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Copenhagen Consensus 2008 Challenge Paper

Education

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This paper reviews the stylized facts regarding the levels of human capital investments and the returns to those investments in developing countries. It shows that 23% of children in developing countries do not complete the fifth grade and of these, 55% started school but dropped out. We argue that eliminating dropouts is the most cost effective way to make progress on the goal of Universal Primary Education. Of the various mechanisms we can use, mechanisms that stimulate schooling demand have the strongest evidence of success to date and are the most cost effective.

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I. Benefits from schooling

Few empirical relationships have been more frequently investigated than that between years of schooling and earnings. Literally hundreds of studies using a wide variety of data sets from developed countries, spanning many decades, and employing alternative specifications to correct for various potential sources of bias, have consistently found positive private returns per year of schooling.[1] Returns are frequently at or above long-run average market returns to other investments.

Estimated returns to schooling in developing countries have been of comparable magnitude to returns found in developed countries. Table 1 presents ordinary least squares estimates of returns from a standard Mincerian earnings function applied to 63 household data sets from 42 developing countries. The results are presented separately for males and females and for urban and rural residents. These data sets were selected because the variable definitions could be harmonized across countries and because separate returns could be estimated for men and women and for urban and rural residents.[2] The same model was estimated for all countries so that the variation is not due to specification choice. Several interesting results are apparent. First, private returns, estimated as the percentage increase in annual earnings obtained from an additional year of schooling, are almost universally positive. In only one case for women, four cases for men, three for urban residents and two for rural residents did education fail to raise earnings. The interquartile range for estimated real returns across countries varies from 5 to 10

[1] Card(1999) contains an excellent review of the various estimation methods and biases associated with analysis of the returns to schooling. It appears that returns to schooling generated by ordinary least squares estimation tend to understate true returns, although the bias appears to be small.
[2] We are indebted to Claudio Montenegro for sharing these regressions results.

percent for men and from 9 to 12 percent for women. The interquartile range for both urban and rural residents lies between 5-11%. The median return ranges from 8-10% per year of schooling depending upon demographic group. This is quite consistent with the average return of 10.9% for low-income countries found in the Psacharopoulos and Patrinos (2004) literature survey of studies published in the 1990s. While there is considerable variation in the magnitude of the return, there does appear to be a positive reward to individual time spent in school.

Table 1: Sample statistics of estimated returns per year of schooling in developing countries.

Percentile	Male	Female		Urban	Rural
10	2.3	3.7		3.8	1.2
25	4.5	8.9		6.3	5.4
50	8.2	10.3		9.2	8
75	9.5	12.3		10.6	10.1
90	11.4	13.2		11.6	12.6
Average	7.2	9.8		8.3	7.5
Standard Deviation	4.4	3.7		3.8	5
Skewness	-1.2	-1		-1.3	-0.9
Correlation	0.85			0.85	

Authors' compilations of estimated returns to schooling using a standard Mincerian earnings functions applied to 63 household data sets from 42 developing countries. These are the same data sets used for Figure 1 except that some data sets are dropped because they did not have separate information on urban, rural, male, and female earnings. We thank Claudio Montenegro for supplying these estimates.

A second generalization is that in all but a handful of countries, estimated returns to schooling are higher for girls than for boys. Estimated returns average 7.2% for men and 9.8% for women across the data sets. One might suspect that the difference in returns is due to a selection problem—a lower proportion of women than men are engaged in wage work, and so one might suspect that it is the most productive women that are disproportionately drawn into the labor market. However, the direction of bias is not obvious—women who opt not to enter the labor market will have a value of time in nonmarket activities that exceeds their market value, and so

the bias could go in the opposite direction. However evidence presented by Schultz (1999) and Duraisamy (2002) suggests that selection has similar effects for men and women.[3]

A third notable finding is that in about two thirds of the countries, returns to urban residents exceed those of rural residents, although the differences are smaller than those between men and women. Estimated returns average 8.3% for urban workers and 7.5% for rural workers. Again, one might suspect that the returns to rural workers are biased upward because a disproportionate share of rural workers will work without wages on home enterprises or farms. Again, the direction of bias is unclear, as those opting to work on farm will have a higher value of time than their market opportunities. Additionally, higher wages in cities create an incentive to migrate from rural to urban markets, and so rural residents with the highest market skills will likely have moved to the cities.

