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Are Girls Worse Off?

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Abstract

Recent evidence from Pakistan points to significant pro-male bias within households in the allocation of education expenditures. This raises two important questions: Is less spent on enrolled girls than boys through differential school-type choice for the two sexes, for example through a greater likelihood of sending boys to fee-charging private schools? And, if indeed this is the case, are girls thereby condemned to lower quality schooling, on average, than boys? By asking these questions, this paper makes three contributions to the literature. *Firstly*, this is one of a very few studies in Pakistan to explore the question of the relative effectiveness of public and private schools despite there being an unprecedented expansion of fee-charging private schools in the last two decades. *Secondly*, unlike existing papers which focus on primary schooling, this study looks at potential learning gaps by school-type for students in their last year of middle school (grade 8), very near their transition to secondary schooling. *Thirdly*, it exploits unique, purposively-collected data from government and private school students and thus, in estimating achievement production functions, is able to control for a number of variables typically 'unobserved' by researchers. The findings reveal that boys are indeed more likely to be sent to private schools than girls within the household, so that differential school-type choice is an important channel of differential treatment against girls. Private schools are also found to be of better quality – they are more effective than government schools in imparting mathematics and literacy skills. Girls lose out *vis a vis* boys in terms not only of lower within-household educational expenditures but also in terms of the quality of schooling accessed.

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Introduction

A sizeable number of children of school-going age in Pakistan are not in school. Even more worryingly, a significantly larger number of girls are out of school than boys at all education levels - for every 100 enrolled boys (aged 5-9) only 82 girls were enrolled in primary school in 2004[1]. These figures are a cause for concern especially if Pakistan is to meet the targets of universal primary education and promotion of gender equality by the year 2015 set by the Millennium Development Goals (MDGs). However, while the MDGs spell out the importance of being *in* school, they say nothing about the quality of schooling while there. This is despite there now being almost universal agreement that what is learnt in school matters equally with, if not more than, the years of schooling acquired.

The debate on school quality often centres on the public versus the private provision of education. A case for private schooling is made on several grounds, the cost to the government being one of the first - education provision is costly and governments worldwide are financially constrained. This need for supplementing education through the private sector is summarised in the Government of Pakistan's recent statement that the government's role in education "…is that of an enabler and facilitator, rather than a provider and sole producer" (GoP 2004, pp. 31). Private school expansion is also favoured on the grounds that charging fees increases accountability of schools towards parents and potentially also increases efficiency. Under certain conditions, competition generated through emergence of private schools may also improve efficiency of stagnant government sectors. These viewpoints suggest that organisational differences and differences in teacher incentives between private and government schools may be important.

However, while numerous commentators take the view that public financing of schooling for all is needed, the public/private debate is helpful in understanding whether private management and provision of schooling is more efficient than typical public sector models. Some authors see private schools as playing only a peripheral role as 'conduits' for educational expansion in most developing countries (Lockheed and Jimenez, 1994). Moreover, unconstrained expansion of fee-charging schools is questioned on equity grounds: that they only cater to the elite in urban areas and marginalise the poor. These views have been challenged in Pakistan. Studies reveal an unprecedented expansion of private schooling rather than just a 'peripheral' role. Furthermore, evidence suggests that private schools do not cater only to the urban elite but are also utilised by the poor (Alderman, Orazem and Paterno, 2001; Andrabi, Das and Khwaja, 2002). There is also some evidence that private schools can bridge gender gaps as even rural parents are seen willing to send their daughters to private co-educational schools (Andrabi *et al.*, 2002). However, it is important to note that these

[1] Figures from: http://www.dfid.gov.uk/countries/asia/pakistan/mdgs.pdf

arguments do not affect the equity argument – where people feel they have no alternative (either because there is no public schooling available or is of very poor quality), parents may seek private schooling and this represents a constrained choice especially for the poor.

Within the context of the school quality debate, this paper is motivated by two concerns. Firstly, a recent study in Pakistan finds large and statistically significant pro-male bias in *within* household education expenditure allocations in both the enrolment decision and the decision of how much to spend conditional on enrolment (Aslam and Kingdon, 2007). Secondly, as mentioned above, Pakistan has witnessed a mushrooming of private provision in the last two decades. There is also growing international interest in the question of whether there is a private school advantage and, if so, why it exists. These issues generate two important questions: 1) is less spent on enrolled girls than boys through differential school-type choice for the two sexes, for example through a greater likelihood of sending boys to fee-charging private schools than girls? And 2) if differential school-type choice is indeed the mechanism by which more is spent by families on sons' than daughters' education, is it the case that girls are thereby condemned to lower quality schooling, on average, than boys? That is, are private schools superior in quality and more effective than government schools in helping pupils to acquire learning?

While three past studies in Pakistan aim to compare students' learning differences in the two school types, their focus is on primary school pupils (Alderman *et al.*, 2001; Arif and Saqib, 2003; Das, Pandey and Zajonc, 2006). To our knowledge, no study looks at the relative effectiveness of government and private schools at the middle-level despite the emergent need for investigating the issue at this level: a comparison of the relative concentration of private schools in Pakistan (1990-2004) shows that enrolment in private schools at the middle-level has expanded even more rapidly than enrolment at the primary level. For instance, while the proportion of children enrolled in private schools has remained fairly static at the primary level (about 11 per cent), private-share of middle school enrolment has expanded from 17 per cent in 1992 to 52 per cent in 2004[2]. This suggests that private middle-schools are absorbing an increasingly higher proportion of school-age children.

Moreover, investigating the quality of schools at this level is also important because middle-school (grade 8 in this study) is the year just before the transition to secondary school. While Pakistan is far from achieving the MDG 'Universal Primary Education' target, it is making slow progress towards achieving this goal. The obvious decision a primary school graduate (or his/her parent) has to make is between the no-school option and moving on to middle-school. Given the consensus that school quality is a key determinant of child school enrolment and further retention, quality has to be above a threshold-level to generate the

[2] 1992 figures from Pakistan Education Statistics (1992-1993), 2004 figures from Pakistan Economic Survey (2004-2005).

incentive for parents to invest in children's further education. Evidence from other developing countries shows that while completion of 5 years of primary schooling generates significant non-market benefits especially to women's education in some countries, the most universal benefits are associated with completing secondary schooling (Ainsworth, Beegle and Nyamete, 1996). The natural transition between the two levels is middle-schooling. Finally, middle-school is often the exit point from schooling altogether for girls as they reach puberty and approach 'marriage-age'[3]. Coupled with this, many private schools (especially in rural areas and the very low-fee charging schools in urban locations) hire female teachers to keep salary costs low and, very often, these female teachers have acquired education only till the secondary level (Andrabi, Das and Khwaja, 2006). Whether graduates from government and private schools differ in terms of learning acquired is, consequently, also important for the learning *their* students will acquire in the future if they become teachers.

These considerations provide the rationales for studying the relative quality of the two school types at the middle-level of education. Lack of data has been a key constraint hampering research. In this study, we overcome this constraint by utilising two data sources. In the first instance, the nationally representative Pakistan Integrated Household Survey (PIHS 2002) is used to draw inferences about gender differences in school choices. However, as with most LSMS-type (Living Standards Measurement Studies) datasets, the PIHS does not have information on student achievement which would allow a 'relative effectiveness' comparison across school types. For this purpose, we utilise a purpose-built school-based survey conducted by the author in Lahore district in Punjab province, Pakistan in 2002-2003. Using stratified random sampling the survey collected data on 1887 pupils in any one section/class of grade 8 in 65 sample schools (40 private and 25 government) in urban and rural Lahore. Although limited to one district of the country, this dataset is unique in providing a very rich set of variables allowing estimation of achievement production functions. Moreover, as these data were collected exclusively with a view to methodological limitations facing researchers, we were able to collect information on a number of variables typically deemed 'unobserved'. This allows us to convincingly proceed with a relative effectiveness comparison by school type at the middle-level in Pakistan.

Data used in this study reveal that the public-private difference in raw student achievement in standardised tests is statistically significant. However, differences in raw scores may reflect differences in observed background characteristics as well as non-random selection into private and government schools which, in turn, induces correlation between private school attendance and unmeasured individual and family background effects favourable to pupil achievement. Recent studies of the relative efficiency of private and

[3] While age-at-marriage is increasing, the mean marriage age for females is 17.9 among the 20-24 year old married youth (Sultana, 2005).

public schools take into account biases introduced by sample-selection. In the absence of experimental data, they rely on the Heckman two-step procedure which entails finding a credible and exogenous variable determining school-choice which does not directly affect achievement. However, since we control for a number of variables such as individual 'ability' and 'motivation', potentially generating sample selection in the first instance, our Ordinary Least Squares (OLS) estimates are not expected to differ significantly from the Heckman-corrected ones.

This paper proceeds as follows. Section 2 provides an overview of Pakistan's education system and the policies shaping its evolution. Section 3 presents descriptive statistics and estimates simple regressions to examine whether males are more likely to attend private schools in Pakistan. The methodologies used and the evidence from previous literature on relative effectiveness of school-types is reviewed in section 4. Section 5 shows econometric findings while Section 6 concludes.

