10 years), completed O/Ls (11-12 years), completed A/Ls (13 years), university graduates and post-graduates. The coefficient δ_i measures the extent to which schooling level raises earnings above the reference level of schooling. An employees' experience is proxied by age x_i in the absence of data on experience while the general non-linear contribution of experience to earnings (i.e., increasing first and then tapering off) is adjusted for by x_i^2, as is conventional. The vector z_i contains other personal characteristics such as whether the individual is married or not, ethnic group and district of residence that may all have an influence on wage earnings. The district of residence is denoted by 24 dummy variables with the Colombo district omitted. The independent error term with mean zero and constant variance is denoted by ε. The wage equation, estimated

as above treats the schooling measure as being exogenous, although it might not be, since unobservables such as ability maybe included in the error term and be related to the level of schooling attained, making this regressor endogenous. If schooling level is endogenous then OLS estimates will be biased. This issue has been the preoccupation of the literature since the earliest contributions and a number of approaches have been used to deal with the issue. In early studies, measures of ability (e.g., IQ scores) were incorporated, directly into the wage equation to proxy ability. More recent non-experimental methods have included matching methods, instrumental variable methods and control function methods (Blundell. et. al. 2004). The issue of the possible endogeneity of the level of schooling has not been dealt with directly in this paper. However, the fixed effects estimation discussed below, that looks at within-sibling differences in wage returns will account for this if one assumes that unobserved effects are additive and common within siblings so that they can be differenced out by regressing the wage difference within the siblings against their education difference (Ashenfelter and Zimmerman 1997).

The results reported and discussed in the main text are based on a sample restricted to men and women between ages 15 to 65 who are in paid employment, in order to capture those who are more likely to be in full-time employment. These respondents claim that the wage reported is from their 'principal' occupation in the last calender month. In 1995/6, roughly 56 per cent of employed males and 54 per cent of employed females work as paid employees (i.e., wage earners) in the government, semi-government or private sector in rural Sri Lanka. Employers and own-account workers comprise 39 and 29 per cent respectively amongst males and females. In 2000/01, 60.79 per cent of males and 49.19 per cent females were in wage employment. The rest have been in non-wage employment, without being further classified, unfortunately, as own account workers or unpaid family workers.

Wages are used instead of earnings (i.e., wage earnings as well as earnings as an employer or own-account worker) for several key reasons. Firstly, in rural Sri Lanka, as common in developing countries, a large proportion of females

work as unpaid family workers. For example in 1995/6 nearly 16 per cent of females reported they were unpaid family workers. The corresponding figure for males was 4.31 per cent. Moreover, even though 98 per cent of those claiming to be wage earners actually report the wages they earn, only 42 per cent of males and 63 per cent of females who claim to be own account workers or employers actually report earnings in the 1995/6 survey. Thus the information the survey supplies regarding non-wage earners is incomplete. This problem is not confronted in the results of the 2000/01 survey. Secondly, in many cases the male-female contribution is difficult to separate when it comes to 'own-account' work and households are more likely to attribute such earnings as those arising from the male's efforts than females especially when answering survey questions. Thirdly, the focus on wage earners in this study is in line with previous studies for Sri Lanka such as Gunawardane (2002) and references there in such as Deolalikar(1995) for Taiwan. It ensures that mainly full-time workers are included in the sample and affords comparability between studies. Fourthly, and most importantly, own-account earners have been excluded because there are several studies done for Sri Lanka that indicate a strong preference among youth in school and those new to the labour market for wage-paid jobs (Salih 2001, National Youth Survey 2001). Most youth seek education in the hope of doing white collar, preferably government sector jobs. Own-account work is often an option of last resort. So it can be assumed that parents' and children base their expectations about returns, on the wage-employment market. We shall assume in addition that expected wages are based on current wages.

The sample of wage earners I use for the OLS regressions may well be non-random since they exclude own account workers and employers. In other words, my estimates will be biased because wage rates are observed only for individuals participating in the labour force as paid employees. The OLS estimates can be adjusted for selectivity bias using the Heckman correction (Heckman 1979). The correction is akin to adding an extra regressor, the inverse Mills ratio derived by running a probit estimation in the first instance to predict the probability of being a wage earner. However, to do this, we need to address

the issue as to why an individual would choose to work as an employee as opposed to being an own account worker or unpaid family worker. Household level variables that we use to estimate this participation probability are critical in calculating the inverse Mills ratio that is used for the Heckman correction. In rural Sri Lanka, many people choose to work in family run agricultural plots. Some run petty trades or businesses that they start up with private savings or loans based on private assets left as collateral. Yet some others seek wage employment in the private sector but fail to find it because of a lack of ability in English language or the right 'connections'. Many youth seek self-employment or fall back into agricultural activity (often following their parents) as an option of last resort. Unfortunately the data set is not rich enough to offer information about household wealth, assets (land ownership or the presence of an established family-run business), English language ability or such factors that may influence a person's decision to be a wage employee. All that is possible is to correct for household demographic variables such as the number of young children (whose presence increases the opportunity cost of joining the labour force especially for women), the number of older persons in the household, etc. that are more important for a female's decision to participate in wage employment rather than a male's. In any case, such an estimation may suffer from the problem of endogeneity because earned wage may influence the number of children, for instance.

