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Gender and Household Education **Expenditure in Pakistan**

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Abstract

This paper addresses two questio~s central *to* the literature on intra-household resource allocations: does the allo.::atiof' of hous~hold educational resources in Pakistan favour males over females? And,wha1 explains the inability of the standard Engel curve approach *to* detect differential treatment even where discrimination is known to exist? Using uhique individual level data from the latest household survey *from* Pakistan, we estimate Engel curves to address these questions. Empirical findings reveal significant pro-male biases in the allocation of educational expenditure among all school-going age groups in Pakistan. We conclude that one *of* the main reasons for the failure of studies in identifying biases lie in using highly aggregated expenditure data in conventional estimates.

JEL Classification Numbers: I2l, J16, J71

Key Words: Gender bias, educational expenditure, Engel curve, Hurdle Model, Pakistan.

1. *Introduction*

Differential educational outcomes are an important aspect of gender inequalities in Pakistan. Arguably, large and significant observed gaps in male-female schooling outcomes could be caused by potentially lower inputs into girls' education i.e. differential treatment in the allocation of household educational resources. Typically, the detection of gender biases in intra-household allocation of consumption has relied on two approaches: 1) the direct comparison of expenditure by gender, contingent on availability of individual level data and 2) the indirect Engel curve approach which utilises household level data to infer differential treatment by analysing how changes in gender composition engender changes in household expepditure. Much of the 'extant literature has, due to data .limitations, relied on the latter approach rather than the former. This large literature investigating gender biases in household consumption . patterns has raised more questions than it has answered,. Particularly puzzling has been the failure of the conventional Engel curve approach to detect differential treatment in household *allocations* even where male-female *outcomes* bespeak glaring pro-male biases.

In this paper we examine gender biases in the allocation of educational expenditure within Pakistan. The analysis encompasses two main objectives. On the one hand, we test the hypothesis that, in Pakistan, the allocation of household educational resources favours males over females. On the other hap..d, we investigate one possible reason for the failure of extant studies to' detect gender biases, even where discrimination is known to exist. Data from the Pakistan Integrated Household Survey [PJHS (20012002)] is utilised to address both questions.

The reliability of the Engel curve approach as a method of detecting gender biases has been questioned in recent years due to its failure to detect discrimination even where it is known to exist. Deaton (1997, pp. 239-241) remarks 'It isa puzzle that expenditure patterns so consistently fail to show strong gender effects even when measures of outcomes show difference,; between boys and girls.' One possible explanation for this 'puzzle' could be the nature of the data. Previous studies have, perforce, had to use highly aggregated data to infer discrimination. Typically, expenditure data an food and medical expenses, and largely also on education, in household surveys, is available for the entire household rather than separately for each individual member. The Engel curve technique - attempts to deduce differential treatment from household-level aggregated data. However, it is possible that using household level data results in loss of information and makes it more difficult to detect gender biases in intra-household allocations.

The estimation approach adopted in this paper focuses on the issues suggested above. A standard Engel curve analysis is conducted to address the first hypothesis: that educational expenditure allocation in Pakistan favours males over females. Moreover, we propose estimating simple OLS models using data on educational expenditure of *each individual* child in a given household. This allows a test of the second hypothesis: that data aggregation is a possible reason for the failure of previous studies in detecting *gender* biases.

This paper proceeds as follows. Section 2 provides a background of Pakistan. Our discussion in this second section unravels the theoretical framework within which differential schooling outcomes are observed. Section 3 summarises the international and national literature on intra-household allocation of consumption expenditures, including educational expenditure. Section 4 proposes the model and empirical strategy adopted while section 5 discusses the data. Section 6 analyses the descriptive statistics. The empirical results are discussed in section 7 and ,section 8 concludes.

2. *Gender Bias in Pakistan: Is it Advantageous to be a Boy?*

Females are markedly disadvantaged as compared to males in many regions around the world. Nowhere is this disadvantage more apparent than in South Asia and 'especially in Pakistan where women lag behind men in several indicators of human development. In particular, a large literature documents differential schooling outcomes among males and females in Pakistan. A natural question follows: what factors explain higher mortality and poorer schooling outcomes for females in Pakistan? In particular why are female *educational outcomes* in Pakistan so different from those of their male counterparts? Broadly speaking, economic theory proposes three reasons why this may be the case: because the returns to educating boys are greater, the costs of educating boys are lower or because parents prefer educating sons rather than daughters [Glick and Sahn (2000) pp. 67]. ,

Why might the returns' to educating females be lower? If females face job or wage discrimination in the labour market, the economic benefits of educating daughters will be lower. Although there are substantial non-market benefits to educating girls (cited ~Ibovc), parents may not take these into consideration while making investment decisions. Even if girls were to earn equivalently to,males once in the labour market, typically in developing countries, females are not expected to remit money to their parents while males are expected to look after their parents in old age -what is called the patrilocal family structure. It makes 'economic sense' for parents to invest less i,n daughters. Returns to girls' schooling maij also be lower if the school quality accessed by girls is inferior, for example due to inferior teacher qualifications and adverse teacher attitudes to girls schooling. Studies in India suggest that not only are females discriminated against in the labour market, they also face substantially low returns to education as compared to boys [Kingdon (1998)]. Kingdon (1996) for urban India also finds that girls have a lower probability of being sent to fee-charging private schools which are costlier and of better quality. Rosenzweig and Schultz (1982) using rural household level data and district level data in India also find that children who . are expected to earn more in future are allocated a larger share of household resources and have a greater propensity to survive as children. In particular, the authors note that female children receive a proportionately larger share of household allocations as compared to males when women's expected employment in the labour market is high (pp. 804).

The direct and indirect costs of educating girls in developing countries may also be higher. The opportunity cost of a girl's time may be substantial' if social norms attribute housework and care of younger siblings her responsibility. Even arguably exogenous sources may increase or decrease these costs. An increase in the number of younger siblings in the household may affect girls' time allocation more than it affects boys. Alternatively, the presence of eider siblings or elder women may provide substitutes for girls, increasing the time available for schooling. Cultural norms and' household constraints imply that marginal costs of girls schooling may be higher than those of boys, particularly where parents believe that participation in household work imparts skills to children (especially girls) which they cannot learn in school.

Finally, son-preference may mould parental educational decisions. Preferences, in tlirn, could be shaped by cultural and social norms regarding the sexual division of lab1~'OG wi~in \\ \:1ousehold rGlick and Sahn (2000),pp. 67 and AI-~amarrai and Ul Lfil (1 uuu:st:.uu 1'0 l'J 11~1',- 4UV -~.UU.. ~\!~M-,Mlt'... *MI* T ~IM ~Mel ~i~ft Peas.good (1997) pp. 5]. There is evidence of son preference in India where fertility stu?les of wome~ reveal a desire for sons over daughters [Das Gupta (1987)]. EVIdence from TaIwan also documents the finding that Chinese f~milies prefer sons to daughters [Parish and Willis (1993)].

For allor-anyone of the above reasons, parents may invest less in girls'. Schooling than on boys'. Whether lower allocations of educational expenditure to girls constitute *discrimination* is arguable. If labour market discrimination generates lower returns to girls' education, smaller allocations to girls *within* the household reflect a purely economic investment motive and this prevents gender-differentiated treatment from being branded 'discrimination'. If 'tastes' for education or cultural and social norms influence allocations, there may arguably be some 'discrimination' story at least in the allocation of educational expenditures. It may be that girls 'tastes' for certain types of allocations dictate spending less on them. They may be compensated, however, with increased allocations of other types of expenditures. However, arguing that girls have lower tastes for education as compared to boys as an interpretation of differential treatment is not very plausible. Education is an investment which affects the life chances of an individual and in case of a human capital investment, it is not possible to compensate girls for increased expenditure in some other good by decreasing expenditure on education. Moreover, there is no theoretical or empirical evidence to suggest that girls have lower tastes for education as compared to boys.

