What policies will reduce gender schooling gaps in developing countries: Evidence and interpretation

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Abstract

This paper considers evidence for the effects of policies on gender gaps in education, distinguishing between policies that are ostensibly gender neutral and those that explicitly target girls. The demand for girls’ schooling is often more responsive than boys’ to gender neutral changes in school distance, price, and quality, patterns which can be explained in a human capital investment model through assumptions about girls’ and boys’ schooling costs and returns. Among policies that target girls’ enrollments, price incentives to households or schools and the provision of female teachers appear to be effective. For many other interventions, however, rigorous evaluations are lacking, pointing to an important agenda for future research.

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1. Introduction

The positive effects of education on economic growth and individual incomes and welfare are widely, even universally, recognized. It is also widely recognized that there are particular benefits to investing in female schooling, due to externalities such as improved child nutrition and schooling and reduced fertility (Schultz 2002). These economic efficiency arguments add to the strong equity rationale for increasing female schooling in areas where girls have traditionally been disadvantaged. Achieving gender equality in education is included among the Millennium Development Goals and many developing country governments now officially recognize this goal as a priority.

Much progress toward gender equity in education has already been made in the last several decades (World Bank 2001). Still, significant pro-male gender gaps remain in several regions, including sub-Saharan Africa, South Asia, and the Middle East. In Africa, the ratio of girls to boys in primary school is 86% and in secondary school is just 75% (Table 1). In South Asia the analogous figures are 85% and 81%. Regional averages also hide important variations. Within Africa, for example, gender disparities are particularly large in many West African countries.

An important agenda for research therefore is to identify policies that would lead to gender parity in education in environments where gaps are large or persistent. This paper considers what research to date can tell us about the impacts on girls’ (and boys’) schooling of a range of education policies, including those related to price, accessibility, and school quality, as well as other policies that might alter household schooling investments by affecting the costs or returns to these investments. To help interpret the findings in the literature I set out a simple conceptual framework of parental investment in girls’ and boys’ human capital. The discussion makes the distinction between explanations of why levels of investments in girl’s schooling might be lower than boys’ (for example, higher opportunity costs of girls’ time) and explanations of why changes in schooling in response to policies such as fee reductions or quality improvements might differ for girls and boys. It is the latter, of course, that is important for determining the appropriate policies to close education gender gaps. Different model assumptions provide alternative explanations of why changes in the cost of schooling
and in school quality might have larger impacts on the demand for girls’ education than boys’, patterns that occur frequently in the empirical literature.

The paper then considers evidence for two basic types of policies that may differentially affect the schooling of girls and boys: those that are ‘gender neutral’, i.e. that do not specifically target female (or male) schooling returns or costs; and those that are gender-targeted, i.e., that attempt to alter the costs or benefits of girls’ schooling relative to boys’. The evidence comes primarily from econometric analyses of schooling demand using representative household surveys, and from a smaller number of randomized policy experiments. By and large I do not delve into the large body of less formal assessments of gender-focused interventions, since few of these have been statistical or rigorous enough to permit reliable inferences (few, for example, collect baseline information; see Kane 2004 for a review). Finally, policies not directly concerned with education, notably those involving the labor market and the market for childcare services, may affect schooling incentives and may do so differently for girls and boys. I consider the (still limited) evidence on such policies as well.

The remainder of the paper is structured as follows. The next section discusses the model of household schooling investment. This is followed in Section 3 by a review of the evidence on gendered impacts of policies. Section 4 summarizes and discusses implications for policy as well as for future research.¹

2. Analytical Framework

The following presentation is largely descriptive and graphical; a mathematical presentation is provided in Glick (2006). The model is a general two-period model of parental investment in daughters’ and sons’ human capital. For the first period parents must decide on the allocation of each child’s time between schooling $S_i$ on the one hand and work activities $L_i$ in the home, a family farm or enterprise, or for wages, on the other. First period utility of the parents depends on their consumption in that period, which in the absence of access to credit to finance school investments is reduced by the cost of children’s schooling. The parents’ second period utility is a function of the consumption made
possible by transfers from children (‘old age support’), which depends on the children’s wealth $W_i$, hence on their schooling. Children’s wealth is also a function of experience accumulated in work activities during the first period since this also increases their human capital. In this sense children’s work time and school time represent competing investment choices for the household. Altruistic parents may also gain second period utility directly as a result of their children having more wealth, i.e., having higher welfare.

The first order conditions for girl’s and boy’s schooling (see Glick 2006 for details) indicate that parents invest in the education of each child until the discounted marginal utility of schooling equals the marginal cost. The marginal utility or marginal benefit equals the discounted utility of the addition to second period consumption from transfers out of the child’s wealth (which increases with additional schooling), plus the direct utility gained as a result of the child having higher wealth. The marginal cost includes the reduction in first period consumption implied by the direct and indirect costs of additional schooling; the indirect (opportunity) costs arise from reductions in the child’s labor contribution to the family. Also included in marginal cost is the reduction in future transfers from the child that occurs because additional schooling reduces first period work experience (i.e., $\partial L_i/\partial S_i < 0$), in turn reducing second period wealth.

Plausible assumptions in this or similar frameworks (Alderman and King 1998; Rosenzweig and Schultz 1982) can explain why investments in girls’ human capital are often lower than boys’. Holding other factors to be the same for both genders, daughters will receive less schooling than sons if the remittance rate $r_i$ is higher out of son’s wealth ($r_b > r_g$), if the marginal returns to schooling in the labor market are everywhere higher for boys than girls ($\partial W_b/\partial S_b > \partial W_g/\partial S_g$), or if the marginal cost of schooling is everywhere higher for girls. To yield gender differences in changes in the level of schooling in response to policies that alter costs or benefits, it is usually necessary to put more structure on the model. In a model in which children’s human capital provides direct consumption value to parents (or one in which parents value the future utility, hence wealth, of daughters and sons differently) assumptions about the parental preference function could generate gender differences in
the responses to policies that alter education costs or returns. In the human capital investment framework, such differential responses can arise from the presence of nonlinearities or discontinuities in the cost or benefits schedules.²

Consider first the case of differences in schooling benefits for girls and boys. Assume conventional concave earnings functions such that marginal returns in the labor market are positive but declining in the level of human capital, that is, \( W_i = \alpha_1 S_i - \alpha_2 S_i^2 \) (\( \alpha_1 > 0, \alpha_2 < 0 \)).³ Given remittance rates \( r_b \) and \( r_g \) for boys and girls, the parental marginal returns to schooling (the change in parents’ second period consumption with respect to an additional year of the child’s schooling) are \( r_b (\partial W_b / \partial S_b) = r_b \alpha_1 - 2r_b \alpha_2 S_b \) for boys and \( r_g (\partial W_g / \partial S_g) = r_g \alpha_1 - 2r_g \alpha_2 S_g \) for girls. If remittances out of son’s income are greater than out of daughter’s (\( r_b > r_g \)), the marginal benefits are higher for boys than girls but also decline more rapidly for boys as schooling increases (the slopes of the marginal benefits are \(-2r_b \alpha_2 \) and \(-2r_g \alpha_2 \) for boys and girls, respectively). The same girl-boy differences in returns would result from discrimination in pay that makes the earnings of women some fraction of those of men, or from lower expected labor force participation or labor supply of girls.⁴

Figure 1 shows the total and marginal benefit and cost functions for this case. Equivalent linear cost functions for girls and boys are assumed for the exposition. As illustrated by the bottom panel, equality of marginal costs and benefits implies lower optimal investment in girls’ schooling (\( S_b > S_g \)) because their marginal benefits function is lower. But a gender neutral fall in school costs, represented in the bottom panel by the shift to the dotted \( MC' \) line, increases optimal schooling for girls more than boys (compare \( S_G' - S_G \) and \( S_B' - S_B \)). Because marginal benefits decline more slowly for girls, the adjustment needed to restore equilibrium after the shift in the marginal cost curve is larger. A similar outcome would occur as a result of a non-gender targeted improvement in returns that shifted up the marginal benefits for both girls and boys.