2. Overview of Schooling in Pakistan

Broadly speaking, there are two main school types in Pakistan – government and private. In both school types, almost always, the formal education system comprises of 5 years of primary, 3 years of middle, 2 years high (Matric/GCSE) and 2 years of higher secondary schooling (FA/FSc. Level/A' Level). While similar in their educational structures, the two school-types differ in terms of financing and regulation. Government schools are heavily reliant on the state exchequer, although in recent years the system has become considerably decentralised and responsibility for the delivery and management of education has shifted to the districts (Devolution Plan 2001). Public schools often operate under poor regulatory environments. The government provides 'free' education up till primary. Although government primary schooling is mandated to be tuition-free and there are nominal fees in middle and high schools, low fees often mask significant non-fee expenditures in the form of uniform, books, transport, examination fees and even admission fees. Finally, government schools are almost always single-sex schools (exceptions occur when schools are co-educational up till primary after which they become single-sex).

Private schools are privately-owned entities owned and managed by sole-proprietors, NGOs, trusts or other forms of management. Most often, the schools are for-profit and are owned by an individual entrepreneur. Although private institutions are required to be registered with the Education Department in the respective provinces, a large (and undocumented) number fail to do so. Registration is often obtained only by institutions needing government 'recognition' which allows students from the school to sit for public examinations. Often, however, unrecognised private schools evade this predicament by

sending their pupils to public examinations as 'private' candidates[4]. By remaining 'unrecognised' the poorer private schools evade large (taxation and other) costs and consequently also remain unregistered. As a result, the true size of the private sector remains unmeasured through government statistics[5]. Moreover, this laxity in registration and recognition means that all unrecognised (and often a large number of recognised) private schools operate in very slack regulatory environments. This has significant consequences for the quality of schooling offered.

By law, recognised private schools must charge fees approved by the Education Departments. There is great heterogeneity in private schooling: Private school fees range from exorbitantly high to relatively small amounts[6]. Moreover, unlike government schools, private schools are often co-educational. According to FBS (2001) estimates, 95 per cent and 96 per cent of all primary, middle, high and higher secondary private schools in Pakistan and Punjab in 2000 were co-educational[7].

The government's decidedly pro-private policies in the education sector coupled with the poor performance of the government sector have resulted in an unprecedented expansion in private provision in Pakistan (Watson, 2005). According to FBS 2001, there were 36,096 private institutions in Pakistan, catering to 6.3 million children in 2000[8]. From 3,343 institutions in 1983, private institutions at the primary, middle and high (up till Matric) levels in Pakistan increased to 33,238 by the year 2000, an expansion of more than 800 per cent in less than 20 years. In the year 2000, approximately 17 per cent of all primary, middle and higher secondary schools were private and accounted for approximately 21 per cent of total enrolment (roughly corresponding to 4.2 per cent and 6.9 per cent respectively in 1983)[9].

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[4] It is possible to appear for public examinations either as a 'Regular' or 'Private' candidate. Regular candidates' admissions for examinations are sent through recognised schools. Private candidates, on the other hand, send in their examination admissions without any institutional backing. This system has arisen historically as many candidates wish to take public examinations and obtain secondary or higher secondary school certificates without formally attending schools. This is especially true for females.

[5] Although the FBS (2001) claims to have interviewed both registered and unregistered schools, whether all unregistered schools have been documented in arguable. Despite the fact that my survey and fieldwork was conducted after the census of educational institutions had already been undertaken, there was no comprehensive list of the un-registered schools which had apparently been counted in the census.

[6] Alderman *et al.* (2001) in their study of schooling choices of low-income families in urban Lahore find that private schools catering to the urban poor charge low fees and the total educational expenditure on all heads (uniform, fees, transport etc.) in private schools is often comparable to that in government schools. In our sample, average private school fees range from Rs. 116/month to Rs. 3766/month.

[7] Surprisingly, this is true even in rural areas: 93 per cent and 97 per cent of all private (primary, middle, high and higher secondary) schools in rural Pakistan and rural Punjab were co-educational (FBS 2001).

[8] It seems likely that the number of private schools and proportions enrolled in them are grossly underestimated as the unregistered sector is not fully accounted for.

[9] The 2000 estimates are based on two sources. Private school figures are from the Census of private institutions (2001) and total number of schools and enrolments in primary, middle and high schools are from the Pakistan Statistical Yearbook (2001). The figures from 1983 form a rough comparison as

Recent estimates in Pakistan show that much of the mushrooming of private schools has occurred in Punjab which houses roughly 50 per cent of the country's total population - of the total (36, 096) private institutions in the country reported by FBS (2001), 66.4 per cent were in Punjab. Secondly, as Alderman *et al.* (2001) and Andrabi *et al.* (2002) point out, private schooling is no longer restricted to urban regions. According to the FBS Census figures, whereas 61 per cent of all private institutions are in urban areas, a relatively large 39 per cent provide education in rural regions of the country. Finally, within the 34 districts of Punjab, the FBS (2001) reports Lahore[10] having the largest number of private schools (3491), representing approximately 15 per cent of all private schools in Punjab (24325). This rich concentration of private schools in Punjab province and more specifically in Lahore district provides an ideal laboratory for investigating the relative effectiveness of private and public schools.

3. School Choice: are boys more likely to attend private schools?

This section looks at descriptive statistics and simple regressions to determine whether private and government schools differ in expense and if there is gender bias in the type of school attended by school-age children. The Pakistan Integrated Household Survey (PIHS 2002), the latest nationally representative dataset covering more than 16000 households across the country is used.

Table 1 shows the proportion of children enrolled in private schools across the four main provinces and in all Pakistan[11]. Clearly, conditional on enrolment, girls are not any less likely than boys to be enrolled in private schools. Indeed, except in the 20-24 age-group, girls are significantly *more* likely to be enrolled in fee-charging private schools as compared to boys. There are, however, striking provincial disparities. The evidence in Table 1 corroborates Andrabi *et al.*'s (2002) findings that in terms of girls' enrolment, private schools in Pakistan cater as much to girls as to boys.

Table 2 shows that expenditure (incurred on various heads of education, such as tuition fees, books, uniforms etc.) is consistently significantly greater in private as compared to government schools. This is true of all age-groups[12]. Jointly, Tables 1 and 2 reveal that although private schooling is significantly more expensive than government schooling, girls are as likely and in some instances more likely than boys to be enrolled in private schools.

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those figures are presumably based on numbers of and enrolments in primary, middle and high schools while the 2000 figures are based on primary, middle, high *and* higher secondary schools.

[10] Lahore is the second-largest city of Pakistan and the capital of Punjab and is categorised as a district with two sub-divisions: Lahore City and Lahore Cantonment (Cantt.) both of which have regions demarcated as urban and rural.

[11] This analysis is restricted to the 97 per cent children who are enrolled in government and private schools only.

[12] There were too few observations in the 20-24 group and thus it has not been included.

However, school choice is determined by a number of observed and unobserved household-level variables. For example, parents with more education, in certain occupations or with higher aspirations and greater motivation for child schooling may choose private schooling. Girls' enrolment may be particularly sensitive to such factors. Therefore, girls attending *any* school and particularly those attending private school are likely to be a highly select sample from the population - selection stemming from observed and unobserved household characteristics.

Given this consideration, Table 3 compares raw gender differences in private school enrolment (column b) with gender differences remaining *after* conditioning on observed household characteristics (column c) and again with gender differences remaining after controlling for both observed and unobserved household characteristics (column d). Column (c) estimates are obtained from the coefficient on the MALE dummy in a linear probability model (LPM) of private school choice fitted on all currently enrolled children, conditioning on observed household characteristics[13]. Column (d) estimates are obtained from the coefficient on the MALE dummy variable in a household fixed effects LPM of private school choice. The dependent variable is PRIVATE which equals 1 if child is enrolled in private school and 0 if in government school. In column (c) independent variables include the log of household size, log of per capita household expenditure, education and occupational status of the household head, dummy variables for the various provinces and constitutional regions and a dummy variable capturing urban regional status. A gender dummy variable (MALE) captures the impact of gender on the choice of private schooling[14].

The fixed-effects Linear Probability Models were fitted on the subset of households that had at least one child of each gender currently enrolled in school and in the relevant age group. According to raw data in column (b), among enrolled 5-9 year olds in all Pakistan, males are 1 percentage point more likely to be enrolled in private schools than females. There are provincial differences, with larger pro-male biases in Punjab and a pro-female bias in Sindh. However, controlling for household factors (observed and unobserved), there is a dramatic change. For all Pakistan, for example, the extent of the bias increases from 1 percentage point to 5 and then to 8 percentage points (columns c and d).

[13] Both OLS and probit models were estimated to examine whether linear probability models yield the same coefficients as probit estimates of school choice. This is important as small sample sizes in household fixed effects estimation (below) necessitate linear probability models. Since LPM and probit models yielded almost identical results, we can be confident in the use of LPM in household fixed effects estimation. Moreover, both LPM and probit are estimated with and without the province-gender interaction terms (for example MALE_PUNJAB, MALE_SINDH etc.). The models with interaction terms were used to determine whether males in a particular region are more or less likely to be enrolled in private schools as compared to girls.

[14] The underlying equations from the OLS/probit model estimates are available from the author.

In summary, while at first glance evidence suggests that girls in Pakistan are not any less likely, and are in fact often more likely, than boys to be enrolled in private schools, conditioning on observed household characteristics changes the picture dramatically. Introducing household fixed-effects (to potentially control for unobserved household preferences) strengthens the finding that males in almost all age-groups and provinces are significantly *more* likely to attend (the more expensive) private schools as compared to girls. This suggests that one mechanism through which households achieve lower expenditure on education for girls is through a lower probability of sending them to private schools. Hence, gender differentiated school choice is an important mechanism through which large and significant pro-male education expenditure biases occur in Pakistan.