I therefore try to account for the issue of sample selection indirectly through correcting for unobserved heterogeneity at the household level[5]. This is done by using the fixed effects estimation to a cluster sample, where the well-defined cluster in this case is the household in each cross-section data set. I use deviations from household means for all households where there are two or more males (females) who are wage earners, to investigate whether fixed effects are important, assuming that differences across households (if they exist) can be captured by parameter α_3 estimating unobserved fixed effects f in an extension of the

[5] This method has also been used in Behrman and Wolfe (1984), Khandker (1990), Behrman and Deolalikar (1993, 1995) and Gunawardane (2002).

model in (2).

$$\ln y_{ik} = \alpha + \sum_{j=0}^{6} \delta_i s_{ijk} + \delta_2 x_{ik} + \delta_3 x_{ik}^2 + \delta_4 \tilde{z}_{ik} + \alpha_3 f_k + \varepsilon \qquad (3)$$

where k is the household. If there are such unobservable fixed effects, and they are significant, the constant term of the fixed effects regression would be significant and the OLS estimations would be biased. Controlling for 'fixed effects' at the household level controls for the sample selection problem as observed by Pitt and Rosenzweig (1990), Heckman and McCurdy (1980). This is because the household-level observed variables used to control for selectivity in the paid labour force are those such as wealth, unearned income, assets etc., and controlling for household fixed effects should control for the selectivity in the paid labour force (Behrman and Deolalikar 1995:106). Apart from this, the fixed effects method addresses the issue of omitted variable bias arising from unobserved heterogeneity at the household and community level. However, this procedure only addreses the issue of heterogeneity bias arising from unmeasured attributes that are common to individuals in the same household, since the fixed effects estimation is limited to households that have more than one male or female earning.

If the unobserved household and community effects are random instead of being fixed, they would bias the error term and invalidate standard statistical tests. In order to test for this possibility, I estimate a random effects model using the same sub-sample. I then use the Hausman test to compare between the fixed or random effects estimations.

The data sources for the estimation of returns are the same as for the previous analysis on intrahousehold allocation. Tables 3.1 and 3.2 provide summary statistics for the variables used for the full sample and reduced sample for 1995/6 and 2000/01, respectively. The reduced sample (i.e., households with two or more male or female wage earners) is roughly between a quarter and a third of the full sample. The reduced samples for both 1995 and 2000 can be noted

for its younger workers, who seem to earn less on average than wage earners in the full samples, with fewer of them married and even a bit less educated. This probably indicates that the households captured in the reduced sample are mostly those where unmarried siblings still live with their parents or younger married couples living with parents. This is not uncommon for Sri Lanka where children leave the parental home mostly after marriage, more often than not into the homes of their in-laws.

3.2 Results

The OLS regressions on the full sample and the OLS, fixed and random effects regressions on the reduced sample are reported in Tables 4.1 for males and 4.2 for females in rural areas. The variables flagged as being significant are almost the same in all the estimations. Moreover, the coefficients for the OLS estimations (on both the full and reduced samples) and the random effects estimations are somewhat similar. However, the fixed effects coefficients are smaller. This implies that unobserved household effects that were not captured in the OLS estimations were positively correlated with any of the explanatory variables. Moreover, the standard errors of the fixed effects estimation is smaller indicating that cluster effects have been taken into account in their calculation unlike in the case of the OLS.

So are unobserved household effects significant? In all cases the Breusch -Pagan Lagrange Multiplier test on the random effects model show that unobserved household effects are indeed significant. The Hausman test, used to compare the fixed and random effects models, rejects the null hypothesis that the difference in coefficients is not systematic in all cases at a 1 per cent level of significance apart from females in 1995, where it is rejected at the 10 per cent level of significance. Assuming that the specification of the model is correct, I interpret this result to mean that unobserved household effects and the implicit correction for selection is indeed important, and that the fixed effects estimations are superior to the OLS or random effects estimations. I therefore focus

on the fixed effects-based estimations.