Differential gender responses to policies can also arise from differences in schooling cost functions. What is required is for the marginal costs of schooling to be increasing, and at different
rates for girls and boys. If families are credit constrained and thus have to finance education through reductions in other first period expenditures, marginal costs may increase via diminishing marginal utility of consumption, which causes the value of forgone consumption to rise at the margin as schooling increases and consumption falls. Further, fees and other direct school costs are usually significantly greater at higher levels of schooling. However, while these factors would make schooling marginal cost curves slope upwards, they would not necessarily do so differently for girls and boys. On the other hand, it is possible for opportunity costs in terms of foregone household production to rise faster with schooling for boys than girls. For example, if only boys are permitted to work outside the home and the labor market values increasing maturity or strength more than girls’ activities within the home do, potential earnings and thus the opportunity cost of not working will rise more quickly for boys than girls as both get older, or equivalently as the duration of schooling increases.

Differentially increasing opportunity costs could also arise from the fact that children’s work experience, like schooling, increases their stock of human capital, hence their future incomes. Attending school reduces the time available for work activities, so more years in school means less accumulated work experience. Assume for convenience that school attendance and work are mutually exclusive activities (i.e., $\partial L_t/\partial S_t = -1$), and that the total years available for either is fixed at some level $S_{max}$ (say, 12 years if children start school at age 6 and leave by age 18 to marry or enter the labor force). The foregoing imply $L_t = S_{max} - S_t$. Assume further that first period work experience and schooling are separable in the production of human capital and that experience increases wealth at a decreasing rate. Then we can write $W_t|S_t = \beta_{1t}L_t + \beta_{2t}L_t^2$, $\beta_{1t} > 0$, $\beta_{2t} < 0$. Substituting the derivative of this function with respect to experience into the marginal school cost function and using $\partial L_t/\partial S_t = -1$ yields marginal costs $MC_t = P + r_t (\beta_{1t} - \beta_{2t}S_t)$ where $P$ represents the annual direct costs of schooling and $\beta_{1t} - \beta_{2t}S_t = (\partial W_t/\partial L_t)(\partial L_t/\partial S_t)$. Given the concavity of the returns function for non-school human capital ($\beta_{2t} < 0$), the marginal cost of schooling is increasing in years of education, as shown in Figure 2.
This occurs because the potential benefits from additions to children’s work experience are larger at greater years of school (i.e., at fewer years of first period work).

In this example marginal costs are depicted as being higher for girls, reflecting (say) the strong demand for their time in household work, but they are rising faster for boys due to greater concavity of the returns to experience function for boys. The latter is possible because of differences in the types of work in which girls and boys engage, though the assumption that boy’s costs are more concave is arbitrary. Because marginal costs are everywhere higher for girls, investment in their schooling is lower than in boys’. However, since their marginal costs are rising less quickly than boys’, restoring equality of marginal costs and benefits after a gender neutral proportional increase in the returns to schooling, shown by the dotted line, requires a larger increase in schooling for girls. A gender neutral reduction in school price would also lead to this outcome.

A third possible source of differential male-female impacts of education policies is the presence of discontinuities in either the benefits or costs of schooling. For example, discontinuities in benefits will occur if primary or secondary completion and receipt of a diploma are requirements for entry into well-paid formal (or possibly, public) sector employment. This ‘sheepskin effect’ shifts up the earnings function at specific years of schooling. For the case of a premium to primary completion, the marginal benefits to schooling would appear as in Figure 3. The earnings function depicted is $W_i = (1-G)[\alpha_1iS_i + \alpha_2iS_i^2] + G[\theta\alpha_1iS_i + \alpha_2iS_i^2]$, $\alpha_{1i} > 0, \alpha_{2i} < 0$, where $G$ is a 0,1 indicator of primary completion and $\theta$ is the premium to primary completion. The figure also shows, as before, marginal costs to be higher for girls than boys, though here the marginal costs are linear in $S$; no assumption is made about the curvature of the cost function. There is a large initial gender gap in schooling, reflecting in part that the optimizing level for girls is on the lower, pre-primary completion portion of the benefits schedule. A gender neutral increase in the returns to schooling, shown by the dotted marginal benefit lines, results in a larger increase in girls’ years of schooling than boys’ because the new equilibrium for girls is on the higher (post-primary returns) portion of the curve. For the same reason, a gender neutral reduction in school costs would also raise girls’ schooling more than boys’.
Finally, gender differences in school dropout/continuation probabilities can lead to differences in responses to changes in school costs or returns. Higher opportunity costs for girls imply, all things equal, that they will receive less schooling than boys’ but does not lead to predictions of different impacts of changes in school costs or benefits; this would generally require additional assumptions about the shapes of the schooling cost functions for girls and boys, as seen above. However, opportunity cost differentials may have important indirect effects via impacts on academic performance and the likelihood of school progression. Because of the demands on their time, girls may have fewer hours available for schoolwork and less regular school attendance than boys. This may result in a higher likelihood of academic failure and an inability to complete (say) the primary cycle or meet entrance requirements for secondary school. Alternatively, academic performance of girls and boys may differ because of school factors that impinge on girls’ ability to learn, such as a lack of encouragement of girls on the part of teachers.

Since academic success or failure cannot be predicted with certainty, risk becomes a factor in parental decisions about investing in their children’s education. Especially when schooling returns are discontinuous, this can lead to large differences by gender in both the level of schooling and in the response to policies. To illustrate, Figure 4 presents a strong version of returns discontinuity such that there are no labor market benefits to schooling until a primary diploma is obtained. Therefore marginal benefits are zero until \( S_i = 6 \) and positive and (we will also assume) declining thereafter. Letting \( G_g \) and \( G_b \) represent, respectively, the female and male probabilities of graduating primary school, expected marginal labor market returns are therefore \( G_g[\zeta_1(S_i-5) + \zeta_2(S_i-5)^2] \) for girls and \( G_b[\zeta_1(S_i-5) + \zeta_2(S_i-5)^2] \) for boys. The figure depicts the case where \( G_g < G_b \). Since girls’ probability of primary completion is lower than boys’, the expected value of schooling benefits is lower for girls. In addition, because of the difference in opportunity costs, marginal costs are higher for girls. The household invests in schooling of the boy to \( S_B \). But given both higher marginal costs and lower expected marginal benefits for girls (themselves possibly the cumulative outcome of higher opportunity costs), the household is at a corner solution with respect to the girl’s education: \( S_G = 0 \).
The figure shows the effect of a gender neutral fall in cost, caused by a reduction in fees or other direct school costs. At lower marginal cost $MC'$, positive investments in girls’ schooling become optimal and the household moves to $S_G'$. The gain in girls’ schooling is much larger than boys’ because boys merely move incrementally along the continuous portion of the marginal benefits schedule. Similar results would obtain from a gender neutral improvement in the returns to schooling.