This raises the question: do girls lose out not just in intra-household expenditure allocations but also in the quality of education acquired? If girls have poorer access to private schools and if these schools are more effective in imparting knowledge to their pupils, gender differences in private school access will also translate into differences in academic achievement. That girls have poorer access to private schools has been established. Whether private schools are more effective than government schools remains to be investigated. If they are, then given girls' inferior access to private schools, it would suggest that, on average, girls face poorer quality schooling than boys in Pakistan. We investigate this question in the remainder of the paper.

4. Literature and Methodology

It is a commonly held view that private schools are of better quality and consequently more 'effective' than government schools in Pakistan. This perception is formed by private schools' better raw exam results than government schools; their being often English-medium schools; and their being sometimes affiliated to international secondary education exam boards, which are thought to improve labour market returns later in life. At the primary education level, Alderman *et al.* (2001), Arif and Saqib (2003) and Das *et al.* (2006) also find that private schools are better in imparting learning to pupils. At the middle-level, this issue is still largely untested. While some authors have argued that the small size of the private sector in most developing countries limits private-public comparisons (Glewwe and Patrinos, 1999), as section 3 revealed, this is clearly not the case in Pakistan.

The relative effectiveness of school types can be estimated using either one of two methodologies. In the first, effectiveness is measured as the premium (if any) of private schooling in labour market earnings among graduates of various school types[15]. Studies from

[15] These studies have variously controlled for the standard Mincerian-earnings variables (such as education and experience) with some making efforts to control for the endogeneity of schooling arising

several countries point to a relative earnings advantage of private school graduates (see Brown and Belfield, 2001, for a review of studies in the UK and USA; Bedi and Garg, 2000 for Indonesia; and Asadullah, 2005 for Bangladesh and Pakistan). Evidence from Pakistan also corroborates these findings: earnings of private school graduates are up to 31 per cent higher than those from government schools (see Nasir, 1999 and Asadullah, 2005). Our own estimates, using the PIHS (2002) show the private school earnings premium to be between 19 and 27 per cent[16].

Alternatively, school-type effectiveness is measured as the difference in pupils' learning achievement in the two school-types. Achievement differentials are estimated using education production functions with the outcome of schooling (in this case achievement score on standardised tests) regressed on educational inputs as follows:

$$A_i = \beta \mathbf{X}_i + \mu_i \quad (1)$$

In (1), A_i measures the achievement score of pupil *i*, **X** is a vector of variables assumed to determine achievement, β is the corresponding vector of coefficients to be estimated and μ is an error term. Clearly, relative effectiveness assessments cannot be based simply on comparisons of raw achievement scores with the claim that the school type with the higher score is more 'effective' in imparting learning. Pupil achievement is affected by a wide array of factors including individual characteristics (such as innate ability and motivation), family background such as the home learning environment, parental education etc.[17], and even pre-school experiences (see Behrman, Hoddinott, Maluccio, Soler-Hampejesk, Ramirez and Stein, 2005). To the extent that such factors affect parental schooling choices (e.g. children from more privileged backgrounds or with more educated or motivated parents may systematically select into private schools), the government and private school samples will be non-random draws from the population and generate sample-selectivity issues (discussed later).

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from 'ability bias' and other biases. However, given data limitations, more often they rely on OLS or sample-selectivity corrected estimates while recognising the limitations faced.

[16] Using the PIHS, we estimated earnings functions incorporating the standard education/experience variables and a dummy variable, PRIVATE (equals 1 if individual was enrolled in a private school when of school-going-age and 0 otherwise). Three additional variables were included: READ = 1 if individual can 'read in any language with understanding', 0 otherwise, WRITE = 1 if individual can 'write in any language with understanding, 0 otherwise', and MATHS = 1 if individual can 'solve simple (plus minus) sums, 0 otherwise. As READ/WRITE/MATHS may be correlated with PRIVATE, the first specification introduces them independently to capture their effect, if any on earnings before introducing the school-type dummy. The results are suppressed due to space constraints but the main findings are reported above. See Aslam (2007) for details of underlying regressions of earnings functions.

[17] One of the most robust findings in educational research is that a child's educational attainment is consistently driven by family background (Chevalier et al., 2004, pp.1).

In the literature two main approaches have been adopted in the estimation of education production functions that explicitly take into account different school types: (1) a private school dummy approach in a pooled sample (government and private) and (2) estimation of two separate achievement equations for private and government schools. In the first approach a single achievement function is estimated for the full sample of students, and a private school dummy variable is included with the coefficient on the dummy measuring the private school achievement advantage. However, if 'motivation' or innate ability are in the error term, in pooled samples they generate a correlation between the school-type dummy and the error term, violating a basic assumption of classic linear regressions. The evidence on private school advantage using this approach is mixed (see for instance Psacharopoulos, 1987; Williams and Carpenter, 1991; Mizala and Romaguera, 2000; Somers *et al.*, 2001 and McEwan, 2000).

We are aware of three regression analyses that compare achievement differentials among children in different school-types in Pakistan. A study by Arif and Saqib (2003) uses the dummy-variable approach and purpose-built data on government, private and NGO schools located across six districts in Punjab, Sindh, NWFP, Balochistan and AJK. The authors administered questionnaires to grade 4 (primary school) pupils, their parents, teachers and school heads. In total, 50 schools were sampled across the country yielding 965 primary school boys and girls. Tests of numeracy, literacy and life-skills/general knowledge were administered to all pupils to obtain measures of cognitive skills. The quality difference in school-types was measured through inclusion of two dummy variables ('NGO school' and 'private school', with 'government schools' as the base category) in achievement functions. Private school pupils are found to perform significantly better than those in government schools while this was not true for NGO school students.

The study by Alderman *et al.* (2001) remains the most methodologically sound and convincing study of private-public schools to date. Using an area-frame sampling methodology, the authors identified low-income areas in Lahore District and conducted household-level and school-level surveys. Tests of Urdu and mathematics were administered to a subset of third-grade children. Achievement production functions were fitted including a school-type dummy. However, non-random assignment of pupils in private schools was controlled using the estimated predicted probability of private school enrolment based on logit estimates of school-choice. The authors found that, controlling for home background and school inputs, children in private schools performed better than their government school counterparts. The key strength of this study is that the data are based on a household-level survey and does not ignore selectivity into particular school-types relative to children not attending school at all. Moreover, the author's extremely rich data help convincingly identify school-type in the achievement production functions.

Finally, a recent study by Das, Pandey and Zajonc (2006), uses a rural sample of 828 schools from 114 villages in three districts of Punjab (Attock, Faisalabad and Rahim Yar Khan) randomly testing 10 pupils in grade 3 in every school in the chosen village. The tests were conducted in English, Urdu and Mathematics. At one point, the authors compare the 'adjusted' and 'unadjusted' knowledge score gaps by school type. The 'unadjusted' gaps represent the mean difference in pupil scores in the three tests while the adjusted gap is the coefficient on private schools in a child-level OLS regression that includes wealth, father literacy, mother literacy, gender, age, age squared and a village-level fixed effect. Their data also corroborate the findings of the two previous studies and confirm that private school pupils outperform public school counterparts in all three subjects. The authors also note that there is no decrease in the gaps after conditioning on the covariates (i.e. the adjusted and unadjusted gaps are roughly identical). This finding appears to suggest that differences in schools rather than differences in family background generate learning differences. This is not surprising given the relative homogeneity in socio-economic status that one would expect in rural areas in Pakistan.

The findings from the three studies in Pakistan reported above suggest that in urban and rural Pakistan private school pupils outperform public school counterparts, at least at the primary level. However, all three studies adopt the dummy variable approach which may be restrictive as it imposes the vector of coefficients in both school types to be identical. There may be important differences in characteristics of individuals *across* the two school-types which may interest researchers. The private school dummy may also be endogenous. The alternative to the 'Dummy variable' approach overcomes one of the methodological limitations (constraining the vector of coefficients) by fitting two different achievement production functions, one each for the private and public school samples. Relative effectiveness of the two school-types can then be estimated using a variation of Oaxaca's (1973) methodology, asking the question: if we were to randomly choose an individual with the average characteristics of the entire student population in our sample, say $\overline{X}$, would this pupil perform better in a government or private school? Equation (1) can be estimated separately for the two school-types:

$$A_{iG} = \beta_G \mathbf{X}_{iG} + \mu_{iG} \quad (2)$$

$$A_{iP} = \beta_P \mathbf{X}_{iP} + \mu_{iP} \quad (3)$$

where *i* denotes the *i*th pupil, G and P are subscripts representing government and private schools, A denotes the achievement score of each pupil and X denotes personal and family background characteristics of pupils. Equations (6) and (7) estimate education production

functions controlling for home background characteristics of pupils and the β coefficients are derived accordingly. The error terms, μ are assumed to be randomly and normally distributed.

We can predict a score ($\hat{A}_G$) by using the average characteristics of the entire student population and using the coefficients derived from (6). This would be the average student's predicted score if she were to attend a government school. Similarly, we can predict a score $\hat{A}_P$ by using coefficients derived from (7) and using the average characteristics of the entire student population. This would be the average student's predicted score in a private school. The achievement advantage of private schools over government schools can simply be calculated as the difference in predicted scores: ($\hat{A}_P - \hat{A}_G$).