3. *Literature Review*

An investigation into gender biases in resource allocation can be conducted in one of three main ways: 1) the 'indirect' inferential Engel curve approach and 2) adult-good approach or 3) the 'direct' analysis of individual level outcomes[2]. Traditionally, household level outcomes in intra-household resource allocation have been investigated using indirect methods as researchers are limited to data on consumption expenditures aggregated to the household level. The Engel curve method seeks to infer differential treatment within the household indirectly by examining how a change in household gender composition alters household expenditure on a given item. However, this method does not provide a convincing test for 'discrimination'; if two households have an equal total sum of money to spend, gender composition can only alter -the composition of demand. If households with women spend .less on some good, arguably they will spend more on another so that one cannot claim existence or absence of discrimination [Subramanian and Deaton (1990), pp. 2].
Alternatively, 'outlay-equivalent ratios' can be calculated to test for possible discrimination within the household, at least for children. This method, introduced by Deaton (1989) is based on Rothbarth's (1943) procedure for measuring the cost of a

2 Most studies on intra-household resource allocation have been based on testing the'validity of various models of the household [see for instar.ce Lancaster (2003) and Quisumbing and Mallucio (2000)].

child and asks whether the cost of a girl is less than diat of a boy. It starts, somewhat paradoxically, with identifying goods and the resulting expenditures or items which are not consumed by children (for example, alcohol, gambling, cigarettes etc.). The addition of a child to a family is treated as a purely negative income effect on the demand for these 'adult goods' because a child normally does not contribute to family income and is assumed not to consume such goods either. If an additional boy in a family reduces the expenditure on adult goods by more than an additional girl,' evidence for gender discrimination is said to exist.

A number of studies in the household allocation literature have' used the 'indirect' approaches to infer differential treatments within the household. either by simple Engel curve estimation or by identifying suitable adult goods to analyse gender inequalities [Deaton (1989), Subramanian and Deaton (1991), Ahmad and Morduch (1993), Rudd (1993), Haddad and Reardon (1993), Subramanian (1995), Deaton' (1997), Bhalotra and Attfield (1998), and Gibson and Rozelle (2000) among others]. The evidence from these studies on various country environments is mixed. Taken as a unified whole, empirical literature based on methods 1) and 2), has failed to find strong evidence of pro-male gender bias.

Although Pakistan provides an ideal setting for studying gender differences in consumption, surprisingly few studies have been conducted in this environment. In a recent study, Bhalotra and Attfield (1998) adopt a slightly different approach and estimate semi parametric Engel curves for food items using the Household Income and Expenditure Survey (I987-1988) in rural Pakistan. The authors allow allocations of individuals to depend on their earning status and work status in an attempt to control for different food needs arising due to various levels of activity. The main finding of the authors is that the demapd systems for food and milk products are quadratic in log expenditure, suggesting a non-linear relationship at least in rural Pakistan. While little evidence of gender biases is found amongst children, adult males do appear to get more as compared to adult females. Additionally, there is evidence of male workers getting more than dependents but there is no evidence of differential treatment of the elderly and higher birth order children in the sample.

A natural query ensues: why have so many studies failed to find evidence of differential treatments in budget shares where the systematic patterns in outcomes such as sex-ratios, mortality rates and enrolment rates etc. are expected to leave some trails in. consumption patterns within the household? This confusing state of affairs leads Deaton (1997) to note: 'It is a puzzle that expenditure patterns so consistently fail to show strong gender effects even when measures of outcomes show differences between boys and girls.' (pp. 239-241).

The puzzle in economic literature on intra-household allocations of expenditure has been attributed to a number of causes. One of the major problems with analysing household 'outcomes using the .'indirect methods' is that they are capable of doing only just that ~ analysing household outcomes. The aggregative nature of data on food shares and other heads may mask the underlying *process* by which resources are actually. allocated within a household. Arguably, the aggregated nature of data in conventional analyses of Engel curves may be a factor explaining the failure of the. approach to pick up gender bias [Kingdon (20Q3)].
Moreover, in many countries girls could be differentially treated in ways other than food denial [Bhalotra and Attfield (1998), pp. 476]. Since most of the 'indirect' analysis has

focussed on food shares and resulting biases in intra-household food allocation, other forms. of biases against girls will be masked, for instance differential treatment in access to health facilities or time spent with children at home [Basu (1989) and Das Gupta (1987)]. There is evidence of such neglect in both India and Pakistan. Empirical evidence suggests tpat rural Indian parents spend more time' at home when the child is male as compared to female [Rose (1996)]. Hazarika (2000) also finds that although, in Pakistan, girls have less access to health care, they are not under-nourished as compared to boys (pp. 90). Furthermore, it has been argued that sample truncation may be so severe in the case where girls have been discriminated against that they have died [Udry (1997)]. Moreover, girls could have greater needs than boys so that equal allocations stilJ have an adverse effect on them [Ahmad and Morduch (1993)]. Alternatively, critical interventions may not be made for girls while they are made for boys [Gibson and Rozelle (2000)]. It has also been suggested that in some instances studies have been conducted in regions where women and girls are economically productive and in such regions one does not expect biases fo emerge. For example, Deaton (1.997) notes that Maharashtra is not an ideal setting to explore gender bias as there is not much evidence of excess infant mortality among girls in this Indian state. However, none of these explanations can tonvincingly elucidate why gender-related differential treatments in education budget shares are not apparent where school outcomes and literacy rates bespeak a strong pro-male bias3.

The analysis of <u>individual-level outcomes,</u> where data is available, is an attempt to overcome the problems associated with the 'ipdirect' approaches. The critical element in such an analysis is the existence of data which documents the expenditure on key items for each individual within a household. A number of studies in recent years have. utilised individual level data in an attempt to enrich the analysis [Hazarika. (2000) for Pakistan, Quisumbing and. Maluccio (2000) for Bangladesh, Indonesia, Ethiopia and South Africa, and Kingdon (2003) for India].

Kingdon's (2003) study is particularly stimulating in this respect as it utilises individual-level data. from rural India on 16 'states to investigate gender bias in educational expenditures. To this end, the author argues "that there could be two possible explanations for the failure of extant studies in picking up gender bias where

3 A more credible explanation rests on the methodology adopted to infer gender biases within the household. In mu.ch of the extant literature using the' indirect' approach, OLS regressions are fitted on expenditure share equations with a large number of budget share values equalling zero. Furthermore, the OLS technique assigns equal weights to the decision of whether to spend at all on a given good and how much to spend conditional on incurring positive expenditure. If interest lies in analysing educational expenditure and resulting differential treatments, in the case of girls, the decision to enrol (to incur *any* expenditure at all) may be more important than the decision of how much to spend, conditional on enrolment. Ifhousehalds that incur a positive expenditure;: on girls education are selected non-randomly from the population so that they spend more on daughters' education, the modelling of the zero-versus-positive expenditure decision to,'Sether with the decision of how mrch to spend given enrolment may lead to adding up of two diverging biases - one against girls and another against boys. This problem could be masking differential treatment through the adding up of the two opposing effects and could possibly explain the inability of detecting a bias where it is expected to exist (future work addresses this issue). This iS3ue is explored in another paper.

it is expected. Firstly, a pro-male bias in expenditure may operate through two channels, one via the zero-versus-positive expenditure decision and second via lower expenditure on daughters than on sons conditional on positive expenditure. Using a, methodology which assigns equal weights to these two, often divergent, channels of bias may lead to toe adding up and hence dilution of the biases generating the conclusion of no significant gender bias. Secondly, the author suggests that aggregation of data across individuals in a given household may make it more difficult to pick up the effects of biases within households (pp.2-3). To address the first, methodological concern, the author estimates Hurdle Models by separating out the two mechanisms through which biases may operate. The second potential explanation is tested by examining whether the effect of gender in an educational expenditure function at the household level is similar to the effects using individual level data. Using the 1994 NCAER rural household survey on 16 states in India, the author concludes that incorrect functional form of the Engel curve and assignation of equal weights to two often divergent mechanisms of bias in India (in the 5-9 and 1014 age groups), may be an important explanation for why the conventional household expenditure method fails to detect gender bias in intra-household resource allocation (pp. 23). Additionally, the analysis also provides support to the argument that aggregation of data at the household level makes it more difficult to pick up gender differences (pp. 23).

Sathar and Lloyd (1994) is one of the only studies we are aware of which addresses allocation of educational expenditures by gender in Pakistan. Using the PIHS (1991), it investigates inequalities among and within families in the access to, completion of and resulting educational expenditure on primary schooling. Their findings suggest that the most important determinant of educational expenditure is parental education; children of mothers who have attended school receive between 60 and 75 per cent more in educational expenditure in urban areas as compared to children of mothers with no schooling (pp. 124). Household income and availability of school have statistically significant effects on both boys and girls. There seems to be some evidence of a trade-off in educational quality (educational expenditure) and quantity of children but the effect of sibling size is larger on girls

4. *Model and Empirical Strategy*

In this section we describe the -empirical methodologies adopted in this paper to investigate differential treatment against females in Pakistani households. Our modelling strategy utilises household survey data from Pakistan to test ",!hether the allocation of household educational expenditure favours males over females. In particular, we focus on two types of outcomes: <u>household level outcomes</u> and <u>individual level outcomes.</u> Both'outcomes are investigated using the model specified in below.