An interesting aspect of each of the cases depicted is that they suggest a tendency for gender differences in response to policies affecting school price (and also quality) to be larger when the initial gender gap itself is large. In the example in Figure 4 of differences in dropout probabilities, girls are initially at a corner solution while the optimal schooling for boys is greater than completed primary, so the gender gap is large. Girls gain substantially relative to boys from the policy change by shifting up to the continuous segment of the benefits curve while boys just move along it. In contrast, if girls and boys both were initially on the continuous portion of the benefits curve the initial gap would be smaller, and gender neutral shifts in either marginal costs or benefits would have equivalent impacts on girls and boys rather than favoring girls. The same logic would apply to quality improvements as well, since as discussed below such improvements can be interpreted as upward shifts in the schooling benefits curves. Similarly, in the situation depicted in Figure 3, there is a large initial schooling gap because girls and boys are on different segments of the benefits schedule, and the effect of a rise in benefits or fall in costs is larger for girls because it causes them to move to the higher (post-primary) segment. For initial positions in which both girls and boys are on the same portion of the benefits curve, hence where there are relatively small initial gender differences, the same shifts in benefits or costs lead to similar impacts for girls and boys. It is easy to demonstrate that the cases in Figures 1 and 2, of boys’ marginal benefits falling faster than girls’ or boys’ marginal costs rising faster than girls’, also imply an association of large initial gender gaps and stronger policy impacts for girls.6
3. Evidence for impacts of policies on girls’ and boys’ schooling

3.1 Effects of Price/Distance

Evidence from demand studies

With the foregoing theoretical discussion providing a general framework for interpretation, I turn now to the evidence, beginning with the policy variable perhaps most frequently analyzed in the demand literature, school cost. In empirical studies cost is alternatively measured by price (school fees or other obligatory expenditures) or proxied by the distance to schools; the latter in fact is more common and is often necessary because public education is nominally free in many countries. Distance is associated with direct transportation costs as well as opportunity costs: more time spent traveling to and from school implies greater foregone income or output from a child’s home or other productive labor. Studies using non-experimental data, particularly those using school fees as a cost measure, face several econometric issues in the estimation of price effects. Some of these are general concerns with non-experimental data that will be discussed in Section 3.2. Here it should be noted that price effects are likely to be biased downward in absolute value if the model lacks adequate controls for school quality, since we would expect schools that expend more resources on teachers and other inputs to impose higher fees. The omission of quality attributes that positively influence demand will thus tend to make price impacts appear less negative than they actually are.

Many non-experimental studies using household survey data find that girls’ schooling is more sensitive to cost, however defined, than boys’. Distance to school or the absence of a nearby school has stronger negative impacts on female than male enrollments in settings as varied as India (Sipahimalani 1999), Ghana (Lavy 1996), Senegal (Glick and Sahn 2005a), Malaysia (DeTray 1988), the Philippines (King and Lillard 1987), and Pakistan (Hazarika 2001; Lloyd et. al. 2005). In Kenya, higher school fees increase dropout probabilities for girls but have no effect on boys (Lloyd et. al. 1998). In rural Pakistan, girls’ enrollment but not boys’ is sensitive to direct costs (Lloyd et. al. 2005). Schultz’s (1985) study provides evidence from cross-country aggregate data. Using public education expenditures per teacher as a measure of the price of schooling, he finds greater price responsiveness
of girls’ education, measured by changes in gender-specific enrollment ratios. Note that for this result to reflect actual demand behavior by households as in studies on micro data, one must assume that higher public expenditures for teachers translates into higher school costs to households.

This is an impressive array of cases, but Filmer’s (1999) comprehensive analysis of comparable Demographic and Health Surveys for a sample of 19 countries cautions against making general claims about gender differences in impacts. Filmer includes indicators for the presence of primary or secondary schools in the local community in probits for current enrollment. Better physical access usually strongly encourages school enrollment of rural children 6 to 14, but in only four cases is there a significant difference by gender in this impact (three showing a stronger effect for girls).

Similarly, Glick, Saha, and Younger (2004) find no gender differences in the (negative) effects of distance to schools on either primary or secondary enrollment for both Madagascar and Uganda.

Still, in many cases girls’ schooling is found to respond more strongly than boys’ to changes in school distance or availability, while the opposite is very rarely found. How appropriate is it to interpret the former result as indicating that girls’ schooling is ‘more price-sensitive’? Although this interpretation is often made, it may not be valid. Responses to changes in travel time or distance to schools might differ by gender even if the impacts of a change in monetary costs, e.g., a fee reduction, would not. Parents may be especially reluctant to allow girls to walk long distances to school on their own, in which case sending daughters to school may entail transportation costs, or else psychological costs, that are not incurred for sons. Having a school close by thus can reduce the effective costs of girls’ school attendance while having no effect or a smaller effect on costs for boys.

This can happen as well if the value to the household of the child’s time is higher for girls. Distances to school in rural areas are often substantial, necessitating non-trivial reductions in children’s time in productive activities after or before the school day. In terms of the model presented in Section 2, if the shadow wage is higher for girls, a decrease in distance to school that reduces foregone work time equivalently for girls and boys would shift the marginal cost function down more for girls, leading to larger schooling gains for them than for boys. In contrast, a reduction in school
fees would lead to equal shifts in marginal costs for girls and boys.\textsuperscript{9} Obviously, however, whether or not the estimated effects of distance capture a standard price effect, findings showing stronger distance impacts on girls are highly policy relevant: they indicate that school construction programs that reduce the average distance between home and school can have disproportionate benefits for girls’ education.

\textit{Evidence from program evaluations}

A different source of information on how investments in girls’ and boys’ human capital respond to costs are evaluations of interventions that attempted to improve schooling outcomes via price or other financial incentives. Several of these studies are especially valuable because they were based on randomized policy experiments, or else utilized “natural experiments”. An example of the latter is the study by Angrist et al. (2002) of Colombia’s national voucher system for private secondary schooling, in which a limited supply of vouchers was assigned to qualified low income public primary students based on a lottery system (hence was randomly assigned). Eligible girls and boys were equally likely to receive the subsidy, and voucher recipients of both genders did modestly better in terms of school attainment and test scores. These effects, however, were larger for girls. In a rather different demand side intervention, Mexico’s PROGRESA program, poor rural communities were randomly assigned to receive the program, which encouraged primary school enrollment by providing education and food grants to mothers conditional on their children attending school and being brought in for regular medical checkups (Skoufias 2001). While both boys and girls benefited, girls’ primary enrollments (but not secondary enrollments) increased more than boys’; the effects on overall grade attainment were slightly larger for girls (Morley and Coady 2003). In contrast, in another Latin American conditional cash transfer program, Nicaragua’s Red de Protección Social, there were equivalent strong enrollment benefits for young girls and boys (Maluccio 2002).