However, estimating achievement production functions on students in different subsamples (of school-type) generates sample selectivity concerns. This may arise if individuals select themselves into private or government schools in a non-random way - those who benefit most from being in a certain school-type are also most likely to be in it (self sorting). It is often observed in South Asian countries that more educated and well-off parents choose to send their children to fee-charging private schools and that free government schools are often the choice of the poor and uneducated. If parental education is positively correlated with unobserved parental ability and if there is intergenerational transmission of ability, then more able children will systematically select into private schools. Alternatively, private schools may cream-off the most able pupils through entrance tests (hierarchical sorting).

Heckman (1979) suggested a method of overcoming the bias associated with sample selectivity. Although the implementation of the Heckman two-step procedure is fairly simple, the challenge is in finding valid exclusion restrictions – i.e. at least one variable directly affecting choice of school type and not directly explaining pupil achievement (i.e. not in X_i). Studies in the past have often used family background and school characteristics as identifying exclusion restrictions but these have been questioned (Altonji, Elder and Taber 2002, and Glewwe, 2001). Many of the family background variables cannot be credibly excluded from achievement functions while school-level variables are the consequence rather than the determinants of school-choice. For instance, Altonji *et al.* (2002) argue that religious affiliation and proximity to school, often used in identifying the Catholic school-effect in US studies, are not valid instruments as they directly determine pupil achievement. However, data limitations imply that identifying exclusion restrictions are often justified on empirical grounds, i.e. on the grounds that they (*de facto*) are insignificant in the achievement equation but significant in the school-choice equation.

Pioneering work rigorously comparing the relative effectiveness and efficiency[18] of school types in five educationally diverse developing countries using the Heckman approach was conducted by a group of World Bank researchers (see Jimenez *et al.*, 1991a; and Lockheed and Jimenez, 1994, for a summary of the main findings). The authors used data on achievement of secondary school pupils in Colombia and Tanzania (Cox and Jimenez, 1990), the Dominican Republic (Jimenez *et al.*, 1991b), the Philippines (Jimenez *et al.*, 1988a) and Thailand (Jimenez *et al.*, 1988b). The studies had a common methodology and found comparable results. In all five country-settings, even after controlling for student background and sample selection biases, private school pupils consistently outperformed those in government schools in verbal and mathematics tests. Moreover, the unit costs of private schools were lower than those of public schools. This was a key finding as it suggested that private schools were also relatively more efficient in the use of their inputs (such as teachers) which reinforced their achievement advantage.

Kingdon's (1996) examination of the relative effectiveness and efficiency of different school types in urban Lucknow District in the Uttar Pradesh state of India also used the Heckman approach to correct for sample selection bias. It confirmed the findings of the aforementioned studies - that private school pupils learn more than their government school counterparts. However, more recent evidence on the private school advantage is mixed. For instance, Lassibillie and Tan (2001) counter the previous evidence in Tanzania (Jimenez *et al.* 1990; Psacharopoulos, 1987), finding instead that *public* (secondary) schools are more efficient in imparting achievement to pupils as compared to private schools. However, Tooley (2005) corroborates Kingdon's (1996) findings for primary and secondary school pupils in poor areas of Hyderabad (Andhra Pradesh), India.

Increasing use is now made of experimental designs to overcome problems of sample selection within the school-choice literature. This approach is more convincing as it involves experiments to randomly assign children to 'treatment' (private) and 'control' (government) groups and assesses differences in educational outcomes among them. If school-type is allocated randomly, one can be more sure that the differences in achievement (if any) among pupils in the two school types are due to differences in school-type rather than due to differences in family or individual unobserved characteristics (see Angrist *et al.* ,2002 and Cullen, Jacob and Levitt, 2005). However, experimental studies exert stringent data requirements which are often not met especially in developing countries and researchers have to rely on older, often more unconvincing approaches, to compare achievement by school type.

While most studies are unable to directly control for the variables generating

[18] Efficiency comparisons are based on comparing the cost-effectiveness of various school-types.

endogeneity and sample selectivity due to data constraints, the present study uses purposively-collected data to examine the relative effectiveness of school types in Pakistan. Consequently, we have measures for a number of variables usually deemed 'unobserved' including measures of child motivation (EDU_WISH = how much education child wishes to acquire), the home learning environment (FREE_HELP = number of hours of help with school work provided by any parent, siblings or relatives) and a proxy of child ability obtained through testing each child on the Raven's Progressive Matrices Test (RAVEN = score on Ravens test)[19]. Including these controls should reduce some of the biases that plague other studies. Moreover, our study is also better able to capture a large array of observed individual and family factors conditioning on which is important for valid inferences about pupil achievement in the various school-types. At the outset, therefore, we do not expect our OLS achievement production functions to differ significantly from Heckman-corrected ones, a suspicion confirmed in the empirical work which follows.

5. Data, Estimation and Results

Data

The data for this study comes from a purpose-built school-based survey conducted by the author in Lahore district in Punjab province, Pakistan in 2002-2003. Using stratified random sampling on 65 schools (25 government and 40 private) in urban and rural Lahore, the survey collected detailed data on 1887 pupils in any one section of grade 8th in each sample school. Each pupil filled out a questionnaire containing questions on personal characteristics (age, motivation[20], gender etc.), parental and family background (parental education and occupation, family structure and size, wealth and income etc.), schooling (books prescribed in school, length of the school week, family expenditure on schooling in the past year, hours of home tuition taken etc.) and opinions on various issues such as how important did they think schooling was for girls as compared to boys. In addition, each child took the Raven's Standard Progressive Matrices test and tests of numeracy and literacy[21]. The

[19] It has been suggested that this measure of pupil's innate ability is possibly endogenous in that it is not independent of the child achievement level. However, as long as there is some exogenous element in the Raven's test, it does provide a valid measure of ability and several studies have used it as such.

[20] In most studies, motivation or child's educational aspirations are not controlled for. In our purpose designed study, special care was taken to obtain a measure, albeit not a perfect one, to capture child motivation. We asked the child the question: 'What is the highest level of education you wish to attain?' with all possible educational levels (such as Middle school or upto 8th grade, Matric or grade 10 etc.) as answer choices.

[21] The Raven's Progressive Matrices test has been used extensively in studies around the world in an attempt to control for the ever-elusive 'ability'. The test consists of 60 items arranged in five sets (A, B, C, D, & E) of 12 items each. Each item contains a figure with a missing piece. Below the figure are either six or eight alternative pieces to complete the figure, only one of which is correct. Each set involves a different principle or "theme" for obtaining the missing piece, and within a set and across the sets, the items are roughly arranged in increasing order of difficulty. This test was designed to measure a person's ability to reason by analogy independent of language and formal schooling. Although there

literacy and numeracy tests were developed by the Educational Testing Service (ETS) for use by Knight and Sabot in their study in Africa (see Boissiere *et al.* 1985) and have been discussed extensively in Knight and Sabot (1990). We adapted these tests to the Pakistani context, reduced the number of questions to test the pupils within a given time frame, and translated them into Urdu to administer them to children in the national language when the school was Urdu-medium.

Finally, each child was weighed and their height and arm circumference measured. The survey also collected information on a total of 339 teachers who taught the pupils in the section of grade 8 that was sampled in each school and collected data on school resources and expenditures by interviewing head teachers of the schools. Finally, mostly for consistency checks and for additional information, each child was sent home with a 'parents questionnaire' which was filled out by the parent (or the child asking the parent questions if parent was illiterate) and returned to school authorities the next day. Information on 1770 parent questionnaires was collected and collated.

Achievement Differences: Private and Government Schools

Table 4 describes the variables used in OLS estimates and later in the Heckman school choice probit and corresponding achievement functions. Table 5 sets out the means, standard deviations and t-values of the differences across private and government schools. As Table 5 shows, the maximum mark in the achievement test is 50. It also reveals that private school pupils achieve on average 6 points more on standardised tests of literacy and mathematics (ACHIEVE) than government school students. This difference is statistically significant at the 1 per cent level. However, it cannot soely be attributed to a school-type effect as it is also apparent that in almost all respects, private school pupils come from relatively more privileged backgrounds. For example, they are significantly more motivated (EDU_WISH), and have more conducive home learning environments (a significantly larger number of books at home and lower number of siblings). Moreover, they have more educated parents who are wealthier and more likely to be professionally employed.

Initially, achievement production functions are fitted on the pooled sample (government and private school pupils) and OLS estimates obtained with and without a PRIVATE school dummy. The results are reported in Table 6. The table examines whether the 6 points raw private school achievement advantage remains after conditioning on individual and family background characteristics. Almost all variables have the expected signs – for instance ability (RAVEN) has a significantly positive association with achievement as does the child's educational aspiration (EDU_WISH). The first cut at the data

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is some controversy about how independent this instrument really is of formal schooling, the raw score yields an estimate of ability which is arguably better than not having any estimate at all.

reveals that having controlled for a number of covariates, learning achievement does not differ significantly by gender. Moreover, comparing across (a) and (b), the large and significantly positive coefficient of PRIVATE suggests a substantial private school achievement advantage even after controlling for individual and family background. Although this falls from a raw advantage of 6 points to a ceteris paribus advantage of 2.5 points, it equals a 0.35 standard deviation of the achievement score.