The fixed effects coefficients on the education level variables are often higher for females with secondary education and those who completed O/Ls than for males. In the OLS and random effects estimations, this result is more pronounced. To make this result clearer, I calculate returns to education using the coefficient values and levels of schooling. They are calculated as $\delta_i - \delta_{i-1}/s_i - s_{i-1}$, following the notation in equation 3 where δ_i is the coefficient on schooling level s_i. The formula shows the extra return to an extra level of schooling, with the value of the increase in earnings calculated as $\exp^{\delta_1} - 1$, given that the dependent variable is the log of wages and the reference level for schooling is 0. Since individuals may have completed varying years of schooling in the primary, secondary and graduate level cohorts, I use average years for these cohorts. Thus s_1=3, s_2=8, s_3=11, s_4=13, s_5=16 and s_6=18.

Table 5 reports fixed effects estimation based returns to education calculated, using the reported results for rural areas and unreported results for all areas. The results show that women have an unambiguously higher return to secondary and O/L education than do men in terms of both rural areas and all-sectors. This matches trends observed in the 1980s and 1990, reported by Aturupane, Gunawardane and other studies. Apart from Gunawardane (2000) the other studies do not account for household level heterogeneity and it is likely that the returns estimations are inflated. However, this does not affect the trends illustrated by these estimations. The trends in all the estimations, regardless of the econometric refinement and differences in the dependent variables, is broadly the same. For the completed O/L and A/L categories, returns to females is higher. Overall, however, the size of the returns have fallen over the two decades beginning in 1981. This is partly because the earlier estimates are 'inflated' in not accounting for household level heterogeneity, and partly, because true returns have indeed fallen, at least from 1985 onwards when the estimates discussed become more comparable in terms of methodology adopted.

The calculations in this paper show, in addition, that the clear advantage females had in terms of returns in the 1980s and even 1995, diminishes slightly

especially for rural areas by the year 2000. Secondary school educated women still have an advantage but the male-female gap has fallen. In the case of females who have completed O/Ls in rural areas, their returns to education have fallen dramatically from 8.8 to 1.6 between 1995 and 2000, to be almost equal to that of men. Moreover, even though the all-sector returns for A/L educated females remains higher in 2000 than for men, this is not so for women and men in rural areas. It is beyond the scope of this paper to discuss why the returns have changed as they have between 1995 and 2000, and indeed why returns overall have been going down since 1981. Suffice it to note that there have been many exogenous shocks the Sri Lankan economy experienced during the post-liberalisation period. Economic liberalisation in 1977 brought with it a radical policy shift with a welfarist, left-wing government replaced by right-wing policies, trade liberalisation and privatisation. The early and mid 1980s saw huge influxes of foreign capital and investment especially in large scale, government backed, infrastructure development programs–mainly in the area of irrigating the dry-zone. Civil, political and youth unrest was rife during this period and 1989 brought in a president who sort aggressively to ease out civil and youth tensions through large scale poverty programs and housing projects. Insurgencies and political unrest continued until late 1994 brought with it a new government after 17 years under the rule of the United National Party. With it came a second wave of liberalisation with large scale privatisation efforts as well as the opening of more large-scale export oriented female-labour intensive garment factories since the late 1980s. The garment industry offered a lot of scope and opportunity for young women to work. However, 1995 was a year where poverty rates in Sri Lanka were at an all-time high since the initial economic liberalisation in 1977. This, together with job opportunities created after the second wave of liberalisation probably resulted in a higher labour force participation rate, especially by women. The year 2000 was significant in that a peace pact was agreed upon between the government and the Tamil Tigers, ending (temporarily at least) 17 years of civil war, bringing some amount of stability to the economy. The two decades since initial economic

liberalisation in 1977, therefore, has been turbulent for Sri Lanka, politically, socially and economically. This together with exogenous shocks both national and international have no doubt affected relative returns, and is a matter that needs careful further investigation.

Is it possible that our returns to education estimation biased in that it excludes important "non-market" factors that influence a female's returns, such as cultural or normative considerations? Some studies for neighbouring countries such as India and Bangladesh show that a woman often moves in with her in-laws after marriage and her earnings there onwards accrue to the family of her in-laws (Malhotra and Tsui 1996). This means that her natal family benefits less from her economic returns, and any 'true' estimate of returns to education should account for this by deflating a purely market-based calculation as above. An implication of the girl's earning not accruing to her own family is that parents choose to invest more in sons under the implicit assumption that it will be sons who will look after them financially in old age rather than daughters. This is not so in Sri Lanka. In a majority of Sri Lankan families the married couple is responsible for their own finances and daughters are not constrained in helping out their siblings and parents out of their own income, if they so wish. So the threat of in-laws' siphoning-off earnings is unlikely. On the contrary, education gives the girl more autonomy and social mobility so that she will have more authority to dispense her earnings as she wills–and perhaps its better to invest in education than in material dowry which can well be dissipated by the husband/in-laws. In some cases, employment has been a substitute for the dowry that is still considered important by some Sri Lankan parents and youth. The Sri Lanka Youth Survey suggests that dowries are considered important only by 19 per cent of the sample of youth aged 15-29 and that too more predominantly among the Tamils rather than the majority Sinhalese. Malhotra and Tsui estimate this at to be 30 per cent according to their survey of Sri Lankan youth. The trend of education and consequent earning potential being a substitute for the dowry is seen in South India as well, where higher education is often a dowry substitute and a means of improving a

women's value in the marriage market.