In Bangladesh, the Food for Education subsidy program offered households a monthly food ration conditional on a child’s school attendance. In the initial two years of the program, enrollment in schools participating in FFE skyrocketed (though some of the measured increases may have reflected
shifts from non-FFE schools) and the gains were much larger for girls than boys—41% vs. 28% (Ahmed and del Ninno 2002). Unexpectedly given these figures, this pattern was not confirmed in an econometric analysis using household survey data carried out by Ravallion and Wodon (2000). Using village participation in the FFE program to predict the potentially endogenous household food ration, these authors report positive effects that were statistically similar for girls and boys.\(^9\)

A very different source of evidence on the impacts of changes in direct costs is the recent experience of several countries in which primary school fees were eliminated or sharply reduced nationwide. In Uganda, Tanzania, and Malawi, such policies resulted in sudden and very large surges in enrollments, with girls’ enrollments increasing the most (See Herz and Sperling 2004 and references therein). In one sense these major shifts in pricing policy can be viewed as large-scale natural experiments, though this interpretation is problematic, in part because the shift typically coincided with other policies such as publicity campaigns to promote schooling. Even taking such factors into account, however, these country experiences point to the presence of substantial price responsiveness of education demand, and especially for girls. Of course, where fee elimination actually comes close to getting all children enrolled, as in Uganda in the late 90s, it is inevitable that female enrollments will rise more if they were initially lower than male enrollments.

Nevertheless, these experiences, together with the evidence from both schooling subsidy programs and demand studies using monetary measures of cost, suggest that the demand for girls’ schooling is often more price responsive than boys’—not merely more sensitive to distance. A framework in which schooling was viewed in consumption terms would explain differences in price elasticities with reference to parental preferences for girls’ and boys’ human capital. The human capital investment framework provides alternative plausible interpretations, several examples of which were shown in Section 2. The comparative static effect of a reduction in price will be larger for girls if, all else equal, marginal benefits fall less rapidly for girls than boys (as in Figure 1), the marginal costs rise less rapidly for girls (as in Figure 2), or under either of the two discontinuous returns scenarios of Figures 3 and 4. When price effects are larger for girls, policies that reduce the direct
costs to households of sending their children to school, even if they do not single out girls for special
treatment, will disproportionately raise female enrollments or attainment. Such policies are appealing
in that they achieve two important objectives, raising schooling overall and reducing gender gaps.

Targeted subsidies for girls’ schooling

Education policies, of course, can also specifically target girls. Most would agree that where
gender schooling disparities are large or persistent, targeting is warranted even if girls would benefit
somewhat disproportionately from gender neutral policies. One approach operates on the demand side
by lowering the costs to households of educating girls relative to boys. Where this approach has been
implemented, it has been effective at improving gender equity in schooling. An early and much
celebrated example is the Bangladesh school stipend program, begun in 1982 to subsidize household
expenditures on girls’ secondary education. In the first five years of the program, girls’ secondary
enrollment rates in program areas rose from 27 to 44 percent, more than twice the increase observed
nationally (Bellew and King 1993).

Kremer, Miguel, and Thornton (2004) report on a policy experiment in rural Kenya in which
half of the schools in the study were randomly chosen to offer merit-based scholarships to girls who
scored above a certain percentile on standardized examinations. In addition to this price incentive to
parents, schools also had an incentive to improve girl’s attendance and performance, since
participating schools directly received part of the scholarships. Girl’s attendance as well as test scores
in intervention schools were significantly higher than in the controls, as was teacher attendance. Even
boys as well as girls with low baseline scores (who were not likely to win the scholarships) enjoyed
significant test score gains in the eligible schools, possibly due to peer effects of being in classrooms
with girls who were motivated by the possibility of a scholarship and thus worked harder.

Two earlier randomized evaluations, both in Balochistan Province, Pakistan, considered pilot
programs to improve girls’ access to local schools in a region where girls were significantly
disadvantaged. The Quetta Urban Fellowship program encouraged NGOs to build new primary
schools in poor neighborhoods by paying a subsidy to the school (not to families) for each girl enrolled. Enrollment growth of girls in the intervention neighborhoods was 33 percentage points higher than in control neighborhoods (Kim et. al. 1999). Enrollment increased slightly for boys as well. Kim et. al. suggest that the sharp increase in girls’ enrollments was in part an outcome of reduced distances to schools that would accept them. The second pilot program, in rural areas of Balochistan, supported village organizations in setting up and operating separate private primary schools for girls staffed by female teachers. Enrollment of girls initially rose 22 percent in program areas relative to control areas, while also rising 13 percent for boys (Kim et al. 1998). Although inadequacies in funding and operational expertise forced the rural program to end (Alderman et. al. 2003), the initial success here and in the urban program in attracting female students is noteworthy. This presumably had to do in part with characteristics of the new schools that made them culturally appropriate for girls (considered below), not just with changes in price or accessibility.

3.2 Characteristics of schools and the learning environment

Definitions and methodological considerations

This section encompasses standard measures of school quality – number or qualifications of teachers, availability of blackboards and textbooks, and so on – but in addition considers factors that may not normally be considered measures of service ‘quality’, such as the share of female teachers. In reviewing this evidence, I follow Lloyd et al.’s (1998) distinction between characteristics of the school environment that are the same for boys and girls but nonetheless may have gender-differentiated impacts on outcomes, on the one hand, and aspects of the school environment that are different for boys and girls, on the other. Generally, policies that change school characteristics of the first kind could be described as gender neutral, while policies that change aspects of schools or the school environment that are different for girls and boys are usually conceived of explicitly as means of improving girl’s attainment or learning.
For most studies estimating the impacts of school quality using non-experimental data, a good deal of caution in interpretation is warranted. Standard problems include measurement error in school characteristics, omitted variable biases, and biases due to heterogeneity in unobserved community or household characteristics (themselves a form of omitted variable bias). Omitted variable bias can arise because, given the limitations of most school or community surveys, models usually exclude a range of potentially important education inputs. Many of these factors also affect learning or enrollment and are likely to be positively correlated with the levels of one or more of the included attributes, an association that implies an upward bias in the estimated effects of the latter. A positive bias also occurs if, in communities where parents feel more strongly about schooling and thus tend to enroll their children, such parents also take steps to insure that local schools have more resources, or if households with strong education preferences move to areas where school quality is higher. In contrast, if governments purposely locate facilities or upgrade quality where the population is disadvantaged or for other reasons is less likely to send children to school, there would be a downward bias in the estimates of the effects of school quality on demand.

These factors, if present, will lead to biases in the estimates of the effects of school characteristics on schooling outcomes, but the implications are less clear with respect to biases in estimates of the difference in effects for boys and girls. If omitted factors have equivalent effects on girls’ and boys’ schooling outcomes they will lead to similar upward or downward biases in the estimates for included regressors, and these will be eliminated from the difference in the girl and boy estimates.\textsuperscript{10} Note, however, that the assumption of equivalent effects of unobservables may be strong, particularly given that the analysis is predicated on the possibility that the factors that we do measure affect the genders differently. Essentially the same idea motivates the use of household fixed effects techniques to test for male-female differences in the effects of regressors. If household level unobservables (including education preferences and motivation, home inputs into learning, and ability) influence the levels of the outcomes for both girls and boys but these effects do not differ systematically for girls and boys, differencing across gender within the household—estimating the
boy-girl difference in outcomes—isolates the true gender differential in the effect of the variable. Here too the implied restrictions may be strong. One would have to assume, for example, that parents with strong preferences for human capital and who therefore may provide more home inputs into learning or move to areas where school quality is high do not also have relatively strong preferences for educating girls. Still, this approach seems like a logical way to analyze gender differences in the effects of school (and other) factors affecting education outcomes. Despite this, in the literature considered in this review the use of household fixed effects or within family estimators remains rare.