However, the PRIVATE school dummy is potentially endogenous. Pooled sample specifications also constrain the values of the coefficients on the variables other than school-type to be equal in both school-types. This may be especially restrictive for the effect of gender which may vary by school-type. Therefore, we estimate education production functions on sub-samples of government and private school pupils separately. As mentioned before, we do not expect our OLS estimates on sub-samples of private and government school pupils to differ significantly from Heckman-corrected estimates as our rich controls include, among others, measures of ability and motivation (albeit imperfect).

The Heckman two-step results are reported in the Appendix. Table A1 shows the school-choice probit. The base category is government schools. We experimented with a large number of variables as potential exclusion restrictions and report the results for specifications with strongest selectivity effects. The exclusion restrictions (WEALTH1, FSELFEMP, FPROFEMP and FEDYRS) are jointly significant at the 1 per cent level and WEALTH1 and FPROFEMP are individually significant at the 1 and 5 per cent levels, respectively[22]. As with any cross-sectional study, the difficulty of finding credible exclusion restrictions remains but we use mainly an empirical justification. The four identifying variables lacked significance in achievement functions but were significant in the school-type probit. While it could be argued that father's occupation affects school-type choice by affecting earnings and should not have an impact on achievement, the results should be interpreted with caution because this theoretical justification for the exclusion restrictions is somewhat weak.

Three separate selection-corrected equations are fitted in each of the private and government sub-samples – with ACHIEVE, READ and MATHS as the dependent variables. ACHIEVE is the sum of READ and MATHS and takes on a maximum value of 50. READ and MATHS take on maximum values of 25 each. These are reported in Table A2. In both (government and private) sub-samples, the lambda terms have small positive coefficients. The signs on λ are consistent with more able and motivated children being more likely to be enrolled in both government and private schools. Moreover, the lambda terms are statistically

[22] We experimented with the WEALTH variable by including it in various forms in achievement functions. The quadratic term was also insignificant in all specifications. It was also insignificant in the school-choice probit and hence excluded to achieve a parsimonious specification.

insignificant with t-values of 1.38 and 0.40 in government and private samples, respectively. We had anticipated significant selectivity effects. Results reveal to the contrary. As argued above, one reason could be that the rich variables included in our achievement equation are good at capturing effects of unobservables on achievement. Another could be the high standard errors on lambda, which could arise because of the high collinearity of lambda with some of the variables in the achievement functions (Lambda is derived from stage 1 probits and many of the variables included in stage 1 are also included in stage two). Finally, it remains possible that lambda is not well identified because the first stage equation is not properly specified: it contains a number of variables that are potentially endogenous.

The coefficient on the lambda term measures the bias due to non-random sample selection. We anticipated that because of the rich controls for family background and individual ability and motivation allowed by our data, the Heckman-corrected results would not differ significantly from OLS regressions on sub-samples. This is also confirmed through the Hausman specification test comparing the Heckman two-step model (on ACHIEVE) against the OLS in the government and private sub-samples[23]. The coefficients of the variables in the Heckman equation are insignificantly different from those in the OLS equations. Thus, we discuss the main findings from OLS models estimated on sub-samples of private and government school pupils below.

However, the OLS models estimated below are imperfect as the endogeneity of various variables in the achievement production functions remains. Whatever the underlying cause of endogeneity may be (reverse causation, correlation of included regressor with error term or measurement error), it generates biased parameter estimates of all included variables. Consequently, one cannot provide a causal interpretation to the parameter estimates.

Discussion of OLS Results

Tables 7 and 8 report OLS equations of pupil achievement in Achieve, Reading and Maths in the government and private sub-samples. Note that the R^2 values of the government sub-sample in the Achievement, Reading and Maths production functions are much lower than in the private sample. This could be because of lesser variation in the dependent variables 'ACHIEVE', 'READ' and 'MATHS' in the government sample than in the private sample (this smaller variation is clear from the kernel density of ACHIEVE in the government than in the private sector, reported in the Figure 1).

[23] In the government sub-sample, the computed chi-2 statistic (12) is 1.89 while in the private sample, the computed chi-2 (12) is 0.16 respectively. The critical chi-2 statistics at 12 degrees of freedom is 21.03 at the 5% level. We can accept the H_o that the difference in coefficients between Heckman and OLS is not systematic.

Focus first on ACHIEVE (overall achievement scores) in the first columns of Tables 7 and 8. In private schools males outperform their female counterparts while no such MALE achievement advantage exists in government schools. Moreover, male students perform significantly better than females in Maths in both school types while female students perform better in Reading (although the effect is significant only in government schools). Delving further, the pro-male bias in overall achievement in private schools arises from a large and significant pro-male achievement advantage in Maths scores (males achieve 1.6 points more as compared to females). Although there is a pro-female Reading advantage in private schools, this is small (0.01 points) and not significant. In government schools, however, a large and significant pro-male Mathematics advantage (1.3 points) is matched by a large and significant pro-female advantage in Reading scores (1.2 points).

Gender differences in achievement have been variously attributed. Males and females may vary in their individual attributes as well as family-specific attributes especially in parental attitudes and expectations. Studies in the USA have found differing parental attitudes and expectations towards daughters and sons with less confidence being reported in daughters' mathematics skills as compared to sons' (Kimball, 1989, Stockdale, 1995). An intergenerational transfer of attitudes may result in girls' (and possibly even female teachers') perception of mathematics as an unimportant or a difficult subject for girls. Also, differences in achievement may arise due to biological and psychological factors (see Mellanby, Maxtin and O'Doherty, 2000). Moreover, teaching techniques may be dissimilar for male and female children or there may be well-entrenched stereotypes in pupil assessment (McNabb, Pal and Sloane, 2001). For example, research on mathematics achievement has found that the extent of academic and non-academic interaction within class rooms is much greater for males and that males receive more praise and encouragement as compared to females (Kimball, 1989)[24].

In both school-types, RAVEN and EDU_WISH are significant determinants of achievement, reading and maths scores and have the expected signs. Whether a child has private home tuition (HTU_TAKEN) seems to have a perverse sign though it is statistically significant only in government schools. A possible explanation is that poor performance in school induces parents to complement child schooling with home-tuition. Student absenteeism is significantly negatively associated with pupil achievement in most cases.

Relative Effectiveness

This section investigates whether private school pupils learn more than their government school counterparts. Relative effectiveness is computed in the way described

[24] For a comprehensive study of gender differences in academic achievement in Kenya, see Appleton (1994).

above. We predict scores for government and private school pupils, $\hat{A}_G$ and $\hat{A}_P$, by ascribing to them the average characteristics of the entire student population and using the coefficients derived from estimated achievement equations (2) and (3). The achievement advantage of private schools over government schools is calculated as the difference in predicted scores: $(\hat{A}_P - \hat{A}_G)$. We estimate predicted scores using the OLS coefficients (Tables 7 and 8) as our preferred estimates. Table 9 reports findings. The Heckman-corrected results of standardised achievement scores are also presented in Table 9 for the sake of comparison and are clearly not very different from the OLS findings.

The raw (unadjusted) achievement, maths and reading differentials show a substantial private school advantage, scoring 5.8, 3.3 and 2.5 points more, on average, than government school pupils in tests of achievement, maths and reading, respectively. However, the raw advantage of private schools in both subjects (and in total achievement) falls greatly when individual and family background effects are controlled for. This is true for both OLS and Heckman estimates. For example, among the OLS results, the raw achievement score of private school pupils (26.60 points) is 28 per cent higher than that of government school pupils (20.79 points). But, standardising for background, the difference falls to 12 per cent. This suggests that, of the total raw achievement advantage of private school pupils over government school counterparts (5.81 points), 54 per cent is explained by student intake while 46 per cent (2.65 points) can be attributed to school effects. In other words, roughly half the pupil advantage in achievement in private schools is due to pupil intake and the other half due to school effects. This corroborates, to a large extent, the finding by Das *et al.* (2006) of what they call the 'primacy of schools' in rural Pakistan suggesting that improvements in learning are at least partially amenable to policy. However, we do find that **student intake** explains a larger proportion of achievement gaps between school-types, which is not unexpected given the predominantly metropolitan nature of our sample compared to a fully rural sample from Das *et al*.'s study.

We wish to examine whether the two school types are equally effective in imparting mathematics and reading skills. The predicted Maths score of a child in a private school (9.63 points) is 19 per cent higher than his/her predicted score in a government school (8.10 points). Similarly, the predicted reading score of an average pupil in a private school is 8 per cent higher than in a government school. Thus, private schools are relatively more effective than government schools in imparting maths and reading skills to their pupils. The size of the private school advantage is substantial. The 2.65 point advantage in achievement is equal to about 0.40 standard deviations of the raw average achievement score of the sample as a whole. Because the equations underpinning the predicted score estimates do not include school-level factors, the finding of a private school advantage captures the relative advantage

arising from differences in tangible school inputs as well as the *use* of those inputs (management differences).

6. Conclusion

The main objective of this study was to examine the relative effectiveness of school-types at the middle-school level in Pakistan. This curiosity arose because of the recent finding by Aslam and Kingdon (2007) that intra-household educational expenditure allocations are significantly pro-male. One explanation for this could be a higher probability of boys being sent to private schools. If this is true and if private schools are more effective in imparting learning to pupils, then girls lose out not only in terms of educational expenditures but also in terms of schooling quality. Evidence from nationally representative household survey data presented in section 3 showed that girls do have substantially and significantly poorer access to private schools than do boys. We find, in addition, that private schools are indeed of better quality: they are 19 and 8 per cent more effective in imparting mathematics and literacy skills, respectively, than government schools. Thus, our evidence suggests that girls do lose out *vis a vis* boys in terms not only of lower educational expenditures but also in terms of the *quality* of schooling accessed, at least in the district of Lahore.