In some cases, dowries are often collected by the girl herself as the age at marriage is pushed forwards[6]. However, in Sri Lanka, the age of marriage being pushed forwards is not indicative that employment is an alternative to marriage as in some East Asian countries such as Thailand or Taiwan. The higher age at first marriage in Sri Lanka seems to be driven by poor, rather than improved economic and political conditions (Caldwell et al 1989). For most females, employment before marriage is more for the income it provides, than purely for the dowry they can collect through 'saving' or the career they can build as a substitute for the dowry (Malhotra and Tsui 1996). Female earnings, or rather, the earnings of both the man and the woman in the family has grown important over time due to slow economic growth and political unrest and thus, economic returns to education play an important role when a household decides to invest in a girl-child, rather than dowry or other 'cultural' or normative concerns. Thus a woman's non-market influences on returns to education placed mainly by cultural and normative factors do not appear to be very different to her male counterparts. A majority of Sri Lankan women participate actively in the labour market and are not considered a burden. As such, we can assume that the estimated returns to education, are reasonably representative of the 'true' value and does not need any significant adjustments for unobservable factors affecting returns.

[6] The median age at first marriage in Sri Lanka, for women in rural areas, has risen from around 20 in the 1960s to 25-27 in 2000 in rural areas (DHS 2000; Dissanayake 2000). Sri Lanka has historically had ages at first marriage that are higher than those of the rest of the region. For example, while her counterparts married on reaching puberty at ages as young as 13 or 14 in Northern India, Pakistan and Bangladesh, the Sri Lankan female has been marrying at around 18 or 19 even during as far back as the 1940s. During the last couple of decades, these median ages have increased further, matching other Asian countries such as Taiwan or Thailand, as have educational levels and social welfare for women (De Silva 1990, Thornton and Lin 1994).

4 Conclusion

The first part of the paper showed that contrary to most developing countries, there is a bias favouring girls in rural Sri Lanka in the allocation of education expenditure within the household. This was seen using demand analysis assuming a linear Engel curve. Sri Lankan rural households seem to be allocating more educational resources towards girls in 1990/91 for age groups 5-9 and 17-19 and in 1995/6 for age groups 5-9 and 14-16. The 5 to 9 age group corresponds to the run-up to year 5 scholarship exams where children can gain entry into better performing state schools. The 14-16 age group captures the culmination of secondary education with the reading for the Ordinary Level examination and gaining entrance to read particular subjects for the Advanced Levels. The 17-19 age group captures the run-up to and culmination in Advanced Level examination, by far the most competitive exam in Sri Lanka that allows a student to gain university entrance. The result of intrahousehold bias in the allocation of education favouring girls, was tested in various ways for robustness. This included analysing the quality of the data, verifying the result by income quartile, splitting the age-group categorisation in various ways and seeing if the results held for households with only boys or girls. The results were robust to all these different specifications: there was indeed a bias favouring girls in the years 1990/91 and 1995/6.

The second part of the paper tried to understand why these biases arise. The basic hypothesis was that it was due to economic reasons with household level biases reflecting labour market returns to education. An analysis of returns to education showed that the household level allocational biases seem to match macro-level trends in private returns to education. Corresponding to results of several previous work done on Sri Lankan returns to education, our results showed that for 1995, returns to schooling for a girl at the secondary, completed O/L and completed A/L categories was higher than that for a boy in rural areas as well as all areas (urban, rural and estate). In other words, schooling a girl for one extra year at these levels in particular, earned a girl a higher return on

that extra year than a boy. At the margin, therefore, it was more 'efficient' in an economic sense to invest in a girl. However, this clear advantage in terms of economic returns enjoyed in the 1980s and 1990s seems to be lost by the year 2000 and together with it the intrahousehold bias in education favouring girls. Reasons as to why the relative return structure seems to have changed is beyond the scope of this paper and is left for further research.