Aspects of school quality/environment that are similar for girls and boys

The foregoing (strong) caveats aside, there is some empirical support for the idea that standard aspects of school quality have stronger impacts on girls’ schooling than boys’. Both Khandker (1996) for Bangladesh and Lloyd et al. (1998) for Kenya find that increases in indicators of teacher quality raise girls’ enrollments or reduce their dropout probabilities but have no effect on boys’ schooling. In rural India, Dreze and Kingdon (2001) report that various measures of school quality have larger or more significant impacts on girls’ primary enrollments than boys’; the most impressive difference is in the impact of providing mid-day meals in schools, which raises the female enrollment probability by 15 percentage points. King et al. (1999) find for Pakistan that merit-based grade promotions have greater impacts on girl’s school continuation than boys’ (though rather than differential school ‘quality’ effects this could reflect a selection process whereby relative to boys, only high achieving girl students tend to get promoted for merit). In rural Pakistan, Hazarika (2001) finds that while having a local school with a water supply has similar effects on boys’ and girls’ primary enrollment probabilities, having blackboards in schools is positively associated only with girls’ enrollments.

Analysis of a natural experiment in India by Chin (2002) also points to stronger effects of school quality on girls. Exogenous variation in quality was provided by the introduction of Operation Blackboard, through which the government was to provide an additional teacher to all primary schools initially with just a single teacher. Chin is able to establish that an additional teacher increased girl’s
primary completion rate by 3-4 percentage points and literacy rates by 2-3 points. In contrast, there were no significant effects on boys.

For most of these studies it not clear why the demand for girl’s schooling responded more than boys’ to changes in service quality that were apparently targeted equally to both. The possibility should be noted that ‘high quality’ schools in terms of standard indicators may also feature better (more supportive) learning environments for girls. Then at least part of the apparent gender differential in response to quality is actually due to other, unmeasured aspects of schools that differ for boys and girls. Assuming this is not the case, one might surmise that school and teacher improvements somehow affect girls’ ability to learn more than boys’, inducing parents to enroll girls or keep them in school longer. In terms of the model of Section 2, an improvement in school quality increases the marginal benefits of schooling, since the increment to human capital from another year of schooling is larger when quality is higher. This raises the optimal level of schooling, and more so for girls than boys if girls’ learning is more responsive to the change in quality. Note, however, that with the exception of the India study by Chin, this process can only be inferred indirectly from the evidence since these analyses consider only enrollment outcomes, not academic outcomes, i.e., test scores. Moreover, it is not readily apparent why changes in quality should have stronger impacts on girls’ learning.

Alternative interpretations of girl-boy differences in schooling responses to quality that do not require differential learning effects are possible, based on gender differences in the schooling benefit or cost functions as outlined in Section 2. Define equivalence in learning impacts from improved quality as a situation where for any level of schooling \( S \), total benefits increase by some fixed proportion that is the same for girls and boys. Although the benefits curves for girls and boys thus shift up equiproporportionately, the adjustments in the optimal levels of schooling for girls and boys will also be functions of the slopes of, or presence of discontinuities in, the marginal benefit and cost functions. For example, in the quadratic schooling benefits case in Figure 1, marginal benefits are declining faster for boys than girls, so the change in schooling required to restore equality of marginal
benefits and costs after such a shift will be smaller for boys than girls: girls’ schooling increases more. The same outcome could be generated by differences in the slopes of the male and female marginal cost functions and is exactly what is illustrated in Figure 2 by the upward and equivalent shift in girls’ and boys’ marginal benefits functions. Similarly, in the discontinuous returns cases depicted in Figures 3 and 4, it can easily be seen that equivalent girl-boy shifts in benefits from quality improvements would also tend to disproportionately raise girls’ schooling.

Further, as discussed in Section 2, each of these models also predicts that stronger impacts of quality on girls’ schooling will occur in situations where initial girl-boy disparities are large. This is consistent with the presence of substantial mean gender gaps in the populations analyzed by the each of the studies cited above. However, it should be kept in mind that the pattern in existing research may be an artifact of the choice of study environments; researchers may not have bothered to address this issue in cases where gender disparities in education were small.

Aspects of school quality/environment that are different for girls and boys

There is little doubt that in many countries the school learning environment favors boys over girls (World Bank 2001), for reasons that may include a lack of female teachers, unfavorable teacher treatment of girls in class, sexual harassment by male teachers or students, and curricula and textbooks that present favorable adult role models only for boys. The few econometric analyses considering these factors appear to confirm the potential for negative effects on girls’ education. Lloyd et al. (1998) report that girls’ dropout probabilities in Kenya are significantly influenced by teacher attitudes about whether math is important for girls, and by differences in the (self-perceived) abilities of girls and boys to seek advice from a school staff member, and by differences (again, self-perceived) in the treatment of boy and girl students. Also in Kenya, Appleton (1995) finds that girls’ exam performance, unlike boys’, is negatively affected by unfavorable teacher evaluations of their abilities.

The provision of female teachers is frequently cited as a means for encouraging girl’s school enrollment and academic performance. Parents in some cultures may be unwilling to send their
daughters to school unless they can be taught by a female teacher. Elsewhere, having female teachers could encourage parents to enroll daughters through beneficial impacts on girls’ academic performance, which would occur if girls respond better to female teachers or if female teachers are more sympathetic to girl students. In line with either of these hypotheses, in Bangladesh, the presence of female teachers in local schools was found to increase girls’ enrollment probabilities (Khandker 1996). Similarly, in cross-country regressions for Africa, Mingat and Suchaut (1998) find that having more female teachers is associated with higher enrollments and lower dropout rates for girls.

Consistent with the idea that having female teachers boosts girl’s performance, a five-country African study by Michaelowa (2001) found that girls’ learning gains in the 5th grade are larger when they have a female teacher, while boys’ are larger when the teacher is male.

It is possible, however, that the presence of female teachers is not exogenous to girls’ education outcomes. Local communities or parents’ associations often hire teachers to supplement those provided by the government, and could choose to hire women if girls’ academic success is considered a priority. If teachers tend to work in regions where they were raised, localities with stronger traditions of (and thus also current preferences for) female education will have a larger supply of educated women, hence of female teachers. Either situation implies that the association of the presence of female teachers and girls’ educational success may not be causal or at least, may overstate the true causal relation. Therefore randomized program evaluations of interventions involving the placement of female teachers are of particular interest. In one such experiment, the rural Balochistan program mentioned above, villages were assisted in opening primary schools for girls staffed by female teachers. As indicated, there were very significant gains in female enrollments in these villages compared with non-program villages. Unfortunately, the design of this experiment does not make it possible to disentangle the effects of its various elements, e.g., female teachers, girls-only schools, strong parental involvement, and effective reductions in distance to the nearest suitable school.