4.1 Engel Curve Analysis

The parametric analysis of household-level outcomes begins with the estimation of a standard Engel curve linking budget shares on educational/expenditure with total household expenditure and the demographic composition of the household. Although there are various functional forms for the Engel curve, the Working-Leser specification has the theoretical advantage of being consistent with the existence of a utility function and the postulation of a linear relationship between the budget share on each good and the log of total expenditure conforms well to dat~ in most instances. Additionally, transforming total expenditure into logarithms and expenditure on a given item into budget shares renders the function approximately linear by inducing an approJ:Cimate normality in the joint density of the transformed variables [Deaton (1997), pp. 231].

To test gender patterns in household educational expenditure, we estimate the following expenditure function:

Wi = a + ~ In *(Xi / ni*) + A In *ni* + *L 8k* (*nki / ni*) + q> *Zi* + *Ili* (1)

where

Wi	is the budget share of education of the *ith* household i.e. it is = *(Exp_edu* / Total exp);
Xi	is the total expenditure of the household;
Ni	is the household size;
In *(xJ nd*	is the natural log of total per capita expenditure;
nki / *ni*	is. the fraction of the household members in the *kth* age-gender class where *k* = 1... K refers to the *Kth* age-gender class within household
zi	is a vector of other household characteristics such as household head's education, gender and occupation and dummy variables to capture province and region etc;
Ili	is the error term.

A, β, λ, θ_κ and φ are the parameters to be estimated. We estimate the Working-Leser specification which has been relaxed to allow for non-linearity in log per capita expenditure (LNPCE) so that any observed differences in the independent variables are not simply picking up possible non-linearities in the Engel curve. This is particularly i,mportant within the Pakistani scenario because a study by Bhalotra and Attfield (1998) in rural Pakistan has found that Engel curves for food, adult goods and child goods are non-linear. So as not to pre-judge. the issue in case of educational expenditure, we allow for non-linearities in estimation. The term *ni* allows for an independent scale effect of household size. In Working's formulation of (1), the sign of the ~ coefficients determines whether the 'good' for which expenditure share is being calculated is a necessity (~< 0) or a luxury (~ > 0). T~e coefficients, ~, control for the expenditure elasticity which is denQted by €j which equals 1 + ~ / *w*. Since the *nki* / *ni* fractions add up to unity, one of them has to be omitted from the regressjon. In' this paper, we allow for 14 age-gender groups: males and females aged 0-4, 5-9, 10 14, 15~19, 20-24, 25-60 and 61 and above (omitting the fraction of women aged 61 and above in the regression analysis)[4]. The *8k* coefficients capture the effect of household composition on household budgetary allocations. These coefficients tell us what the effect of changing household composition is while holding household size constant, for example by replacing a child aged 5-9 by a child aged 10-14 or by replacing a male with a female in a given age category. The difference across gender can be easily tested using an F-test under the following hypothesis:

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[4] These age-gender categories are defined as MOT04, FOT04, M5T09, F5T09, 1\.1 1 OTOI4, r 1 OTO 14 etc. and arc the proportion of males (M) and (F) aged 0-4, 5-19, 10-14 and so in a given household.

$8km = elf$ (2)

where *m* denotes males and *f* denotes females and *k* refers to a given age-category. Testing, for example, whether boys aged 10-14 are treated differently from girls aged 10-14, we simply seek whether the coefficient on MI0T014 (proportion of males aged 10 to 14 years in. the household) is significantly different from the coefficient on FI0T014 (proportion of females aged 10 to 14 years in the household).

The *z* variables capture the effect of any other relevant household characteristics. In this study, the *z* vector includes variables controlling for household head's education, marital status, occupation and gender, a regional dummy, and dummy variables for the 'provinces in Pakistan. Head's education is denoted in the form of five dummy variables: (i) a dummy variable capturing the missing values for head's education, (ii) with head's education less than or equal to Primary (Grade 'katchi,5 to 5) (iii) education at least equal to Middle (grades 6, 7 and 8) and (iii) education at least equal to Matric (grades 9 and 10). The base category is head's education more than Matric (including F.A., B.A., Masters etc.). Marital status of the household head is denoted - as a variable which takes on various possibilities (such as married, widowed, etc.) and gender of the household head is denoted in the form of a dummy variable taking the value of 1 if head is female and 0 otherwise. We define head's occupation using four occupational dummies: (i) those whose occupational status is reported as missing are grouped into one dummy variable, (ii) 'white collar workers' are grouped under a single dummy variable and include individuals reporting themselves to .be either managers, professionals, technicians. or clerks, (iii) those reporting themselves machine operators and assemblers or belonging to the services. or trades industry are grouped into a single dummy variable. Individuals in elementary occupations *or* skilled agricultural workers are the omitted category. The regional dummy takes the value' l' - if the region is urban and '0' otherwise. Finally, we include dummy variables to encapsulate any differences in tastes and agroclimatic conditions across provinces, which we cannot otherwise control for, with 'PUNJAB' - as the omitted provincial dummy. All right-hand side variables are assumed exogenous[6].

[5] The 'Katchi' class is the equivalent of a 'Nursery' class in the developed countries and is followed by gradc 1

There are a number of methodological constraints imposed by estimating the conventional Engel curve. Firstly, estimating by OLS presumes that dependent variable - the budget share of education (EDU_SHARE) is normally rather than log-normally distributed. Furthermore, in the extant studies using the Engel curve approach, the regressions tend to be run including all households regardless of whether they spend anything or not on the good in question (in this case, education). The reason for including *all* households in the estimatir>n of bl:dget share equations is straightforward. If differential treatment against girls in -educational spending were to occur *only* after the girls were enrolled in school, there would be a rationale for excluding those households which report no expenditure on education. There is a ~trong prior. however, which suggests that much of the biases against girls actually occur in the decision of *whether* to enrol the girl in school or not (i.e. in the zero-versuspositive spending decision, $Wi = 0$ vs. $Wi > 0$) as compared to the decision of *how* much to spend conditional on enrolment (as apparent from Section 6). The fact that a household spends nothing on education could be reflecting that that household is selectively choosing not to enrol girls in school for any of the reasons mentioned in Section 2 above. There are, therefore, strong economic grounds for including zero as well as positive expenditure households. in the analysis. In much of the extant literature, equation (1) has been estimated using OLS with household outlay on education, food items or health regressed on the independent variables. Given the large proportion of households reporting zero expenditure and the resulting censoring of the dependent variable, OLS is not the appropriate

5. *Data and Estimation*

The data used in this study is from the fourth round *of* the Pakistan Integrated Household Survey (henceforth PIHS) 2001-2002. Previous rounds *of* the PIHS collected data in 1991, 1995-1996, 1996-1997 and 1997-1998. This national sample survey was essentially designed *to* evaluate the Social Action Program (SAP) *of* the government *of* Pakistan *to* assess various socio-economic aspects and it has 'been designed and implemented by the Federal Bureau of Statistics (FBS). Community and household l~vel data was collected on a diverse set of issues including demographic characteristics of households, income, level *of* education and .health etc

Data was collected using a two-stage sampling methodology. In the first stage, 1142 Primary Sampling Units (PSUs) were selected from all provinces and regions *of* Pakistan. In the second stage, 12 households from urban and 16 *from* rural PSUs were selected randomly from a fixed see. A questionnaire was administered *to* each household. Community questionnaires were administered only in rural PSUs. This strategy yielded detailed information on 16,400 households from all regions of Pakistan[8].

To analyse the issue at hand, we constructed *four* main sets *of* samples, one each for the household and individu.al level analysis. *For* tackling gender differentials in education shares using <;:onventional, household-level Engel curves, a sample *of* all households having at least one child aged 5-24 was created[9]. Focusing only on households with children *of* school-going age is consistent with both goals *of* this

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model to apply in the estimation procedure. A simple application *of* the OLS model to data that is censored yields parameter estimates which are biased downwards [Deaton (1997)]. The Tobit model has been suggested as an alternative to OLS given the truncation *of* household education expenditure for a large proportion *of* the households. Employing the censored maximum likelihood function, the Tobit framework overcomes the inconsistency in parameters estimated using OLS in the presence *of* sample censoring. However, there has bee:1 reluctance in applied' econometric settings to apply the Tobit framework because of the crucial limitation that the Tobit modcl is complctcly idcnti ticd only if the assumptions of normality and homoskedasticity are completely fulfillcd [Dcaton (1997)]. Additionally, another shortcoming *of* the Tobit model is that it assumes that a'singlc mechanism determines the choice between w *=0* versus w> 0 and the *amount* ofw given w *>0.* In particular, oP (w '> 0 I *x)* / ax} and oE (w > 0 I *x,* w > 0) / ax} are constrained to have the same sign. Alternatives to Tobit models have been suggested to allow the initial decision *of* w = 0 to be separate from the decision. *of how much* w given positive w.