At the outset, we noted various problems in analysing the relative effectiveness of school types, including endogeneity of school-type dummies in pooled samples and sample selectivity concerns in sub-sample analyses. However, given the unique dataset available to us, it is also arguable that we control for important components of a number of variables (such as motivation and ability) that partially generate these biases. Consequently, the main findings of our study are based on OLS models. Although we recognise that these models may still suffer from endogeneity bias, estimating structural equations underpinning the relative effectiveness computations is nevertheless a worthwhile exercise. Even after including a rich set of controls, the evidence points to a large and significant private school achievement advantage.

This finding is validated on various grounds. Firstly, earnings function estimates show earnings premia for private school graduates in the labour market. This indicates that employers believe private schooling to be of better quality, leading to more productive workers. Secondly, as section 2 highlights, the unprecedented expansion of fee-charging schools in Pakistan in the last two decades is consistent with parents perceiving private schools to be of better quality. Finally, empirical evidence (international and national) corroborates the findings of this study. The discovery of a relative learning advantage of private schools is consistent with evidence from Colombia (Angrist, et. al., 2002), India (Kingdon, 1996), Thailand (Jimenez *et al.*, 1988a), Philippines (Jimenez *et al*. 1988b) and

from the Dominican Republic (Jimenez *et al.*, 1991) though it is not consistent with evidence from 10 Latin American countries (Somers *et al.*, 2001) and from Argentina and Chile (McEwan, 2000). Importantly, however, evidence from Pakistan validates the current finding of a private school advantage (Alderman *et al.*, 2001; Arif and Saqib, 2003; Das *et al.*, 2006). These past studies find private schools to be more effective in imparting learning among primary school pupils, a finding confirmed for the middle schooling level in this paper.

It is important to note that the analysis of pupil achievement in this study controls only for individual characteristics and family background. In estimating achievement production functions, school inputs and information on costs are not used as controls. This means that while we can argue that there is a significant private school achievement advantage, we cannot underpin whether this is because of differences in school resources and inputs or even in the differential use of these inputs in the two school types. To draw more informed conclusions about the relative effectiveness of the two school-types, one would also need to incorporate an analysis of the relative costs of government and private schools. This is an exercise left for future work[25].

[25] Detailed cost data were also collected from all schools sampled in the survey.

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Figure 1: Kernel Densities (ACHIEVE) by school-type

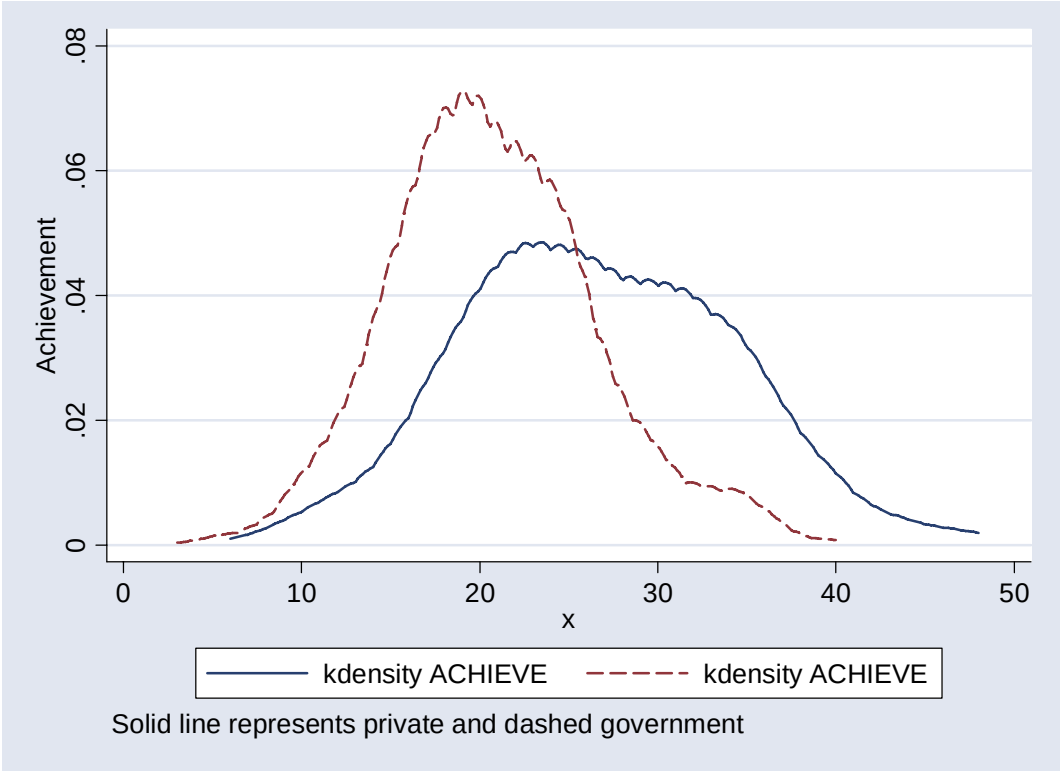

Table 1: Private School enrolment, conditional on enrolment: by gender, age category and province (weighted)

Age group	% of Girls in private schools (a)	% of Boys in private schools (b)	Difference (c) = (b) – (a)	t-value of the difference (d)
Age 5-9				
Punjab	31.9	35.5	3.6	1.92
Sindh	29.7	24.9	-4.8	-1.95
NWFP	18.8	20.4	1.6	0.72
Balochistan	6.5	8.3	1.8	0.71
Pakistan	29.3	30.2	0.9	0.67
Age 10-14				
Punjab	29.6	23.6	-6.0	-3.02
Sindh	26.8	18.7	-8.1	-2.36
NWFP	12.3	16.3	4.0	1.61
Balochistan	4.3	5.8	1.5	1.10
Pakistan	25.8	20.6	-5.2	-3.73
Age 15-19				
Punjab	22.9	18.7	-4.3	-1.40
Sindh	19.1	16.9	-2.1	-0.59
NWFP	12.8	10.3	-2.5	-0.73
Balochistan	6.1	3.7	-2.4	-1.00
Pakistan	20.1	15.8	-4.3	-2.16
Age 20-24				
Punjab	20.2	24.6	4.4	0.57
Sindh	5.6	13.3	7.7	1.33
NWFP	13.8	8.1	-5.7	-0.67
Balochistan	0.0	3.6	3.6	1.64
Pakistan	13.4	16.1	2.7	0.65
All ages 5-24				
Punjab	29.6	27.9	-1.7	-1.27
Sindh	26.2	20.6	-5.6	-2.93
NWFP	15.6	16.6	1.0	0.58
Balochistan	5.4	6.2	0.8	0.62
Pakistan	26.4	23.6	-2.8	-3.09

Note: Computed from the PIHS (2001-2002). Positive t-value indicates a pro-male bias in enrolment. Highlighted cells indicate t-values significant at 10% or more. Sampling weights applied.

Table 2: Annual Education Expenditure (Rupees) in Schools, by age category and province

Age5-9		**Punjab**	**Sindh**	**NWFP**	**Balochistan**	**PAKISTAN**
Expenditure (Private)						
Private Tuition	(a)	159	313	211	154	186
School Fees	(b)	1259	2412	1903	2312	1617
Books	(c)	285	398	311	411	324
Uniform	(d)	260	274	362	325	306
Transport	(e)	87	383	302	205	177
Other	(f)	418	720	398	666	482
Expenditure (Government)						
Private Tuition	(g)	44	41.72	8.48	10.40	29
School Fees	(h)	107	29.22	36.12	18.47	63
Books	(i)	150	93.97	125.21	119.46	136
Uniform	(j)	186	94.38	182.21	124.14	167
Transport	(k)	22	4.61	7.92	4.96	12
Other	(l)	302	273.13	253.54	193.29	263
t-value of difference in (a) and (g)		-9.9	-12.0	-11.5	-7.3	-20.3
t-value of difference in (b) and (h)		-30.6	-29.9	-27.0	-31.3	-57.1
t-value of difference in (c) and (i)		-20.0	-28.0	-22.5	-19.4	-42.5
t-value of difference in (d) and (j)		-12.5	-22.5	-19.9	-14.4	-34.2
t-value of difference in (e) and (k)		-5.5	-13.8	-11.5	-8.8	-17.9
t-value of difference in (f) and (l)		-9.2	-19.5	-10.1	-15.3	-26.5
Age10-14						
Expenditure (Private)						
Private Tuition	(m)	237	491	483	298	318
School Fees	(n)	1712	2682	2154	2354	1992
Books	(o)	472	503	491	482	495
Uniform	(p)	361	326	490	330	401
Transport	(q)	110	488	476	128	238
Other	(r)	593	910	607	756	649
Expenditure (Government)						
Private Tuition	(s)	117	63	17	9	59
Admissions and Fees	(t)	246	101	84	29	146
Books	(u)	333	213	240	269	287
Uniform	(v)	302	175	284	157	267
Transport	(w)	60	45	58	28	48
Other	(x)	449	407	379	272	386
t-value of difference in (m) and (s)		-5.7	-10.3	-14.9	-6.2	-18.5
t-value of difference in (n) and (t)		-32.7	-30.3	-34.8	-35.5	-64.3
t-value of difference in (o) and (u)		-12.4	-17.5	-20.8	-7.4	-28.9
t-value of difference in (p) and (v)		-6.3	-11.1	-15.6	-9.2	-21.9
t-value of difference in (q) and (w)		-2.9	-12.1	-12.0	-2.8	-15.1
t-value of difference in (r) and (x)		-6.0	-14.6	-9.9	-10.8	-19.4