This is also an issue to some extent with the results of the randomized program evaluation by Banerjee et. al. (2000) of a policy in India set up to add teachers to informal schools run by an NGO.
The program hired a second, female (if possible) teacher for schools in the treatment group. The intervention both significantly reduced the days the school had to be closed (which was one objective of the program) and led to a 50 percent increase in girls’ attendance, while having no effect on boys. It is not clear if the strong benefits for girls came because the additional teachers were female, because ‘availability’ (days open) increased in informal schools that were acceptable to parents for girls, or because general school quality improved with the increase in the number of teachers.\textsuperscript{13} As with the Balochistan program, however, the results do point to a package of measures that may lead to large gains for girls even if the precise pathways are not transparent.

With respect to another aspect of the school environment with potentially strong gender relevance, focus group analyses in a number of settings have indicated the importance for parents of having separate school toilet facilities for their daughters, especially once they reach puberty (See Herz and Sperling 2004). In the Bangladesh study cited above Khandker found that having separate toilet facilities for boys and girls increased girls’ enrollment probabilities as well as their grade attainment. In Guinea, West Africa, construction of separate girls’ and boys’ latrines was a significant component of a major reform program for increasing both female and overall school enrollment in the 1990s. Both girls’ and boys’ enrollments rose dramatically over the period 1989 to 1997, but the female gains were much larger: starting from a low base, gross enrollment for girls more than doubled (USAID 1999). As in so many other cases, it is difficult to identify the specific effects on girls’ enrollments of the policy of interest, because several other gender targeted measures were adopted as part of the Guinea education program, including increases in the number of female teachers and provision of special assistance to pregnant students. Still, the provision of separate toilets or latrines for girls is one intervention (and a relatively inexpensive one) for which the existing qualitative evidence of potential benefits seems very compelling.

3.3 Policies that address the opportunity costs of educating girls

Girls in the developing world typically spend far more time than boys in domestic work activities. The idea that girls' access to education is constrained by their household work obligations
is supported both by ethnographic studies (Nieves 1981; Safilos-Rothchild 1980; Engle et. al. 1985) and econometric demand analyses (Glick and Sahn 2000; Deolalikar 1998; Levison and Moe 1998; Pitt and Rosenzweig 1990). The latter show girls’ schooling to be more negatively affected than boys’ (if boys’ is affected at all) by the presence of younger siblings, or in the case of Pitt and Rosenzweig, by the illness of an infant sibling. Given the pattern of child labor specialization by gender, policy measures such as subsidized childcare services that reduce the household’s domestic work burdens would in effect target girls’ education. Like subsidizing girls’ tuition, public provision or financing of childcare would reduce the costs to households of educating girls relative to boys, in this case, the opportunity costs. The research just cited suggests inferentially that the benefits of such a policy to girls’ schooling may be substantial. Unfortunately, while there are anecdotal accounts of community-based childcare services freeing up girls’ time for school attendance (see Herz and Sperling 2004), there has been little rigorous analysis of the issue. Still, one careful study for Kenya (Lokshin et. al. 2000) finds that lower local childcare center costs increase both maternal employment and girls' schooling, while having no effect on boys' schooling.

Girls may also benefit from flexibility in school schedules that help them balance school and domestic responsibilities. Flexibility could be provided by holding afternoon sessions for girls, or opening small satellite schools to be nearer to where girls (and for that matter, boys) live and work. Often it is informal or community schools that offer these options. Although here too there is a lack of formal evaluations, descriptions of a number of such interventions suggest that they can significantly raise the school attendance of girls (Herz and Sperling 2004 and Herz et. al. 1991 discuss several examples). In some contexts (e.g., Pakistan’s Balochistan Province, see World Bank 1996) offering later sessions for girls can address a different, cultural barrier to their education: double sessions make it possible for girls to attend school separately from boys.
3.4 Public information campaigns to encourage girls’ schooling

Where traditional beliefs make parents reluctant to send daughters to school, there may be an important role for programs using various media to promote the benefits of educating girls. For poorly educated parents in particular, such campaigns may have a strong efficiency rationale as they can supply information that these parents lack on the benefits to female schooling, for example, improved child nutrition. Such ‘sensitization’ interventions are attractive as well because they are inexpensive compared with, say, scaled up improvements in teacher training or textbook availability. Kane (2004) and Miller-Grandvaux and Yoder (2002) note a number of African projects in which community education campaigns, often in the context of programs to initiate new community (i.e., informal) schools, were associated with large gains in female enrollment or at least more gender equity than in existing public schools. However, it is difficult to assess the effectiveness of such campaigns. For one thing, they tend to be implemented in conjunction with other education policies (nation-wide or local), making it hard to attribute enrollment gains specifically to the outreach efforts. In many of the cases cited by Kane and Miller-Grandvaux et. al. the sensitization efforts coincided with, among other measures, a move toward flexible schedules. Community-level randomized study designs to assess the efficacy of information campaigns are a possibility, at least with respect to campaigns using local level (as opposed to national) programs or media.

Discussions of such community information efforts also often emphasize the role of community ‘participation’ or active involvement in programs to raise girl’s schooling. This has been said to be a key ingredient of successful programs (see Kane 2004). Barriers to assessing this claim include not just the presence of other policies associated with the female schooling initiatives, but the possibility that communities where participation in these initiatives is strong may be those where female education is relatively highly valued, or where women have a more prominent role in community decision making. In such communities girls’ enrollments would be higher even without the program. In principle, community randomized designs could be used to estimate the impacts of programs created to encourage greater local participation in girls’ education initiatives.
3.5 Labor market policies

Perhaps the most obvious link between labor markets and the relative returns to investments in girls’ and boys’ education involves the question of whether additions to schooling are rewarded with higher pay equally for women and men. By and large in developing countries, this appears to be the case (see Schultz 2002), through there are some exceptions (Appleton et. al. 1999, Kingdon 1998); in the latter cases, it is plausible that the differences in female and male wage structures are a cause of low female schooling investments. But the issue—and the scope for policy to influence girls’ schooling—is more complex than this. A key factor (see Glick 2006 for detailed discussion) is that labor force participation and labor supply is far more variable for women than men, who tend to participate full time over their prime adult years. In most societies, parents would be correct in anticipating that daughters on average will end up spending fewer years full-time in the labor force than will sons. Even where additions to schooling raise hourly compensation equivalently for males and females, these differences in labor supply imply that investment in another year of education of a girl increases expected annual as well as lifetime labor market earnings by less than it would for a boy. The difference, in proportional terms, is essentially equal to the share of predicted full time equivalent years of labor force participation of a woman relative to that of a man. If parents incompletely value female schooling productivity benefits for non-market activities (See Glick 2006), the smaller increase in expected lifetime labor market earnings from additional schooling for a girl than a boy implies that the expected household benefits at the margin to educating daughters will be lower than for sons.14

If private (household) schooling returns for girls are low relative to boys because their future labor supply is expected to be lower, policies that encourage greater female participation, hours of work, or employment continuity should induce parents to invest more in their daughters’ education. This link has not received much attention in the literature. In view of the constraints on women’s labor force activity posed by their domestic responsibilities, one policy (if not precisely a labor market policy) would be to subsidize childcare services (see Glick 2002). Public sector support of childcare is thus uniquely situated in that it can increase incentives to invest in girls’ education in two ways: by
raising expected future labor market benefits via positive effects on female labor supply and, as described in Section 3.3, by reducing the current (opportunity) costs of sending girls to school.