7 As in most house!1old surveys, this two-stage sampling strategy draws clusters (PSU's) followed by the selection *of* households within each PSU. Furthermore, the probability *of* selection of each household in such a complex survey design is not equal. These issues raise concerns for using sample 'weights' and correcting for sample 'clustering' effects. Regarding both descriptive analysis and multivariate regressions, weighting becomes an issue if one wants to make a statement regarding the population. For depicting the mean and variance *of* the sample, however, weighting is not an issue. Additionally, as Deaton (1997) has argued, failing to weight only has an effect on the constant if the underlying relationship is linear. Given a non-linear relationship, a biased coefficient may result. The effects on standard errors and, hei1ce, inference are a lot less clear. For inference (standard errors), what matters more is correcting for the effects *of* clustering which tend to increase standard errors [I am thankful to Marcel Fafchamps for these comments].

8 Pakistan Integrated Household Survey, Enumerator's Manual *of* Instructions, Round 4:2001-2002, Fcderal Bureau *of* Statistics, Government *of* Pakistan, Islamabad.

9 Wc excluded households without any children of school-going age so as to cxclude the possibility that a household reports no educational expenditure because it doesn't have a child of school-going age.

paper: detenning whether gender bias exists in the allocation of educational expenditure and evaluating the reasons why previous studies have failed to pick up gender effects in intra-household allocations. All households reporting enrolled and non-enrolled children were included in this sample. This yielded a total of 14,680 households. For the individual-~evel analyses, the sample was created *at the level of the individual* - all children' aged 5-24 whether enrolled or not enrolled in school (57,604 children). The total educational expenditure (TOTAL_EDU) variable w'as truncated at Rs. 25,000 to exclude outliers[JO]

The key variable in the conventional Engel curve analysis is the budget share of educational expenditure in total household expenditure. The PIHS reports individua'\level expenditure on each child currently enrolled in school as well as total household level expenditure on various items of consumption including food, leisure, health and education. The education share (EDU _SHARE) variable was created as-the fraction of total educational expenditure I I in total household expenditure.

In the first in~tance, we regress the budget share of educational expenditure on the log of per capita expenditure (LNPCE) and its square (LNPCE2), log of household size (LNHHSIZE), the age-gender composition variables, and the z-vector variables including the dummy variables for head's education, marital status and gender and regional and provincial dummies. This is the pooled sample. To further disaggregate the analysis, we estimate separate regressions for the various provinces and further sub-divide the sample into urban and rural regions to analyse whether gender differential patterns differ across the regions and across provinces. *A priori,* we expect differential treatment against girls to be manifest more in certain provinces and in rural regions as compared to urban areas where media outreach and cosmopolitan - values are expected to reduce male-female differentials[12].

6. *Descriptive Statistics: PIHS 2001-2002*

In, this section we examine individual level data on educational expenditure on children of school-going age in Pakistan. Thisoverview of the basic characteristics of enrolment and expenditure levels by gender, age-groups, provinces and regions (urban/rural) provides a first look at the patterns of differential treatment in outcomes (school enrolment) and intra-household patterns of allocation.

6.1. Enrolment Rate Differentials by Gender, Age-group and Regions.

Tables 6.1 and 6.2 illustrate current enrolment rates by ag~-group, gender and region in each of the provinces and territories in P~kistan, computed using the PIHS 20012002 data set. Invariably, there are wide disparities in enrolment between males and females and across regions in Pakistan. The differentials are lowest in Punjab and the highest in FATA. For instance, in the 10-14 age group in FATA while male enrolment

[10]It was found that only 0,6 per ceni of the sample reported expenditures greater than Rs. 25,000.

[11]Total educational expenditure was estimated from individual-level expenditures of currently enrolled children to achieve greater ?ccuracy.

[12] The empirical specifications are likely to be fraught with cndogeneity, particularly of household size. In another paper we estimate household fixed effects to control for such pos~ibilities.

is 61 per cent, female enrolment is a mere 2 per centl3. The significant difference in current enrolment by gender reveals the fact that girls are substantially more likely to report zero educational expenditures simply because they have a significantly lower probability of being currently enrolled in school.

Table 6.1: Current enrolment rate of individuals, by age and gender

PROVINCE	Al!e 5-9				Aile 10-14				Al!e 15-19				Al!e20-2,		
	M I F I		Gao'		M I F I		Gao		M I F I		G.ao		I M I F I		
PUNJAB	66	61	5	***	69	58	II	***	36	27	9	***	&	6	
SINDH	52	39	13	***	58	39	19	***	31	1&	13	'"	9	5	
NWFP	63	45	1&	."	79	42	37	"*	4&	1&	30	'"	13	5	
BALOCHISTAN	46	31	15	"*	65	37	28	."	35	IS	20	.**	10	3	
AJK	.&4	72	12	"*	91	&1	10	"*	60	40	20	".	15	7	
NORTHERN AREAS	54	47	7	*	91	70	21	**.	74	40	34	."	21	6	1
FATA	40	5	35	."	61	2	59	"*	19	2	17	'"	4	1	
PAKISTAN	59	47	12	."	69	49	20	".	3&	22	16	".	10.	5	

Note 1: ... depicts significance at the 1% level.'. significan~e at 5 % and. significance at 10%.Note 2: M denoted 'male' and F denotes 'female' respectively. Note 3: NWFP = North West Frontier Province, AJK = Azad Jammu and Kashmir and FAT A = Federally Administered Tribal Areas.

Table 6.2: Current enrolment rate of individuals by age and regjon

PROVINCE	Age 5-9				Age 10-14				Age1S.19				Age20-2		
	U I R I		Gap		U I R I		Gap		U I R I		Gap		U IRI		
PUNJAB	77	56	21	".	74	56	1&	.**	42	23	19	**.	11	4	
SINDH	.64	36	2&	.**	6&	3&	30	***	35	17	1&	***	12	3	
NWFP	6&	49	19	***	72	57	IS	***	42	27	15	**.	13	7	
BALOCHIST AN	55	32	23	***	69	45	24	. .**	36	21	15	...	9	5	
AJK	92	74	18	."	93	83	10	."	67	41	26	."	IS	8	
NORTHERN AREAS	53	49	4		77	81	-4		55	57	-2		II	13	.
FAT A	-	25	-		-	35	-		-	10	-		-	2	
PAKISTAN	69	46	23	...	72	52	20	...	41	24	17	**.	11	5	

Note 1: *** depicts significance at the 1 % level. ** significance at 5 % and * significance at 10%. Note 2: M denoted 'male' and F denotes 'female' respectively; t depicts the t-value.

Tables ,6.3 and 6.4 depict average annual educational expenditure of all children within the household (enrolled and non-~nrolled) by age-group, gend0r and region across the provinces in Pakistan., Interpreting Table 6.3, it is apparent that there are very significant differences in average male and female educational expenditures across the provinces. FAT A, B~lochistan and NWFP emerge as the provinces with

13 In drawing conclusions, however, one must keep in mind that the sample size for FATA is quite small. When estimating enrolment rates for the 10-14 age group in FATA we foune,! only 3 out of a total of 132 females enrolled in school. The total sub-sample-of females (132) in the given age-range may not be high enough to draw general concIu~ions.

some of the largest differences by gender. In Table 6.4, conspicuously, differences in average educational expenditure snow strong regional patterns as well, with average educational spending in rural areas very significantly less than that in urban regions.

Table 6.3: Annual educational expenditure on ALL children (en roIled + non-en roIled) by age and gender

PROVINCE	Ae:e 5-9			Ae:e 10-14			Ae:e 15-19			Age 20-24		
	M	IF	I.t	M	IF	I t	M	IF	1 t	M	-I F	1 r
PUNJAB	1007	919	2.00	1456	1253	3.61	1499	1045	5.74	611	356	3.40
SINDH	859	762	1.45	1213	1041	2.00	1296	'861	4.25	608	318	3.47
NWFP	852	561	5.12.'	1442	712	10.24	1556	554	10.61	863	226	5.50
BALOCHISTAN	508	280	5.37	813	476	6.25	783	302	6.95	331	74.	5.07
AJK	1887	1363	3.33	2590	1840	3.90	2474	1435	4.20	1153	491	2.50
NORTHERN AREAS	759	559	2.30	1578	1066	4.32	1775	1042	2.98	467	184.	1.66
FATAI4	356	54	5.25	144	10	.8.39	5'77	0	3.92	218	0	1.52
PAKISTAN	874	709	6.34	1338	997	10.27	1389	820	)2.79	618	284	7.98

Note 1: *** depicts significance at the 1 % level. ** significance at 5 % and * significance at 10%. Note 2: M denoted 'male' and F denotes 'female' respectively; t depicts the t-value.