Can the intrahousehold bias be explained purely with reference to private returns in the labour market? Are girls valued more than boys at a normative or cultural level? This is not so. This is because the bias is only obvious in terms of education expenditure but not with respect to health or food expenditure. Thus there does not seem to be an intrinsic discrimination of boys. Could it be that our estimate for returns is inadequate in not accounting for non labour market factors? For example, should returns be revised downwards accommodating for factors such as the lower status of women in most South Asian countries or because education maybe a substitute for the dowry at marriage? Both these are not significant for Sri Lanka. First, Sri Lankan women have historically had more freedom than her other South Asian counter-parts and later marriage has been accompanied with a cultural heritage of relative gender equality in terms of bilateral descent, a daughter's value in a parental home and continued kin support following marriage. Thus, there is no necessity to revise estimate for an elusive 'lower status' factor. Secondly, even though the dowry is considered important by about a quarter to a third of youth interviewed in certain surveys, the labour market activity of females before marriage is not exclusively for the purpose of collecting a dowry. The economic and political situation in Sri Lanka has not been greatly favourable after liberalisation in 1977 and poverty rates are still high with one in four households below the official poverty line. Increased female participation in the labour market and the bringing in of two incomes by the male and female in a family has now become an economic necessity. Liberalisation and the opening of employment opportunities in garment factories in the free trade zone and in West Asia as domestic aids has mobilised more women to move away from their homes and seek employment. The returns to

educating a daughter are high, and has been so since the early 1980s. It is perfectly rational, at the household level, therefore to favour daughters at least at critical stages of the schooling process.

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Table 1: Summary Statistics for Budget Share of Education and Contributory Variables in Rural areas

Variable name	Description of variable	1990/91	1995/96	2000/01
Educ_share	Budget share of education: household education expenditure/Total expenditure on food and non-food items X 100	1.60 (0.04)	1.68 (0.04)	1.93 (0.059)
Exp_TOT	Total expenditure (in rupees) on food and non-food items per member of the household	791.03 (9.96)	1449.43 (28.37)	3058.65 (47.12)
hsize	Log household size	1.51	1.43	1.36
M0_4	Number of males aged 0 to 4 as a proportion of all household members (excluding boarders and lodges)	.04	.04	.035
f0_4	Number of females aged 0 to 4 as a proportion of all household members (excluding boarders and lodges)	.03	.04	.034
M5_9	Number of males aged 5 to 9 as a proportion of all household members (excluding boarders and lodges)	.04	.03	.037
f5_9	Number of females aged 5 to 9 as a proportion of all household members (excluding boarders and lodges)	.04	.04	.03
M10_13	Number of males aged 10 to 14 as a proportion of all household members (excluding boarders and lodges)	.04	.04	.034
f10_13	Number of females aged 10 to 14 as a proportion of all household members (excluding boarders and lodges)	.04	.04	.033
M14_16	Number of males aged 15 to 19 as a proportion of all household members (excluding boarders and lodges)	.28	.03	.025
f14_16	Number of females aged 15 to 19 as a proportion of all household members (excluding boarders and lodges)	.27	.03	.024
M17_19	Number of males aged 10 to 14 as a proportion of all household members (excluding boarders and lodges)	.27	.027	.027
f17_19	Number of females aged 10 to 14 as a proportion of all household members (excluding boarders and lodges)	.27	.026	.026
M20_29	Number of males aged 20 to 29 as a proportion of all household members (excluding boarders and lodges)	.08	.08	.07
f20_29	Number of females aged 20 to 29 as a proportion of all household members (excluding boarders and lodges)	.08	.08	.08
M30_54	Number of males aged 30 to 54 as a proportion of all household members (excluding boarders and lodges)	.14	.16	.166
f30_54	Number of females aged 30 to 54 as a proportion of all household members (excluding boarders and lodges)	.15	.16	.177
M55**	Number of males above age 55 as a proportion of all household members (excluding boarders and lodges)	.07	.07	.07
f55	Number of females above age 55 as a proportion of all household members (excluding boarders and lodges)	.08	.08	.086
Educ_head	Education level (in years) of the household head	5.9	9.9	8.6
Tamil	Proportion of households with a Tamil household head	.01	.04	.02
Minority	Proportion of households with a Muslim, Burgher or other minority as a household head.	.04	.04	.09

Note: Standard errors in parenthesis for continuous variables. ** Reference group for education Engel-curve estimations

Source: Own calculations using HIES 1990/91, 1995/6 and 2000/01.