Table 2 (continued): Annual Education Expenditure (Rupees) in Schools, by age category and province

Age15-19		Punjab	Sindh	NWFP	Balochistan	PAKISTAN
Expenditure (Private)						
Private Tuition	(a)	299.3	798.5	354.7	234.8	404.3
School Fees	(b)	2737.4	4421.6	4011.2	3428.3	3328.0
Books	(c)	643.9	675.2	620.8	907.8	677.3
Uniform	(d)	424.3	436.9	582.3	373.9	491.3
Transport	(e)	228.1	842.9	494.6	704.3	438.4
Other	(f)	898.8	1585.0	831.9	814.6	1019.3
Expenditure (Government)						
Private Tuition	(g)	466.1	239.3	160.1	17.8	257.3
School Fees	(h)	806.9	455.3	481.5	141.1	534.1
Books	(i)	608.9	394.2	475.6	491.2	523.8
Uniform	(j)	394.0	244.8	434.1	231.2	365.1
Transport	(k)	315.2	344.3	343.8	66.4	283.8
Other	(l)	885.4	915.3	880.4	495.4	812.0
t-value of difference in (a) and (g)		2.1	-4.6	-2.3	-4.7	-3.3
t-value of difference in (b) and (h)		-15.7	-21.9	-21.9	-18.1	-37.7
t-value of difference in (c) and (i)		-1.0	-8.2	-3.9	-4.0	-7.9
t-value of difference in (d) and (j)		-1.4	-7.0	-4.5	-3.0	-9.0
t-value of difference in (e) and (k)		1.2	-5.2	-1.5	-6.3	-3.7
t-value of difference in (f) and (l)		-0.2	-6.5	0.5	-1.6	-4.1

Note: Private tuition fees include expense incurred in last year on private home tuition; Admissions and fees records annual expense on admission, registration, fees funds and donations; Books includes expense incurred on books and other school supplies; Uniform includes expenditure on general school uniform and sport uniforms etc.; Transport includes expenditure incurred travelling to and from school; Other includes expenditure on pocket money, boarding and lodging if living away from home and student membership fees on sports, clubs and libraries etc.

Table 3A: Gender Difference in School-Choice, Raw, OLS and FE Estimates (Age 5-9)

Age 5-9 Enrolled children only						
	Mean of Private	Raw Gender Difference (M – F) in Private Attendance[i]	Coefficient on MALE (OLS) with controls[ii]		Coefficient on MALE in Fixed Effects model[iii]	
	(a)	(b)	(c)		(d)	
			Coefficient (x100)	t-value	Coefficient (x100)	t-value
Punjab	37.7	3.6*	5.0	3.9***	7.3	3.9***
Sindh	25.2	-4.7**	-4.3	-1.9*	3.1	1.9*
NWFP	24.2	1.6	1.6	0.7	7.7	2.9***
Balochistan	11.1	1.8	1.7	0.6	7.1	2.3**
Pakistan	29.7	0.9	4.7	5.7***	8.0	6.8***

Note: (i) has been computed from the weighted figures reported in Table 5.1; (ii) taken from LPM2 results in Appendix Table 5.1 and (iii) estimates based on LPM estimation using household fixed effects; * denotes significance at 10 %, ** at 5 % and *** at 1 % or better.

Table 3B: Gender Difference in School Choice, Raw, OLS and FE Estimates (Age 10-14)

Age 10-14 Enrolled children only						
	Mean of Private	Raw Gender Difference (M – F) in Private Attendance[i]	Coefficient on MALE (OLS) with controls[ii]		Coefficient on MALE in Fixed Effects model[iii]	
	(a)	(b)	(c)		(d)	
			Coefficient (x100)	t-value	Coefficient (x100)	t-value
Punjab	27.4	-6.0***	-0.5	-0.4	3.6	1.3
Sindh	20.4	-8.1**	1.1	0.5	8.7	2.2**
NWFP	18.6	4.0	11.2	4.9***	14.3	3.9***
Balochistan	7.7	1.5	9.3	3.5***	7.3	2.2**
Pakistan	21.6	-5.2***	3.9	4.7***	7.5	4.6***

See Note in Table 3A.

Table 3C:Gender Difference in School Choice, Raw, OLS and FE Estimates (Age 15-19)

Age 15-19 Enrolled children only						
	Mean of Private	Raw Gender Difference (M – F) in Private Attendance[i]	Coefficient on MALE (OLS) with controls[ii]		Coefficient on MALE in Fixed Effects model[iii]	
	(a)	(b)	(c)		(d)	
			Coefficient (x100)	t-value	Coefficient (x100)	t-value
Punjab	19.4	-4.3	0.1	0.1	0.9	0.2
Sindh	17.6	-2.1	1.7	0.5	11.8	2.1*
NWFP	12.2	-2.5	3.5	1.0	6.1	0.9
Balochistan	5.0	-2.4	2.4	0.6	-8.3	-1.5
Pakistan	15.6	-4.3**	0.8	0.7	4.0	1.4

See Note in Table 3A.

Table 4: Definitions of Variables Used in School-Choice and Achievement Production Functions

Variable	Description
ACHIEVE	Student's total cognitive achievement score (sum of READING and MATHS), maximum value 50
READING	Student's total score in literacy/language test (English or Urdu), maximum value 25
MATHS	Student's total score in mathematics test, maximum value 25
MALE	Dummy equals1 if male child, 0 if female
AGE_YRS	Child's age in years
RAVEN	Student's score in the ability test (Raven's Progressive Matrices) max = 60.
EDU_WISH	Child's educational aspirations, index from 1 to 6, for example 1=child aspires to complete education up to class 8^{th}, 2 = aspires completion till class 10^{th}, 6 = aspires completion of professional degree
HTU_TAKEN	Number of hours of paid home tuition taken by child (divided by 1000)
SABSENT[26]	Number of days child absent from schools in month of September, 2002
BOOKS	Number of books in child's home (divided by 1000)
LNFINCOME	Natural log of father's income (rupees per month)

[26] This variable was highly skewed with a very large proportion of values (40 percent) taking the value 0. Only 19 students were outliers (being absent for more than 10 days). This variable was censored at 10 so as to reduce the skewness of the distribution and the effect of outliers.

TSIBLING	Total number of siblings of child, other than child
MEDYRS	Mother's completed years of education
FREEHELP	Number of hours of help child gets in studies at home from other siblings, parents, relatives or friends
URBAN	Dummy equals 1 if school in urban locality, 0 if rural
WEALTH1[27]	Index of monetary value of assets in the household (divided by 1000)
FSELFEMP	Dummy equals 1 if father is self employed, 0 otherwise
FPROFEMP	Dummy equals 1 if father is professionally employed, 0 otherwise
FOCCUPOTH	Dummy equals 1 if father's occupation other than self employed or professionally employed, 0 otherwise
FEDYRS	Father's completed years of education

Table 5: Mean Characteristics of Students by School-Type

Variable	G	P	ALL (G+P)	P - G	t-value (P – G)	
ACHIEVE	20.79	26.60	23.29	5.81		
	(5.76)	(7.58)	(7.21)		18.91	***
READING	13.30	15.80	14.38	1.08		
	(3.61)	(4.21)	(4.07)		13.87	***
MATHS	7.48	10.79	8.91	3.31		
	(3.31)	(4.51)	(4.21)		18.37	***
MALE	0.47	0.46	0.47	-0.01		
	(0.50)	(0.50)	(0.50)		0.63	
AGE_YRS	13.71	13.52	13.63	-0.19		
	(1.26)	(0.94)	(1.13)		-3.44	***
RAVEN	25.79	32.69	28.77	6.90		
	(9.74)	(10.15)	(10.49)		14.97	***
EDU_WISH	4.46	5.14	4.75	0.68		
	(1.39)	(1.26)	(1.38)		11.01	***
HTU_TAKEN	0.28	0.24	0.26	-0.04		
	(0.29)	(0.30)	(0.29)		-3.02	***
SABSENT	1.90	1.65	1.79	-0.25		
	(2.04)	(2.14)	(2.09)		-2.59	***
BOOKS_1000	0.12	0.22	0.16	0.10		
	(0.21)	(0.38)	(0.30)		7.81	***
LNFINCOME	8.55	9.38	8.91	0.83		
	(1.64)	(1.41)	(1.60)		11.63	***
TSIBLING	4.24	3.50	3.92	-0.74		
	(1.83)	(1.70)	(1.81)		-8.93	***
MEDYRS	5.80	8.76	7.08	2.96		
	(4.82)	(4.92)	(5.08)		13.12	***
FREEHELP	10.13	6.20	8.44	-3.93		
	(11.52)	(8.55)	(10.53)		-8.18	***
URBAN	0.80	0.84	0.82	0.04		
	(0.40)	(0.37)	(0.39)		2.29	**
WEALTH1	0.15	0.22	0.18	0.07		
	(0.09)	(0.10)	(0.10)		15.15	***
FSELFEMP	0.46	0.47	0.47	0.01		
	(0.50)	(0.50)	(0.50)		0.40	
FPROFEMP	0.11	0.24	0.17	0.13		
	(0.32)	(0.43)	(0.38)		7.53	***
FOCCUPOTH	0.42	0.29	0.36	-0.13		
	(0.49)	(0.45)	(0.48)		-6.28	***
FEDYRS				2.50		
	8.68	11.18	9.76			***
	(4.65)	(4.44)	(4.73)		11.80	
N	1073	814	1887			

Note: The figures in parentheses are standard deviations. For Yes=1/No=0 type of variables, the mean represents the percentage of ones in the sample. * denotes significance at 10 %, ** at 5 % and *** at 1 % or better. G = government school sample and P = private school sample.