Table 6.4: Annual ellucational expenditure on ALL children (enroIled + non-enrolled) by age and region
respectively; t depicts th~ t-value.

PROVINCE	Ae:e 5-9			Age 10-14			Ae:e 15-19			Ae:e 20-24		
	U	IR	1 t	U	I R	I t	U	IR	I t	U	IR	It
PUNJAB	1664	571	25.21',	2040	85 6	.21.62""	1848	791	'13.50	800	200	8.05
SINDH	1965	220	26.68	2220	44 8	.,,21.40	1876	482	13.87	833	136	8.13
NWFP	1452	445	16.19 .;:	1813	78 8	;h35	1559	765	7.91	674	443	1.91
BALOCHISTAN	909	183	16.42..	1299	375	d6,76	927	372	7.69	324	152	3.20
AJK	2952	1147	11.12	3748	1632	JO.55	2885	147 6	5.34	1106	561	2.02
NORTHERN AREAS	815	597	2.29	1517	1225	2.25	1754	121 0	2.07	391	272	0.63
FATA	-	230	-	-	41 5	-	-	262	-	-	III	-
PAKISTAN	1613	418	4S1Jr	1993	72 1	'n:r8.28-	1734	691	"23.26	742	241	lfsS

Note 1: *.* depicts significance at the 1 % level, .. significance at 5 % and * significance at'JO%. Note 2: M denoted 'male' and F denotes 'female'

Table 6.5, tabulating .the average educational expenditure on currently enrolled children, however, delineates that once enrolled in school, parents do not allocate *less* educatio'nal expenditure on girls as compared to boys. For everall Pakistan, for, example, in the 10-14 age-group educational expenditure is significantly *more* on currently enrolled girls (Rs. 2063) than on boys (Rs. 1941). This indicates that conditional on school enrolment, there is not much bias against females. Much of the differential treatment occurs at entry-levels in terms of parent's decision whether or not to enrol their child in school, based on gender. '

Table 6.5: Annual educational expenditure on en roIled children by age and gender

PROVINCE.	Ae:e 5-9			Ae:e 10-14			Ae:e 15-19			A!!e 20-24		
	M	IF	IT	M	IF.	1 t	M	'\ F	It	M	lF	1 t
PUNJAB	1535	1503	0.51	2126	2166	-0.51	4208	3878 ,\	1.76	7457	6259	1.71
SINDH	1645	1988-:f5T'		2083	2306,ft:3:'8:r" "		4189	4843	-1.99	7053	6751	1.03
NWFP	1362	1263	0.99	1844	1708	1.19	3285	3039	0.95	6446	4377	2.04
BALOCHIST AN	1109	916	1.{!;;'"	1262	1284	-0.23	2226	2086	0.59	3212	2874	0.60
AJK	2239	1890	1.90'	2843	2292 12:62C'"		4124	3744	0.98	7448	6568	0.71
NORTHERN AREAS	1421	1215	1.49	1743	15221.65	"""..,	2409	2616	-0.52 I	2246	3583	..1.0 4
FATA	919	1228	1.49	-0.92		12,	181	42	1.33	3086	3583	
PAKISTAN	1495	1513	1.49	-0.39		"""..,	2409	2616	-0.52 I	2246	3583	..1.0 4

1941 2063 '"::2:38 3629 3695 -0.57 6260 5646 1.54

Note I: **. depicts significance at the 1% level, .. significance at 5 % and. significance at 10%. Note 2: U denotes 'urban' and R denotes 'rural' areas respectively. Note 3: The sample for FATA contains only rural regions.

14 Despite Table I revealing a current enrolment of 2 per cent for females in FAT A, tbe 3 observations on currently enrolled femalesiri the FAT A sub-samples reported educational expenditures of 0 in the 10- 14 age group.

Note 1: ... depicts significance at the 1% level,'" significance at 5 % and' significance at 10%. Note 2: M denotes 'male' and F denotes 'female' respectively; t depicts the t value. Note 3: The sample for FAT A (Federally Administered Tribal Areas) contains no observations for females currently enrolled in school in the 15-19 and 20-24 age categories.

Table 6.6: Annual educational expenditur\: on enrolled children, by age and region

PROVINCE	A2e 5-9			Age 10-14			A2e 15-19			Age 20-24		
	U	IR	IT	U	IR	It	U	IR	It -	U	IR	It
PUNJAB	2185	1014	19.5	2776	1534	16.64	4417	3522	4.73	7372	5791	2.02
S!NDH	3107	609	20.41	3308	1185	14.49	5371	2869	8.10	7125	5491	1.84
Nwrp	2124	916	12.25	2519	1404	10.28	3750	2794	4.08	5439	6177	-0.78
BALOCHJSTAN	1650	578	11.52	1876	843	11.95	2603	1811	3.91	3541	; 2814	1.70
AJK	3221	1557	9.20	4017	1970	9.62	4315	3695	1.60	7426	6730	0.57
NORTHERN AREAS	1540	1231	2.08	1960	1509	3.13	3215	2142	2.63	3632	2229	1.09
rATA	-	942	-	-	1195	-	-	3086	-	-	6040	-
PAKISTAN	2358	915	33.80	2770	1386	28.75	4292	2934	12.22	6589	5134	3.74

Note. I: ... depicts si~nificance at the 1% level, .. significance at 5 % and' significance at 10%. Note 2: U denotes 'urban' and R denotes 'rural' areas respectively; t depicts the t-value. Note 2: The sample for FAT A (Federally Admirlistcred Tribal Areas) contains only rural regions.

Table 6.6 illustrates that conditional on enrolment, regional differentials in annual educational expenditure persist. The widest regional disparities prevail in NWFP and Balochistan, the two provinces with some of the largest disparities in current enrolment.

From the raw data presented in this section, there is fairly strong evidence of differential schooling outcomes between males and females amongst all age groups. Much of the bias in educational expenditures manifests itself via significantly lower pro,bability of girls' enrolment rather than lower expenditures conditional on enrolment. The glaring differentials in schooling outcomes of males and females provoke the question: *what* causes these gaps? This is an empirical question and we turn to an empirical analysis in Section 7 to determine whether differential schooling outcomes leave trails in t~e conventional approach to determining gender biases (the Engel curve).

7. *Empirical Results*

The results of the empirical analysis are divided into two sub-sections. In the first, housebold level analysis is conducted to explore the following question: using the conventional Engel curve approach, is there any evidence that the allocation of household educational expenditure favours males over females? The second subsection explores whether aggregation of data to the household level can explain failure to detect gender bias where it is expected. To this end, we estimate unconditional OLS models using individual-level data, which are compared to the results from the household analysis.

Samples are split by province and region as there may be area-based differences in expenditure allocations within households. In particula:r, girls may be more constrained than boys in rural as compared to urban areas and more poorly placed in certain provinces as compared to others. Separate estimates are reported for Pakistan, Punjab, Sindh, NWFP, Balochistan, Aiad Jammu and Kashmir (AJK), Northern regions (North) and the Federally Administered Tribal Areas (FAT A). The sample is further disaggregated by region (urban and rural) for Pakistan' as a whole and for the four major provinces- Punjab, Sindh, NWFP and Balochistan. It was not possible to disaggregate by region in the remaining 3 territories due to limitations imposed by sample size. All estimates are robust and have been corrected for possible clustering effects. Findings specific to our analysIs are discussed below for all samples.

7.1. Household-level outcomes: *Are male children favoured in allocations of educational expenditure?*

Table 7.1 reports the conventional Engel curve results (also called unconditional OLS in this paper), fitting expenditure share of education (EDU_SHARE) on all - zero and positive - expenditure households. Before discussing the main results, we briefly discuss some summary statistics of the budget share equations. CI~arly, the fit of the conventional Engel curve equation varies significantly, with values of R2 ranging froin 0.13 in Punjab to 0.37 in AJK. Overall, the R2 values indicate a reasonably good fit across the provinces in the data set. The budget share of education also varies substantially by province, which is not unexpected given that average incomes as well as attitudes and values attached to education vary across provinces. For example, households in Pakistan (full sample) devote 2.6 per cent of the total household budget to education with urban areas spending a larger share (4.2 per cent) as compared to the relatively backward rural regions (1.8 per cent). This national average masks large differences across province's and regions. Punjab, not surprisingly, has one of the highest budget shares devoted to education (3.0 per cent) while FAT A has the lowest (0.1 per cent). The Northern areas reveal a surprisingly high educational spending of approximately 3.6 per cent of the total expenditure. This surprise is unravelled, however, when one considers the recent success of the Agha Khan Projects in the region which has resulted in a mass movement in terms of increased enrolment and educational spending particularly of girls [insert more details from studies here]. In all cases, educational spending in rural areas is significantly less than in urban areas, with the largest regional differences in Sindh (2.8 per cent) 15.