Table 2: Education Engel Curves for Rural Sri Lanka

	1990/91	1995/6	2000/01
Log expenditure	0.883	0.950	0.736
	(10.26)**	(11.63)**	(9.27)**
Log household size	0.822	0.850	0.854
	(9.93)**	(5.72)**	(5.16)**
M0_4	-2.728	-1.908	-2.077
	(8.53)**	(7.14)**	(5.80)**
f0_4	-2.642	-1.455	-2.101
	(7.78)**	(4.29)**	(5.15)**
M5_9	0.097	1.800	2.439
	(0.27)	(4.61)**	(5.42)**
f5_9	1.092	2.696	2.391
	(2.84)**	(6.24)**	(5.16)**
M10_13	2.130	3.278	4.403
	(4.86)**	(7.92)**	(8.06)**
f10_13	1.988	3.585	3.555
	(4.64)**	(7.74)**	(7.13)**
M14_16	2.313	3.371	4.616
	(4.49)**	(6.73)**	(7.41)**
F14_16	3.101	4.660	5.350
	(5.55)**	(9.63)**	(7.91)**
M17_19	1.345	2.133	4.459
	(2.56)*	(4.18)**	(6.60)**
F17_19	3.032	2.849	3.608
	(5.67)**	(5.77)**	(7.13)**
M20_29	-1.720	-1.978	-2.371
	(5.20)**	(7.02)**	(7.63)**
F20_29	-0.693	-0.906	-1.037
	(2.53)*	(3.61)**	(3.86)**
M30_54	-1.824	-1.814	-1.694
	(4.73)**	(6.70)**	(6.32)**
M55	-1.507	-1.256	-1.228
	(5.19)**	(5.50)**	(5.11)**
F55	-0.851	-0.809	-1.110
	(3.02)**	(3.80)**	(4.62)**
hhead_educ	0.101	0.152	0.082
	(10.99)**	(13.68)**	(5.53)**
Tamil	-0.489	-0.299	-0.393
	(3.02)**	(1.44)	(2.27)*
Minority	-0.179	-0.098	-0.087
	(0.86)	(0.43)	(0.46)
Constant	-5.677	-6.699	-4.934
	(8.19)**	(10.23)**	(8.92)**
Observations	11007	14234	12487
R-squared	0.15	0.16	0.16
F-Tests: 0-4	0.751	0.257	0.941
5-9	**0.006**	**0.049**	0.916
10-13	0.761	0.489	0.139
14-16	0.160	**0.031**	0.328
17-19	**0.008**	0.236	0.249

Note: Absolute value of t statistics in parentheses; District dummies included in regressions but not reported. Dependent Variable: is budget share of education. * Significant at 5%; ** significant at 1%.
Source: Own calculations using HIES 1990/91, 1995/6 and 2000/01.

Table 3.1: Summary Statistics for Selected Returns to Schooling Variables 1995/96

	Full sample				Reduced sample			
	All Sectors (Urban, rural and estate)		Rural		All Sectors (Urban, rural and estate)		Rural	
	Male	Female	Male	Female	Male	Female	Male	Female
Wage earned during the past month	2934.03 (51.88)	2435.38 (51.52)	2727.03 (54.3)	2313.32 (57.45)	2633.45 (57.84)	2399.65 (71.21)	2450.42 (89.82)	2273.66 (81.42)
Age	36.78	35.03	36.74	35.08	34.33	32.97	34.36	32.99
Age squared	1476.9	1345.30	1473.05	1350.14	1341.48	1223.18	1345.48	1224.75
Primary (1-5 years of education)	.28	.23	.28	.21	.29	.21	.30	.20
Secondary (6-9 years of education)	.37	.25	.38	.28	.36	.28	.36	.32
Finished O/L	.18	.18	.17	.18	.17	.17	.16	.18
Finished A/L	.08	.15	.08	.15	.09	.14	.08	.14
University Graduates	.02	.03	.02	.03	.01	.03	.01	.03
Post graduate	.01	.01	.00	.00	.00	.00	.00	.00
Married proportion	.73	.69	.73	.68	.53	.53	.52	.53
Sample size	13322	6322	8689	3710	4849	2127	2998	1159

Source: Own calculations using HIES 1990/91, 1995/6 and 2000/01.

Table 3.2: Summary Statistics for Selected Returns to Schooling Variables 2000/01

	Full sample				Reduced sample			
	All Sectors (Urban, rural and estate)		Rural		All Sectors (Urban, rural and estate)		Rural	
	Males	Females	Males	Females	Males	Females	Males	Females
Wage earned during the past month (Rs.)	5096.02 (76.56)	4228.82 (82.81)	4868.63 (78.69)	4150.54 (97.01)	4560.4 (79.11)	4020.0 (80.37)	4197.6 (81.31)	3746.2 (85.28)
Age	37.98	36.31	38.05	38.05	34.14	33.2	33.8	33.2
Age squared	1573.67	1449.13	1577.69	1474.90	1345.75	1258.9	1333.3	1256.6
Primary (1-5 years of education)	.25	.23	.24	.24	0.25	0.21	0.42	0.17
Secondary (6-9 years of education)	.43	.29	.44	.44	0.46	0.32	0.49	0.36
Finished O/L	.15	.14	.16	.16	0.14	0.13	0.35	0.15
Finished A/L	.09	.18	.08	.08	0.08	0.16	0.26	0.17
University Graduates	.02	.04	.01	.01	0.17	0.04	0.11	0.04
Post graduate	.00	.00	.00	.00	0.006	0.009	0.06	0.004
Married proportion	.78	.71	.78	.78	0.53	0.5	0.5	0.47
Sample size	12646	5432	9110	3502	3367	1530	2177	870

Source: Own calculations using HIES 1990/91, 1995/6 and 2000/01.