Discrimination in hiring may reduce female labor force involvement, possibly indirectly by leaving only poorly remunerated informal work open to women, who then opt to stay out of the labor force. Discrimination in pay such that women are paid less than men with similar qualifications—which can exist even if the gradient of compensation with respect to schooling is similar for women and men—also reduces the incentives to substitute time in the labor market for home time. If anti-discrimination measures lead to greater female labor force activity, especially in well remunerated sectors or occupations, by the reasoning just outlined they should raise expected household returns to and hence investments in female schooling. Such policy impacts may be difficult to estimate, however. Given that these and other labor market policies usually operate at the national level, their effects generally cannot be captured in cross section surveys; they also seem unlikely candidates for policy experiments. Even with longitudinal or repeated cross section data, the time frame for effects on schooling to be observed may be long as these depend on individuals’ formation of new expectations based on changing female labor market patterns.15

4. Summary and conclusions

Several recurring though not universal patterns can be discerned with regard to the impacts of education policies (and other policies) on the schooling of girls and boys. The findings in the literature have implications for policy to close gender gaps in schooling as well as pointing to areas for future research. Among potential policy levers that do not specifically target girl’s enrollments, a common finding is that girls’ schooling is constrained more than boys’ by the distance to schools. Public investments that increase the local availability of schools are therefore likely to disproportionately benefit girls’ enrollments. A number of studies, including several randomized policy experiments, find as well that girls’ schooling is more sensitive than boys’ to changes in fees and other direct costs. Where this is the case, demand side interventions that subsidize households’ schooling costs will have
larger benefits for girls. A more limited body of evidence suggests that the demand for girl’s schooling is also more responsive than boys’ to improvements in school quality, pointing to another route through which policy may redress gender imbalances even while not specifically targeting girls.

This paper has demonstrated that a simple model of parental investments in children’s human capital can explain these gender differences in responses to education policies through appropriate assumptions about school costs and benefits, specifically with respect to curvature or discontinuities in these functions. The same outcomes could be generated by a model in which the schooling of children is viewed as a consumption good, based on assumptions about the nature of the parental utility function. Existing research generally does not allow one to distinguish these explanations, or for that matter, to distinguish between different model assumptions within the investment framework. However, one reason the latter has been emphasized here is that it yields a number of interesting avenues for further research on the nature of the benefits and costs of girls’ and boys’ schooling and on parental perceptions of these benefits and costs. Some of these are discussed below.

Where gender imbalances are large or cultural barriers to female education remain strong, it will likely be more expedient to directly target girls’ schooling, and there are several well-documented successes of such targeted policies. In particular, on the demand side, households have been shown to respond to incentives in the form of subsidies to enroll girls. On the supply side, evaluations of several programs suggest that school managers or teachers will also respond to financial incentives to attract or retain female students. A handful of randomized experiments involved initiatives that combined several gender targeted measures, such as female teachers, girls-only schools, and reductions in distance to schools deemed suitable for girls. The favorable outcomes for these programs suggest that they can be models for use elsewhere, but it remains unclear which components led to the outcomes or if all them did, or if an important element of success was interactions among them.

Other measures with potential to raise girl’s schooling include the provision of separate school bathroom facilities for girls and boys, flexible school schedules, the redesign of teacher training to change attitudes or behavior toward female students, and information campaigns to promote girls’
education. Some of these measures would serve to reverse aspects of the school environment that effectively favor boys’ learning, or would make schools more acceptable environments for daughters in the eyes of parents. Others, such as flexible or double shift school sessions—and also, subsidized childcare services—would potentially overcome the obstacles posed by girls’ typically heavy domestic work obligations. However, while informal assessments suggest that each of these policies can help girls, they have generally not been subject to rigorous evaluation in the sense used in this paper—using either randomized designs or careful statistical analysis of large scale household surveys in combination with school or program information. Conducting such evaluations is an essential agenda for research to guide policy in this area.

Even for patterns that seem well established by extensive research (summed up at the start of this section), this paper has stressed, first, the methodological limitations of many studies, and second, the need to be wary of broad generalizations about differences in female and male schooling responses to policies. The latter point was brought out by the contrast between the long list of individual published case studies showing that proximity to schools disproportionately benefits girls, on the one hand, and a systematic study of DHS surveys that found few gender differences, on the other. No similar comprehensive study exists for other school characteristics, but clearly we need to be cautious in our statements about gender differences here as well.16

With regard to methodology, in view of a number of potentially serious problems with analysis on non-experimental data, including omitted and mismeasured variables and the endogeneity of policy regressors, there is a compelling case for expanding the use of randomized evaluations. This process is already underway in education research (see Glewwe and Kremer 2006) and naturally would extend to interventions for improving female schooling; indeed, a few such interventions, described above, have already been evaluated this way. However, because of logistical, political, or financial considerations, in many cases randomized studies will not be feasible (see Glick 2006). Research will therefore continue as well to use non-experimental approaches. This will include, in particular, analysis of standard household and community/school surveys, in part because such surveys
are so widely available. However, researchers need to be cognizant of the potential limitations of non-experimental approaches, and should explore techniques, and possibly collect additional data, to overcome these problems. A variety of methods exist for estimating the impacts of policies when participation in or access to programs is not random, i.e., when key policy regressors are potentially endogenous to schooling outcomes. Development and refinement of these approaches is ongoing (see Todd 2006).

Beyond the most obvious focus for research—to evaluate the effectiveness of a range of girls’ schooling interventions in different environments—the conceptual framework and literature reviewed in this paper suggest several directions in terms of questions to be asked and data to be collected. Three of the most important can be mentioned here. First, the human capital investment model suggests that a host of parental expectations shape decisions about the education of sons and daughters: expectations about labor market returns for girls and boys, about remittances (and possibly, bride price), and about the probabilities of school success and continuation. Information on these factors is often available in the same surveys used for the education analysis and can be used to enhance understanding of household schooling decisions. For example, it is often possible to use the data at hand to estimate labor force participation and earnings equations for women and men. This would enable researchers to consider gender differences in overall labor market returns, incorporating both expected employment and earnings outcomes.

Second and related, questioning of parents on perceptions and attitudes about the factors identified above would be a useful complement to demand estimation (or policy experiments) for understanding household education behavior. Economists, with their strong preferences for revealed preference approaches, have not normally paid a great deal of attention to these sources of information. However, there has been increasing interest in approaches to integrating standard quantitative methods with qualitative techniques that are more prominent in other social sciences (Kanbur 2003). In some cases these approaches will be able to capture aspects of schooling decisions that standard survey instruments cannot.
Third, most of the research reviewed in this study has focused on identifying the effects of policies on female and male education indicators, but the issue of costs and more specifically the cost-effectiveness and scalability of different policies is obviously also crucial. Such information would help address a number of important questions for policy. For example, how does the cost-effectiveness of intensive multi-faceted interventions such as that in rural Balochistan compare with simpler programs such as providing incentives to schools to enroll girls as in the urban Quetta, or providing tuition stipends to girls as in Bangladesh? Should programs to boost girl’s education be very broad—applying to all girls—or instead targeted, say, to girls from poorer households or regions? The former approach insures broader political support but may be hard to sustain fiscally. When comparing policy options, it must also be kept in mind that the education objectives of governments in poor countries encompass (as they should) more than just raising female schooling or reducing gender gaps: in particular, many countries still need to increase overall enrollments of boys as well as girls, especially at post-primary levels. Certain policies that induce parents to send girls to school, for example, flexible school schedules, may have little positive effect on boy’s enrollments and may even lower them by reducing available household schooling resources per child or by diluting school quality as total enrollments rise. In this respect, policies identified above that appear to raise schooling of both genders while benefiting girls disproportionately are attractive, at least in contexts where gender disparities are not so large that explicit gender targeting is called for.