The regression results in Table 7.1 indicate that per capita expenditure and its square are significant only in urban Sindh and AJK. In almost all instances LNPCE has a positive and LNPCE2 has a negative sign suggesting a cqncave relationship. The effect of household size is highly statistically significant and positive for Pakistan as a whole and across all provinces and regions. Deaton and Paxton (1998) 'propose a reason for such a result. They argue that economies of scale accrue to households in such a way that at the same level of per capita resources, larger households share public goods such as housing etc. and are better off as compared to smaller households. Larger households should, therefore, be able to allocate larger shares to private goods such as education provided they do not substitute towards the 'cheaper' public goods. 111 Pakistani households, economies of scale could be especially important given the norm of a 'joint family' system. However, an alternative explanation for the positive household size effect could be that larger households are more likely to have children of school-going age which IS why they spend more on education.

The sign and significance of the HEAD _FEMALE variable is especially intriguing. Assuming that female headship is associated with women empowerment, we *a priori* expect female headed households to have a higher propensity to spend on education.

]5 Expenditure shares for AJK appear to be implausibly high.

A priori, we expected more educated household heads to have a higher propensity to spend on children's education. The negative signs on the dummy variables capturing the effects of head's education are in line with these expectations. As compared to more educated heads (in the base ca~egory HEAD_FAMORE), heads' with primary, middle, matric or less education have a significantly negative effect on household educational allocations. The signs on head's occupational dummies are also as per prior expectation. As compared to heads in elementary and agricultural occupations (in the base category), those with white collar, and service and trade related jobs are inclined to spend a greater proportion of total household expenditure on education in almost all provinces. The exception occurs in some regions (such as rural Balochistan and FAT A) which could be explained by the larger dependence on agriculture and relatively fertile land, which renders agriculture a more rewarding occupation.

As expected, households in urban regions allocate more resources towards educational investments. The provincial dummies also reveal that as compared to the most prosperous provincp., Punjab (the base dummy), the less developed and economically backward territories (Sindh, Balochistan and NWFP and FAT A) have a lower propensity to spend. on education. AJK and North emerge as territories spending larger proportion~ as compared to Punjab, which is not surprising given the' results from Section 6.

We now turn to the most pertinent question: what do the conventional Engel curve estimates tell us about gender biases in the allocation of educational expenditure in Pakistan? To address this question, p values of the F tests (for the null hypothesis that the coefficients of the age-gender dummies for males and females are equal), are presented in the last few rows of Table 7.1. For example, the p value of the F test that the coefficients M5T09= F5T09, for the full sample (urban and rural) Pakistan, is 0.8055 which is not significant, suggesting no bias against females in this age range.

Noticeably, the Engel curve method *does* pick up some differential treatment in expenditure allocation in various age ranges in Pakistan. There appears to be significant pro-male bias in the 15-19 age group and some in the 10-14 age group as well. Much of this bias manifests itself in rural areas. There does not appear to be much differential treatment among the youngest age group (ages 5-9). It could be that the Engel curve method is failing to pick up differences in this age group because of incorrect functional form or aggregation issues and we turn to Hurdle Model estimates to investigate this concern.

Table 7.1
OLS Regression of Budget Share of Education: Engel Curves

Dpendent Variable	PAKISTAN						PUNJAB				
	Full		Urban		Rural		Full		Urban		
	Coeff	t-value	Coeff	t-value	C oeff	t-value	Coeff	t-value	Coeff	t-value	Coe
CONSTANT	9.32	1.25	-0.26	-0.01	223.5	1.34	212.22	1.38	35.01	0.85	463
LNPCE	-2.17	-1.21	1.21	0.22	-55.67	-1.33	-49.23	-1.33	-6.95	-0.74	-113
LNPCE2	1.24	1.19	-0.11	-0.36	3.42	1.33	2.76	1.28	0.27	0.52	6
L,NHHSIZE	3.81	10.33	4.55	8,68	349	5.86	3.44	5.01	4.78	5.11	2.
MOT04	-5.27	-2.30	-9.96	-2.19	-2.49	-1.00	. -8.35	-1.94	-5.74	-0.94	-8
M5T09	20.33	8.58	19.77	4.37	2.12	7.37	23.32	6.38	26.25	441	23
MIOTOl4	32.26	1.97	29.55	6.41	34.23	11.25	33.09	7.96	3195	5.24	35
MI5TOl9	20.94	7.92	16.58	349	24.58	7.59	22.68	5.52	20.60	3.08	26
M20T024	4.59	1.69	1.58	0.34	8.1 I	2.28	6.19	148	947	1.53	7.
M25T060	3.18	1.09	0.41	0.09	548	1.47	4.96	1.01	'2.38	0.38	7
M60MORE	2.86	0.81	-1.97	-0.31	549	1.22	5.68	0.98	248	0.29	7
FOT04	-3.57	-155	-7.64	-1.65	-0.57	-0.24	-6.19	-1.61	-3.84	-0.67	-4
F5T09	1940	4.34	20.27	4.36	/19.49	2.97	29.48	3.18	28.56	4.47	30
F1OTOl4	24.86	6.70	26.92	5.58	. 24.22	4.26	36.11	5.19	39.15	5.73	34
FI5TOl9	13.71	5.01	13.26	2.92	13.17	391	18.77	4.28	20.33	3.34	16
F20T024	7.72	2.91	1.98	0.46	10.55	3.30	11.15	2.75	8.03	1.39	14
F25T060	8.38	3.73	8.36	1.93	8.50	3.33	10.75	3.13	10.46	i.69	10
HEAD JEMALE	449	5.71	2.64	1.94	5.77	5.80	6.93	4.73	3.57	1.74	9
HEAD_MARITAL	-0.32	-0.81	*-O.2i*	-0.37	-0.16	-0.32	-0.32	-0.48	-0.31	-0.27	-0
HEAD_EDU_MISS	-9.90	-12.83	-10.69	-9.37	-9.47	-7.74	-10.59	7.15	-10.51	-6.21	-12
HEAD_PRIMARY	-7.00	-9.86	-7.75	-7.78	-6.60	-6:08	-7.53	-5.23	-8.32	-5.13	-8
HEAD_MIDDLE	-3.03	-2.13	-4.12	-4.49	-2.49	-1.23	-0.66	-0.21	-3.60	-2.32	-0
HEAD _MA *TRIC*	-3.21	-4.43	-3.82	-4.30	-2.85	-2.61	-1.35	-0.87	-2.62	-1.85	-2
HEAD - OCCU _MISS	2.21	4.99	2.73	2.70	2.15	4.98	2.87	3.77	3.79	2.73	2
HEAD_WHITE_COLLAR	3.81	5.73	4.78	5.32	2.86	2.93	6.56	4.83	5.95	3.80	8
HEAD_SERVICE	1.95	6.03	2:'43	4.67	1.70	4.28	2.76	4.54	2.84	3.18	2:30
URBAN	2.64	6.18	-	-	-	-	1.65	2.'P	-	-	
SINDH	-4.67	-10.93	-3.31	-5.46	-5.19	-10.43	-	-	-	-	
NWFP	-1045	-1.65	0.67	0.53	-1.80	-2.77	-	-	-	-	
BALOCHISTAN	-6.39	-15.01	5.71	-7.04	-6.57	-11.56	-	-	-	-	
NORTH	2.78	2.28	045	0.16	3.97	3.34	-	-	-	-	
FATA	-6.08	6.50	-	-	-6.27	6.41	-	-	-	'-	
AJK .	3.86	4.13	5.87	4.05	2.72	2.38	-	-	-	-	
R'	0.16		0.19		0.14		0.13		0.18		
N	14555		5268		9287		5580		2247		
DEP V ARIABLE MEAN	0.0263		0.0417		0.0176		0.0301		0.0454		0.0
-VALUES: AGES 5-9	0.8055		0.8705		0,7481		0.5206		0.6195		0.5
AGES 10-14	0.0214		0.4622		0.0327		0.6995		0.1929		0.9
AGES 1519	0.0007		0.2952		0.0001		0.3271		0.9579		0.0
AGES 20-24	0.1280		0.9034		0.3297		0.1640		0.7619		0.1

Note: Coefficients have been multiplied by I OO.The dependent variable is EDU _SHARE i.e. the budget share of education. Base dummy for Head's education is HEAD _F AMORE =1 if head has 12 years of education or more and 0 otherwise. Base dummy for Head's Occupation is HEAD _AGRI =1 if the head is involved in agricultural or. elementary occupatiol1s (such as domestic helpers etc.). The last 4 rows represent the p-values of the F test that the male and female gender-age coefficients in that column are equal.