[27] The WEALTH1 index was computed by assigning the following values to the assets available at the child's home: 1 each to fans, clocks, beds, radio, tape recorder and electric iron, 2 each to pit toilet, bicycle and black and white TV, 5 each to a flush toilet, tap water and cooking stove, 10 each to a VCR, colour TV, electricity, telephone, camera and sewing machine, 20 each to washing machine and fridge and scooter/motorcycle, 50 each to a computer, air conditioner and satellite dish and 100 to a car.

Table 6: OLS estimates (pooled sample) with and without school-type dummy

Variable	OLS without PRIVATE (a)			OLS with PRIVATE (b)		
	Coefficient	t-value		Coefficient	t-value	
CONSTANT	13.529	5.94	***	15.009	7.31	***
MALE	0.883	1.40		0.888	1.61	
AGE_YRS	-0.318	-2.46	**	-0.381	-3.05	***
RAVEN	0.312	12.78	***	0.288	13.26	***
EDU_WISH	0.751	6.17	***	0.659	5.86	***
HTU_TAKEN	-1.137	-1.69	*	-0.858	-1.57	
SABSENT	-0.232	-2.93	***	-0.208	-2.84	***
BOOKS	2.031	5.20	***	1.704	4.83	***
LNFINCOME	0.169	1.66	*	0.051	0.54	
TSIBLING	-0.257	-2.77	***	-0.201	-2.21	**
MEDYRS	0.116	3.10	***	0.082	2.31	**
FREEHELP	-0.035	-2.21	**	-0.009	-0.58	
URBAN	0.630	0.80		0.858	1.11	
PRIVATE	-	-		2.541	4.22	***
N	1887			1887		
R^2	0.44			0.46		

Note: Dependent variable is ACHIEVE; t-values are robust and corrected for cluster effects (school-level); * represents significance at 10 %, ** at 5 % and * at 1 % or better.

Table 7: OLS Production Functions - Government School Students

Variable	Dependent Variable ACHIEVE (a)			Dependent Variable READ (b)			Dependent Variable MATHS (c)		
	Coefficient	**t-value**		**Coefficient**	**t-value**		**Coefficient**	**t-value**	
CONSTANT	15.989	10.09	***	13.218	10.80	***	2.772	2.89	***
MALE	0.055	0.08		-1.205	-2.87	***	1.260	3.79	***
AGE_YRS	-0.376	-2.89	***	-0.323	-3.49	***	-0.053	-0.87	
RAVEN	0.222	9.28	***	0.111	8.49	***	0.111	8.26	***
EDU_WISH	0.646	5.37	***	0.322	3.53	***	0.324	4.08	***
HTU_TAKEN_1000	-1.178	-2.20	**	-0.557	-1.92	*	-0.621	-1.59	
SABSENT	-0.177	-2.31	**	-0.090	-1.79	*	-0.087	-1.90	*
BOOKS_1000	0.878	1.63		0.242	0.61		0.636	2.82	***
LNFINCOME	0.166	2.13	**	0.080	1.50		0.086	1.47	
TSIBLING	-0.096	-0.83		0.003	0.04		-0.099	-1.70	*
MEDYRS	0.048	1.16		0.016	0.53		0.032	1.84	*
FREEHELP	-0.029	-2.49	**	-0.012	-1.36		-0.017	-2.40	**
URBAN	1.105	1.17		0.515	0.88		0.590	1.44	
N	1073			1073			1073		
R^2	0.287			0.223			0.247		
Mean (Dependent Variable)	20.788			13.303			7.485		

Note: The dependent variable is as specified; * represents significance at 10 %, ** at 5 % and * at 1 % or better; All t-values are robust and corrected for clustering (school level).

Table 8: OLS Production Functions – Private School Students

Variable	Dependent Variable ACHIEVE (a)			Dependent Variable READ (b)			Dependent Variable MATHS (c)		
	Coefficient	t-value		Coefficient	t-value		Coefficient	t-value	
CONSTANT	16.085	3.47	***	17.243	5.24	***	-1.157	-0.41	
MALE	1.543	1.97	**	-0.008	-0.01		1.550	2.95	***
AGE_YRS	-0.406	-1.52		-0.534	-2.80	***	0.128	0.88	
RAVEN	0.365	11.66	***	0.165	8.73	***	0.200	11.08	***
EDU_WISH	0.730	3.73	***	0.442	2.98	***	0.288	2.94	***
HTU_TAKEN_1000	0.053	0.05		0.273	0.44		-0.220	-0.37	
SABSENT	-0.235	-2.01	**	-0.087	-1.13		-0.148	-2.29	**
BOOKS_1000	1.559	3.99	***	0.454	1.66	*	1.105	3.24	***
LNFINCOME	-0.155	-0.92		-0.217	-2.34	**	0.062	0.53	
TSIBLING	-0.292	-2.04	**	-0.125	-1.39		-0.167	-2.06	**
MEDYRS	0.088	1.43		0.005	0.14		0.082	2.13	**
FREEHELP	0.053	1.71	*	0.024	1.23		0.028	1.33	
URBAN	1.217	1.19		0.441	0.62		0.776	1.60	
N	814			814			814		
R^2	0.465			0.292			0.449		
Mean (Dependent Variable)	26.598			15.805			10.794		

Note: The dependent variable is as specified; * represents significance at 10 %, ** at 5 % and * at 1 % or better; All t-values are robust and corrected for clustering (school level).

Table 9: Raw and Standardised Achievement, Reading and Maths Score by School-Type

Equation	Achievement Points G *(a)*	Achievement Points P *(b)*	Achievement Advantage Points $A_P - A_G$ (b – a) *(c)*	% Private Advantage over Government {(P-G)/G}*100 *(d)*
Maths				
Raw	**7.48**	**10.79**	**3.31**	**44.3**
OLS standardised	**8.10**	**9.63**	**1.53**	**18.9**
Heckman standardised	**7.16**	**9.82**	**3.14**	**37.2**
Reading				
Raw	**13.30**	**15.80**	**2.50**	**18.8**
OLS standardised	**13.87**	**14.98**	**1.11**	**8.0**
Heckman standardised	**13.78**	**14.26**	**0.48**	**3.5**
Achievement				
Raw	**20.79**	**26.60**	**5.81**	**27.9**
OLS standardised	**21.97**	**24.62**	**2.65**	**12.1**
Heckman standardised	**20.94**	**24.08**	**3.14**	**15.0**

APPENDIX

Table A1: Determinants of Choice of School-Type

Variable	PRIVATE		
	Coefficient	t-value	
CONSTANT	-3.256	-6.07	***
MALE	-0.011	-0.16	
AGE_YRS	0.078	2.50	**
RAVEN	0.027	7.72	***
EDU_WISH	0.098	3.56	***
HTU_TAKEN	-0.409	-3.65	***
BOOKS	0.476	3.46	***
LNFINCOME	0.108	4.31	***
TSIBLING	-0.070	-3.50	***
MEDYRS	0.018	1.83	*
FREEHELP	-0.039	-10.47	***
URBAN	-0.315	-3.49	***
WEALTH1	2.238	5.32	***
FSELFEMP	0.074	1.00	
FPROFEMP	0.212	2.09	**
FEDYRS	0.007	0.71	
Log L	-1013.549		
Pseudo-R^2	0.214		
N (Un-Censored)	1887		

Note: The dependent variable is PRIVATE = 1 if school is private and PRIVATE = 0 for a government school; * represents significance at 10 %, ** at 5 % and * at 1 % or better; Exclusion restrictions = [WEALTH1, FSELFEMP, FPROFEMP, FEDYRS] with FOCCUPOTH as excluded category among father's employment status.

A2: Selection-corrected Achievement Equations

Variable	Government			Private		
	Coefficient	z-value		Coefficient	z-value	
CONSTANT	17.170	7.03	***	14.477	2.64	***
MALE	0.071	0.22		1.548	3.74	***
AGE_YRS	-0.432	-3.13	***	-0.384	-1.67	*
RAVEN	0.201	8.92	***	0.374	11.73	***
EDU_WISH	0.570	4.21	***	0.771	3.69	***
HTU_TAKEN_1000	-0.949	-1.71	*	-0.060	-0.08	
SABSENT	-0.179	-2.41	**	-0.234	-2.56	**
BOOKS_1000	0.455	0.57		1.656	2.79	***
LNFINCOME	0.076	0.65		-0.097	-0.47	
TSIBLING	-0.044	-0.45		-0.316	-2.25	***
MEDYRS	0.017	0.39		0.099	1.67	*
FREEHELP	-0.007	-0.32		0.040	1.04	
URBAN	1.306	3.02	***	1.121	1.81	*
λ	1.508	1.38		0.568	0.40	
Wald (Chi2)	487.37			674.75		
N (Uncensored)	1073			814		

Note: The dependent variable is ACHIEVE; * represents significance at 10 %, ** at 5 % and * at 1 % or better;

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