References


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1 The objective here is not to present the economic rationale for investing in girls’ education, e.g., externalities with respect to children’s welfare and economic growth. This has been done many times, most incisively by T.P. Schultz (1993, 2002). The focus instead is on understanding actual parental schooling investment decisions—that is, the private demand for schooling of girls and boys—which by definition do not incorporate externalities, and how these decisions respond to policies.

2 Clearly the consumption and investment perspectives are not mutually exclusive, and any direct consumption value of children’s human capital could be incorporated into ‘benefits’.

3 This is also the specification of Garg and Morduch (1996), though their objective is to explain gender differences in the response of human capital investments to changes in household income.

4 As discussed below in Section 3.5, even if increments to human capital of women are rewarded equivalently to that of men in terms, say, of hourly pay, investment in an additional year of schooling will result in a smaller increase in (expected) lifetime earnings for girls if they are less likely to be in the labor force or if they work over a smaller portion of their adult lifetime than boys will.

5 The quadratic assumption for returns in Figure 2 adds to the difference in girls’ and boys’ responses but is not required for it. Although the function depicted is the same for girls and boys, a proportional increase in (total) quadratic benefits shifts up marginal benefits more at lower S, hence more for girls. Qualitatively, however, the same outcome would occur if returns were linear.

6 As described in Glick (2006), each of these models can also explain why income effects might be larger for girls’ schooling, a pattern that is seen frequently in the literature.

7 Comparisons of the effects of covariates across gender obviously should always be statistical and should involve the appropriate marginal effects (e.g., for enrollment probits, the change in probability for a unit change in the variable; see Glick, Saha, and Younger (2004 Appendix 2.2). In practice, comparisons are often somewhat casual. For example, it is common to conclude that a gender difference exists if a variable has a significant impact on an outcome for one gender but not the other, whereas this can only be supported by a direct statistical comparison of the two effects.

8 Effects of distance reductions when there are greater psychological or transportation costs for girls’ attending school would be represented similarly.
However, since participation in FFE is contingent on enrolling a child, predicted program participation of the household, hence also the level of the food ration, must itself be partially a measure of school enrollment. Therefore the coefficient on predicted participation in Ravallion and Wodon’s enrollment probits is difficult to interpret.

In standard omitted variable formulae, the bias in the estimated coefficients take the form of an additive term; if this level bias is the same for girls and boys, it drops out of the difference in the estimates which consequently is unbiased. For measurement error, on the other hand, the bias takes the form (in the textbook case of one variable with random measurement error) of a proportional reduction relative to the true parameter. This means that the difference in the girls’ and boys’ estimates will be similarly proportionately underestimated.

As these authors note, the free meal is a form of education subsidy. The stronger effect for girls therefore may be an indication of greater price responsiveness of the demand for girls’ schooling.

Studies that directly compare effects of school factors on girls’ and boy’s learning (test score gains) are rare, and in any case selectivity biases may compromise the comparisons because such studies almost always involve in-school samples without corrections for selection into this sample. Where gender gaps in enrollment or dropout are large, selection may operate more strongly for girls, rendering gender comparisons of learning determinants problematic.

However, the authors note that the effect on girls of adding a female teacher is larger when the first teacher is a man, suggesting the importance of having at least one female teacher.

Note, however, that schooling itself may strongly influence female participation and labor supply, hence lifetime incomes, which may offset the negative effects of lower mean labor supply on the returns to female schooling. Define lifetime income or wealth as earnings per full time equivalent year employed (the ‘wage’, \( w \)) times lifetime labor supply or years of full time work (\( L \)). Given the dependence of the wage on schooling, the private marginal labor market return to schooling (ignoring costs as well as the effects of schooling on age at entry) is

\[
\frac{\partial (wL)}{\partial S} = \frac{\partial w}{\partial S} L + \frac{\partial L}{\partial w} \frac{\partial w}{\partial S} L.
\]

Because of lower mean labor supply (\( L \)) for females, the first term on the right hand side will be smaller for girls, but if schooling increases female labor supply (because \( \partial L/\partial w > 0 \)), the second term will be positive hence greater than for boys for whom, as noted in the text, it is essentially zero.

A very different (and faster) way in which improved earnings opportunities for women can affect girl’s human capital is by increasing women’s influence over household allocation decisions. If income is not completely pooled and women have stronger preferences for daughters’ schooling than their spouses, women’s labor earning may have particularly strong benefits for girls’ schooling. On the other hand, time allocation effects may work in the opposite direction, if the demand for daughters’ domestic labor rises when mothers’ labor supply increases. See Glick (2002) for discussion.

Beyond the scope of this study are several broader issues, including the overall level of financial and philosophical commitment on the part of the government to meeting gender equity goals, the potential benefits of implementing multiple rather than isolated interventions, and the role of donor support. These issues are discussed in Kane (2004).

As noted earlier, if the focus is on measuring differences by gender in the response to policies, the burden of identification may be lower. Household fixed effects or within-family estimators to estimate the difference in impacts on girls and boys potentially washes out household-level heterogeneity that would contaminate estimates of the level effects. Note though that in most cases the level effects of policies on girls and boys, not just the girl-boy difference in effects, are of interest to policymakers.

Evaluations of specific programs, for which costs are usually well defined, often do consider the cost side. Examples of cost-effectiveness analysis of education programs are Wodon’s (1998) analysis of Food for Education in Bangladesh and Coady and Parker’s (2002) analysis of PROGRESA.
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Source: UNESCO education statistics

Notes:

$a$ Net enrollment = primary (or secondary) enrollments of primary (or secondary) school age children divided by number of primary (or secondary) age children x 100

$b$ Gross enrollment = total primary (or secondary) enrollments divided by number of primary (or secondary) age children x 100.

$c$ Completion rate = number of students completing the last year of primary over the number of children of official graduation age
Figure 1 - Differential benefits to schooling by gender: effects of a price reduction

Total costs (TC),
Total benefits (TB)

Marginal costs (MC),
Marginal benefits (MB)

Notes to Figures:
G and B denote girls and boys, respectively. No letter means the cost or benefit function is the same for girls and boys. Dotted lines indicate the cost or benefit functions after the indicated policy change.
Figure 2 - Differential cost functions by gender: effects of an increase in schooling returns
Figure 3 - Discontinuous schooling returns: effects of an increase in returns

Figure 4 - Differential school progression probabilities with discontinuous returns: effects of a price reduction