Table 7.1, continued

Dependent Variable	SINDH						NWFP				
	Full		Urban		Rural		Full		Urban		
	Coeff	t-value	Coeff	t-value	Coeff	t-value	Coeff	t-value	Coeff	t-value	Coef
CONSTANT,	-31.83	-2.16	-141.25	-5.25	...3665	-153	-3.35	-0.14	2634	OA2	0.
LNPCE	4.92	lA7	29.77	5.21	71]	U6	306	0.56	-OA 7	-0.04	0.
LNPCE2	-0.16	-0.80	-] A9	. -4.69	-OAO	-1.03	-0.22	-0.64	-0.09	-0.]4	-0.
LNHHSIZE	4.76	9A6	5.59	7.28	4.72	735	5.02	5.99	5.91	3.]5	4.
MOT04	-4.15	-0.96	-7.88	-0.99	-2.66	-0.62	-12.34	-1.93	-29.11	-1.74	-6.
M5T09	]2.83	3.00	]5.22	1.95	9A9	232	16.55	234	0.97	0.06	22
MI0T014	]9.68	4.58	16.7,9	.2.22	19.18	4.28	33.98	5.23	23.91	lAl	37.
M]5T019	13.6 9	3.10	6.62	0.88	18A5	3.99	20.06	2.66 .	9.67	0.50	24.
M20T024	-1.64	-038	-8.06	-1.06	234	0.51	0.1]	0.01	-13.61	-0.73	7.95
M25T060	-UI	-0.24	-7.26	-0.90	1.34	0.28	-1.67	-0.22	-3A5	-0.18	-1.2
M60MORE	-0.47	-0.08	-13.14	-1.33	4.97	0.83	436	0.44	8.17	035	3.
FOT04	-236	-0.54	-8.69	-1.06	0.01	0.00	-12.23	-1.76	-24.49	-1.33	-7.
F5109	10.8	2.50	]2.54	].56	7.57	1.81	12.1	1.76	1735	0.99	9.

	7						2				
FI0T014	13.42	2.98	18.54	2.36	6.8]	1.44	11.65	1.66	'6.9]	OAI	13.
F15TO]9	7.09	1.58	5.84	0.74	6.00	1.36	7.09	0.96	1.18	0.07	7.
F20T024	-0.44	-0.10	-5.46	-0.70	'2.27	0.54	0.93	0.]4	-10.36	-0.62	5.
F25T060	5.15	1..19	2.57	034	4.26	0.98	1.80	031	-1.92	-0.13	2.
HEAD]EMALE	0.50	032	15.87	0.81	-1.72	-0.76	4.69	3.22	4.68	1.53	4.
HEAD_MARITAL	-0.63	-0.87	-159	-1.09	-0.04	-0.06	-0.26	-0.27	0:26	. 0.14	-0.
HEAD_EI.JU_MISS	-0.58	-6.75	-5.60	-4.50	-5.16	-4.44	-15.87	.06	-19.49	-3.75	-14.
HEAD]R1MARY	-3.91	-4.59	-4.16,	-3.45	-2.89	-2.50	-12.21	-5.28 1	-12.87	-3.21	-11.
HEAD_MIDDLE	-1.63	-156	-1.87	1.35	-1.09	-0.74	-8.76	-439	-7.12	-237	-9.
HEAD MA TRIC	-0.23	-2.45	-1.90	-1.49	-2.28,	-1.91	-8.21	-3.81	-934	-2.84	-6.
HEAD_GCCU _MISS	]]7	1.72	0.89	0.93	1.91	2.13	234	1.91	2.25	0.56	2.
HEAD_WHITE _COLLAR	3.95	4.51	4.53	4.08	336	2A7	3.18	1.60	4.61	lAO	0.
HEAD_SERVICE	2.18	4.51	2.25	2.79	2.11	3.96	0.88	1.31	-0.35	-0.22	1.70
URBAN	1.93	3.03	-	-	-	-	2.98	2.22	-	-	
R	0.26		\0.26		0.20		0.20		0.16		
N	3351		1372		1979		2474		772		
DEP VARIABLE MEAN	0.0224		r 0.0388 •		O.oJ 10		0.0278		0.0425		
P-VALUES: AGES 5-9	03923		0.5202		OA432		0.2992		0.1407		
AGES 10-14	0.0521		0.7620		0.0004		0.0000		0.0787		
- AGES 15-19	0.0401		0.8836		0.0007		0.0038		03464		(
AGES '20-24	0.7001		0.5609		0.9863		0.8879		0.7571		

Note: Coefficients have been multipl)ed by 100.The dependent variable is EDU_SHARE i.e. the budget share of education. Base dummy for Head's education is HEAD_FAMORE =1 if head has 12 years of education or more and 0 olhenvise. Base dummy for Head's Occupation is HEAD:..AGRI =1 if the head is involved in agricultural or elementary occupations (such as domestic helpers etc.). The last 4 rows represent the p-values of the F test that the male and female gender-age coefficients in that column are equal.

Table 7.1, continued

Dependent Variable	BALOCHIST AN						AJK		NORTH	
	Full		Urban		Rural		Full		Full	
	Coeff	t-value	. Coeff	t-value	Coeff	t-value	Coeff	t-value	Coeff	t-value
CONSTANT	-14.48	-0.65	c13.07	-0.31	-19.41	-0.68	-167.42	-2.12	-98.73	-1
LNPCE	2.27\	0.41	1.17	0.11	4.07	0.58	35.75	1.85	27.91	1
LNPCE2	. -0.11	-0.33	-0.08	-0.14	-0.22	-0.49	-1.95	-1.68	-1.77	-1
LNHHS1ZE	3.10	5.78	3.28	3.44	3.25	4.92	7.78	5.07	5.95	3
MOT04	-1.30	-0.27	1.38	0.15	- 1.93	-0.35	-2.02	-0.19	-16.56	-0
M5T09	22.06	4.23	21.24	2.26	7.92	1.52	36.25'	3.60	5.66	0
MIOTOl4	13.50	3.00	31.26	2.86	16.86	3.34	52.25	,4.57	40.09	2
MI5TOl9	4.92	1.04	20.44	2.10	10.72	2.18	34.40	3.31	31.04	1
M20T024	4.92	1.04	8.85	0.91	3.39	0.67	9.63	0.66	-18.63	-1
M25T060	1.91	0.38	6.85	0.62	. -0.39	-0.07	-6.56	-0.68	-14.69	-0
M60MORE	-1.36	-0.21	-8.53	-0.69	0.86	0.11	-0.71	-0.06	-26.07	-0
FOT04	1.03	0.23	1.89	0.19	-0.02	-0.00	1.19	0.11	-14.13	-0
F5T09	7.60	1.60	6.55	0.60	6.88	1.36	25.45	3.00	-2.88	-0
FIOTOl4	12.77	2.63	23.74	2.40	7.38	1.55	26.84	2.67	25.56	1
F15T019	7.20	1.58	12.17	1.40	4.26	0.76	14.24	1.65	18.02	1
F20T024	7.70	1.81	8.30	0.97.	6.1\	1.23	7.54	0.79	5.29	0
F25T060	4.44	1.11	:1.88	1.38	0.59	0.13	3.31	0.53	8.72	0
HEAD]EMALE	0.02	0.02	0.30	0.08	-0.30	-0.13	2.25	1.19	0.25	0
HEAD_MARITAL	0.81	1.01	0.32	7.09	-0.63	-0.71	0.15	0.08	-1.14	-0
HEAD EDU MISS	-7.84	-6.04	-11.18	-655	-4.85	-2.60	-11.01	-3.57	-11.21	-2
HEAD=PRIMARY r	-4.89	-3.46	-6.29	-3.27	-2.61	. - 1.25	-7.94	-2.40	-7.04	-1
HEAD_MIDDLE	-5.42	-4.16	-6.95	- 4.11	-3.19	- 1.58	-8.82	-2.89	-8.01	-2
HEAD MA TRIC	-3.72	-3.30	-5.10	- 3.22	-1.68	-1.08	-6.13	-2.1:>	-6.08	-1
HEAD=OCCU_MISS	1.37	I 89	2.55	2.60	1.51	1.48	0.24	0.18	10.37	1
HEAD_WHITE_COLLAR	-0.33	-0.37	. 0.61	0.45	-0.50	1.48	1.28	0.66	- 1.88	-0
HEAD_SERVICE	0.07	1.39	2.61	2.57	0.03	0,06	2.34	1.23	0.78	0
URBAN	3.63	4.78	-	-	-	-	4.29	2.27	-0.93	-0
R'	0.25		0.27		0.18		0.37		0.26	
N	1891		574		1317		5S2		436	
DEPiV ARIABLE MEAN	0.0151		0.0274		0.0097		0.0432		0.0359	
P-VALUES: AGES 5-9	0.0676		0.0266		0.5886		0.1625		0.3427	
AGES 10-14	0.0008		0.3098		0.0004		Om05		0.15:.1	
AGES 15-19	0.0338		0.2567		0.0227		0.0346		0.2100	
AGES 20-24	0.3509		0.9230		0.4244		0.8762		0.2494	