Table 4.1: Males: Private Returns to Schooling in Rural areas 1995/96 and 2000/01

Dependent variable: log wage

	1995/6				2000/01			
	OLS (full sample)	OLS (restricted sample)	Fixed Effects	Random Effects	OLS (full sample)	OLS (restricted sample)	Fixed Effects	Random Effects
Age	0.035	0.047	0.037	0.044	0.042	0.060	0.058	0.066
	(7.95)**	(6.80)**	(5.57)**	(7.37)**	(8.42)**	(8.34)**	(7.36)**	(9.46)**
age_2	-0.000	-0.001	-0.000	-0.001	-0.001	-0.001	-0.001	-0.001
	(7.53)**	(6.77)**	(5.60)**	(7.17)**	(8.59)**	(7.98)**	(7.71)**	(9.33)**
ed1	0.103	0.131	0.029	0.135	0.217	0.282	0.222	0.306
	(3.37)**	(2.43)*	(0.50)	(2.55)*	(5.46)**	(3.25)**	(2.81)**	(4.50)**
ed2	0.301	0.354	0.204	0.383	0.444	0.509	0.327	0.558
	(9.90)**	(6.82)**	(3.32)**	(7.08)**	(10.18)**	(5.30)**	(4.10)**	(8.34)**
ed3	0.628	0.669	0.485	0.727	0.752	0.787	0.412	0.825
	(17.14)**	(11.16)**	(7.02)**	(12.31)**	(15.95)**	(7.48)**	(4.65)**	(11.35)**
ed4	0.853	0.862	0.733	0.929	1.051	1.122	0.658	1.154
	(20.64)**	(14.10)**	(9.39)**	(13.96)**	(21.22)**	(10.03)**	(6.61)**	(14.39)**
ed5	1.181	1.318	1.240	1.355	1.430	1.335	0.844	1.392
	(24.43)**	(13.85)**	(9.22)**	(12.35)**	(22.02)**	(10.64)**	(5.19)**	(10.77)**
ed6	1.380	1.273	1.494	1.583	1.336	1.291	0.788	1.286
	(13.14)**	(5.15)**	(6.43)**	(7.32)**	(13.67)**	(5.28)**	(3.12)**	(6.02)**
Married	0.151	0.132	0.115	0.125	0.173	0.085	0.091	0.084
	(7.50)**	(4.18)**	(3.28)**	(3.99)**	(8.92)**	(2.59)*	(2.25)*	(2.42)*
Tamil	-0.083	-0.072	-0.133	-0.171	0.091	0.018	0.096	0.068
	(1.81)	(1.05)	(1.93)	(3.80)**	(1.77)	(0.21)	(1.00)	(1.17)
Minority	0.089	-0.023	-0.075	0.025	0.059	0.012	0.051	0.058
	(1.75)	(0.31)	(0.86)	(0.43)	(1.07)	(0.15)	(0.52)	(0.99)
Constant	6.773	6.503	6.529	6.342	7.104	6.644	7.121	6.347
	(68.92)**	(42.78)**	(40.41)**	(55.85)**	(74.79)**	(40.93)**	(38.37)**	(46.67)**
Observations	8794	2519	2519	2519	7994	2177	2177	2177
Number of hhid			889	889			779	779
R-squared	0.33	0.36	0.26		0.31	0.29	0.18	
F-ratio/χ2 (p-value)			F=20.89 (0.000)	χ2=808.77 (0.000)			F=11.43 (0.000)	χ2=588.59 (0.000)
B-P LM[1]				χ2=130.3 (0.000)				χ2=132.76 (0.000)
Hausman [2]				37.5(0.00)				78.3 (0.00)

Note: 1. BP- LM: Breusch-Pagan Lagrange Multiplier for significance of household unobserved effects (p-value)

2. Hausman : Hausman test of fixed versus random effects assuming correct model specification (p-value)

Absolute value of t statistics in parentheses * significant at 5%; ** significant at 1 %.

Source: Own calculations using HIES 1990/91, 1995/6 and 2000/01.