Note: Coefficients have been multiplied by 1 OO.The dependent variable is EDU _SHARE i.e. the budget share of education. Base dummy for Head's education is HEAD]AMORE =1 ifhead has 12 yearS of education or more and 0 otherwise. Base dummy for Head's Occupation is HEAD _AGRl =1 if the head is involved in agricultural or elementary occupations (such as domestic helpers etc.). PUNJAB is the excluded province. The last 4 rows represent the p-values of the F test that the male and female gender-age coefficients in that column are equal.

7.2. Individual-level outcomes: is aggregation the reason for the Engel curve method's failure to detect gender bias?

One of the central limitations of studies investigating gender bias in intra-household allocations has been their reliance, perforce, on aggregated, hous~hold level data to infer who gets what within the household. Failure of the Engel curve ineth<;>d in detecting differential treatment even where it is expected a priori may be attributable to data aggregation. Using individual level data on education expenditures, we investigate whether this can be a shortcoming of household allocation analyses in urban and rural Pakistan.

In this section we compare the household level Engel curve results with the estimates obtained using individual level data. However, the two sets of results are not directly comparable and a number of caveats must be borne in mind. Firstly, the dependent variable in the individual level analysis is the total educational expenditure on the individual child (TOTAL_EDU) rather than the budget share of education (EDU _SHARE), as in the household level analysis. Secondly, at the *individual* level, instead of using the demographic variables MOT04, F5T09 etc. we have to use the dummy MALE (equals 1 if child is male, 0 otherwise), to capture the gender of the child. All other independent variables are the ones u.sed in the household lev~l analysis. However, since we are interested in the *marginal* effects of the MALE variable, it is possible to compare somewhat across the two sets of results while recognising that we are not comparing like with like.

We estimate the conventional OLS of TOTAL_EDU. This equation is estimated for the four age-groups: 5-9, 10-14, 15-19 and 20-24 and disaggregated by region (full sample, urban and rural) and by province. A total of 72 equations were estimated using individual-level data. We do not report the results of all equations. Instead, we focus on the MALE gender coefficient and report the marginal effects of this variable in Table 7.2.

The results based on individual level data confirm the findings from the household level analysis. There is a large .and significant pro-male bias in the allocation of educational expenditure in almost all regions in Pakistan. It is apparent that estimation at the individual-level yields a substantially larger number of significant values reflecting a pro-male bias in a majority of the provinces and regions as compared to the analysis. at the household level. This suggests that aggregation of data, an inherent feature of previous studies on intra-household resource allocation, could be masking the true extent of gender bias and that there is no real substitute for individual level data.

Table 7.2: Marginal effect of the. gender dummy variable MALE and p value of the associated t-test, age' group 5-9 (Individual-level results),

	.1 S<1mplt: Size 1--'	Unconditional OLS			
Province		A!!:es5-9	AgeslO-14	Ages15-19	Ages20-24
PAKISTAN	Full	174.2	380.6	583.3	355.3
		(0.00)	(0.00)	(0,00)	. (0.00)
	U,ban	215.2.	261.7	394.7 -	443,2
		(0.00)	(0.00)	(0.00)	(0.00)
	Rural	161.0	440.7	699.4	295.1

		(0.00)	(0.00)	(0.00)	(0.00)
PUNJAB	Full	11 r,,6	223.5	390.7	255.3
		(0.00)	(0.00)	(0.00)	(0.00)
	Urban	74.6	82.4	262.3	410.6
		(?35) I	(0.39)	(0.03)	(0.0 I)
	Rural	,-3.3 ,	314.8	490.1	124.9
		(0.00)	(0.00)	*(0.00)*	(0.07)
SINDH .	Full	96.0	241.9	478.0	334.2
		(0.01)	(0.00)	(0.00)	(0.00)
	Urban	94.7	"95.3	189.0	424.0
		(0.35)	*ro.51)*	(0.25)	(0.01)
	Rural	112.7	465.3	713.9	255.5
		(0.00)	(0.00)	(0.00)	(O.GO)
NWFP	Full	277.0	708,0	960.8	634.2
		(0.00)	(0.00)	(0.00)	(0.00)
	Urban	329.3	794.4	892.4	892.4
		(0.11)	(0.00)	(0.00)	(0.00)
	Rural	264.7	662.5	985.0	667.0
		(0.00)	(0.00)	(0.00)	(0.00)
BALOCHIST AN	Full	210.0	3S8.1	547.1	256.8
		(0.00)	(0.00)	(0.00)	(0.00)
	Urban	438.4	535.2	546.3	333.7
	"	(0.00)	(0.00)	(0.00)	(0.01)
	Rural	81.1	306.2	552.2	217.0
		(O.OOl	(0.00)	(0.00)	(0.00)
AJK	Full	436.8	763.0	883.7	656.8
		(0.00)	(0.00)	(0.00) ,	(0.03)
NORTH	Full	187.4	536.3	536.3	310.7
		(0.02)	(0.00)	(0.00)	(O.08)
FATA	Full	286.5	727.6	531. 8	230.8
		(0.00)	(0.00)	(0.02)	(0.14)

Note: The figures in parentheses are p-values of the t-test of the DME of the MALE dummy computed using MALE = I and MALE =0 and the shaded cells represent significance at 5%. The dependent variable in is the absolute value of total educational expenditure.

8. Summary and Conclusions

In this paper we have examined two questions central to the intra-household resource allocations literature: does the allocation of household educational resources in Pakistan favours males over females? And, what explains the inability of the standard Engel curve approach to detect differential treatment even where discrimination is known to exist'? We exploit the latest national sample survey, the Pakistan Integrated Household Survey [PIHS (2001-2002)], to address both concerns.

The conventional (Engel curve) approach to understanding differential treatment in intra-household allocations has been questioned in recent years for its inability to detect biases in *allocations* even when *outcomes* reveal differently. *One* possible explanation for this puzzle is tested: that data aggregation somehow diminishes ability to detect gender biases. To this end, we utilise unique, individual-level, data on educational expenditures on all children aged 5-24 in the sample.

The results 'reported in Section 7 yield several conclusions. Even using the conventional Engel curve approach, robust evidence of a pro-male bias in educational expenditure is found especially in the 10-14 and 15-19 age-groups. Much of this differential treatment manifests itself in rural areas. The lack of evidence in the 5-9 .age-group is puzzling given large differentials in enrolment reported in Section 6. These results hold when using household and individual level data.

Furthermore, a comparison of individual and household level results reveals that aggregating expenditure data across individuals results in some loss of information with individual level data yielding far superior results as compared to household level data. This implies that studies of intra-hQusehold resource allocation must be based on individual level data, whenever possible; for credible results to emerge.

Finally, although our data quite clearly reveal that in intra-household allocation of educational resources, mabs in Pakistan are favoured over females, whether this constitutes discrimjnation is arguable. As suggested in Section 2, differential treatment could be attributed to an investment motive on part of parents, higher costs of educating girls or a son preference. The investment motive, in turn, could be explained by various factors one of '.vhich is differential returns to males and females in the labour market. There is not much convincing evidence in Pakistan to suggest whether the labour market returns to educating girls are more or less than those for boys. The first published study estimates the gender wage gap in only one city of Pakistan (Rawalpindi), uses relatively dated data but finds some evidence of discrimination against females in the labour market [Ashraf and Ashraf (1993)]. The study by Siddiqui and Siddiqui (1998) concludes that: "55 per cent of the earning differential between males and females is a result of discrimination in the labour market." (pp 894). However, these studies by no means constitute robust evidence. They do not control for important family background variables and/or do not control for ,possible sample selectivity bias in female labour force partiCipation. Future work should focus on this aspect for credible results to emerge.

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