Table 4.2: Females: Private Returns to Schooling in Rural areas 1995/96 and 2000/01

Dependent variable: log wage

	1995/6				2000/01			
	OLS (full sample)	OLS (restricted sample)	Fixed Effects	Random Effects	OLS (full sample)	OLS (restricted sample)	Fixed Effects	Random Effects
Age	0.013	0.021	0.026	0.021	0.014	0.038	0.019	0.033
	(1.55)	(1.53)	(1.97)*	(2.04)*	(2.00)*	(3.07)**	(1.37)	(2.94)**
age_2	-0.000	-0.000	-0.000	-0.000	-0.000	-0.001	-0.000	-0.000
	(1.24)	(1.40)	(1.66)	(1.95)	(1.77)	(2.77)**	(1.79)	(3.10)**
ed1	0.050	-0.117	0.006	-0.064	0.059	0.060	-0.161	0.070
	(1.51)	(1.89)	(0.07)	(0.92)	(1.35)	(0.64)	(1.41)	(0.79)
ed2	0.438	0.334	0.430	0.407	0.426	0.579	0.215	0.621
	(9.91)**	(3.97)**	(4.24)**	(5.50)**	(7.76)**	(5.29)**	(1.76)	(6.88)**
ed3	1.025	0.927	0.891	0.936	0.927	0.890	0.349	0.898
	(21.56)**	(10.26)**	(7.69)**	(11.70)**	(14.65)**	(7.38)**	(2.54)*	(8.98)**
ed4	1.209	1.051	1.011	1.053	1.204	1.052	0.565	1.100
	(27.19)**	(11.92)**	(8.25)**	(12.60)**	(22.07)**	(8.82)**	(4.01)**	(11.32)**
ed5	1.504	1.236	1.240	1.277	1.567	1.477	0.882	1.453
	(34.35)**	(10.18)**	(7.37)**	(10.50)**	(25.11)**	(8.89)**	(5.31)**	(11.62)**
ed6	1.648	1.479	1.136	1.485	1.664	1.642	1.442	1.786
	(21.04)**	(12.09)**	(3.52)**	(6.01)**	(16.05)**	(5.32)**	(4.25)**	(6.04)**
Married	0.006	0.031	0.003	0.036	0.036	0.090	0.139	0.112
	(0.17)	(0.60)	(0.04)	(0.73)	(1.14)	(1.88)	(2.02)*	(2.17)*
Tamil	0.181	0.057	-0.165	0.029	0.127	0.194	0.002	0.119
	(3.66)**	(0.78)	(1.41)	(0.43)	(2.00)*	(2.32)*	(0.01)	(1.48)
Minority	0.170	0.337	0.476	0.210	-0.120	-0.277	-1.585	-0.294
	(1.48)	(1.46)	(1.28)	(1.01)	(0.94)	(1.08)	(3.39)**	(1.72)
Constant	6.748	6.689	6.191	6.581	7.321	6.878	7.650	6.754
	(43.47)**	(28.76)**	(21.64)**	(36.04)**	(54.95)**	(30.23)**	(21.14)**	(32.03)**
Observations	3710	1053	1053	1053	3298	870	870	870
Number of hpouseholds			531	531			459	459
R-squared	0.42	0.41	0.34		0.44	0.39	0.36	
F-ratio/χ2			F=9.56	χ2=548.3 (0.000)			F=7.94 (0.000)	χ2=408.35 (0.000)
B-P LM[1]				χ2=51.5 (0.000)				χ2=48.27 (0.000)
Hausman[2]				16.3 (0.10)				42.01 (0.00)

Note 1. BP- LM: Breusch-Pagan Lagrange Multiplier for significance of household unobserved effects (p-value)

2. Hausman : Hausman test of fixed versus random effects assuming correct model specification (p-value) .

Absolute value of t statistics in parentheses * significant at 5%; ** significant at 1%.

Source: Own calculations using HIES 1990/91, 1995/6 and 2000/01.

Table 5. Private rates of return to education in Sri Lanka 1995 and 2000[1]

	Level of Education			
	Secondary (6-10 years of schooling)	Completed O/L (11 years of schooling)	Completed A/L (13/14 years of schooling)	University Graduate (15-17 years of education)
1995				
Male- Rural	**2.5**	**3.6**	3.5	8.6
Female-Rural	**6.6**	**8.2**	2.4	4.4
Male-All sectors	**2.4**	**4.2**	3.1	7.5
Female-All Sectors	**5.4**	**9.6**	3.2	6.4
2000				
Male- Rural	**1.7**	1.1	3.2	**2.5**
Female-Rural	**4.8**	1.6	2.6	**4.1**
Male-All sectors	**2.4**	**2.7**	**3.9**	**3.9**
Female-All Sectors	**6.3**	**5.8**	**5.0**	**8.4**

Note : Returns for rural sector estimated using results reported in Table 10.1 and 10.2. Returns for all sectors calculated using unreported results. Calculations based on restricted sample fixed effects estimates.
Source: Own calculations using HIES 1990/91, 1995/6 and 2000/01.