Finally, the most telling result from the analysis of differences in returns to schooling across groups within countries is that the differences are so small. Estimated returns are very highly correlated across groups. The correlation in returns is 0.85 both between men and women and between urban and rural residents. Labor markets that reward education highly for men also reward education highly for women. Countries that value education highly in their urban markets also place high value of education in their rural areas.

These returns suggest that across a wide array of countries at all stages of development, education offers consistent, significant positive wage returns—not only to urban male youth, but to women and rural youth as well. Nevertheless, a year of schooling will be more productive in

[3] One exception to this generalization that women have higher returns to schooling than men appears in transition economies. On average, women's rate of return to secondary education is 0.6 percentage points lower and their return to university education is 1.3 percentage points lower than estimated returns for men (Patrinos and Psacharopoulos, 2007).

some environments than others. All of the returns distributions in Table 1 are skewed downward, and so there is a tendency to have more extreme outliers at the bottom than the top. One reason that we know exists but we cannot illustrate easily is that school quality differs across countries. However, if the economic environment rewards educational investments, then developing country parents have an incentive to seek private schools when the public sector supply is lacking. Therefore, we find it useful to examine other reasons why countries or their citizens may not capture the reward from schooling.

II. Where are benefits from schooling greatest?

Schultz (1975) noted that human capital is most valuable in disequilibrium environments. Writing from the perspective of agricultural economies, Schultz argued that in the absence of technological change, production shocks, or price shocks, traditional rules of thumb on how to efficiently manage a farm would be adequate. Consistent with that presumption, Fafschamps and Quisumbing (1999) and Godoy, Karlan, Rabindran and Huanca (2005) found that schooling has a negligible effect on productivity on traditional farms, even though schooling raises earnings in the same locations for farmers engaged in wage work off the farm.

On the other hand, human capital has been shown to play a very important role in agricultural environments encountering technological change. Huffman and Orazem (2007) show that the process of economic development almost universally requires an agricultural transition in which dramatic increases in the efficiency of food production both frees up labor for emerging industrial sectors while lowering the price of food (and hence raising real wages) in urban areas. The most educated farmers are the first to adopt improved varieties, equipment, and

production practices (Huffman, 1977; Besley and Case, 1993; Foster and Rosenzweig, 2004a; Abdulai and Huffman 2005). In India, returns to schooling were highest in areas where Green Revolution technologies were most complementary with local agriculture (Foster and Rosenzweig, 1996).

In order for human capital to attain its highest returns, labor must be able to adapt to disequilibria, whether by moving to industries or areas with the strongest labor demand, adopting or developing new technologies, or switching occupations to fulfill market needs. Good adaptive decisions require a reward, and so human capital will be most valuable when social or governmental institutions place few restrictions on mobility or trade, when wages and prices are flexible, and when property rights are enforced.[4] There is no stronger evidence of the role of freer markets in enhancing human capital productivity than in the rapid increase in returns to schooling observed in virtually all formerly planned economies as they made their transitions toward market systems (Fleisher et al, 2005).

Sen (1999) further stipulates that it is not so much any one economic institution as the combination of institutions that is important in defining economic freedom and the ability to seek rewards for skills. When we divide our countries into groups based on their relative ranking in the Heritage Foundation's Economic Freedom Index,[5] we get a picture of the importance of the overall economic environment in fostering returns to schooling (Figure 1). Because higher index scores signify less economic freedom, countries whose index scores are in the lower half of the Economic Freedom Index have less regulated economies, fewer restrictions on trade, flexible

[4] Acemoglu, Robinson, and Johnson (2001), Acemoglu, Johnson, and Robinson (2002) have examined the role of institutions that constrain or enhance mobility in retarding or fostering economic growth.
[5] Information on the Heritage Foundation Index is available at http://www.heritage.org/research/features/index/chapters/pdfs/Index2006_Chap5.pdf

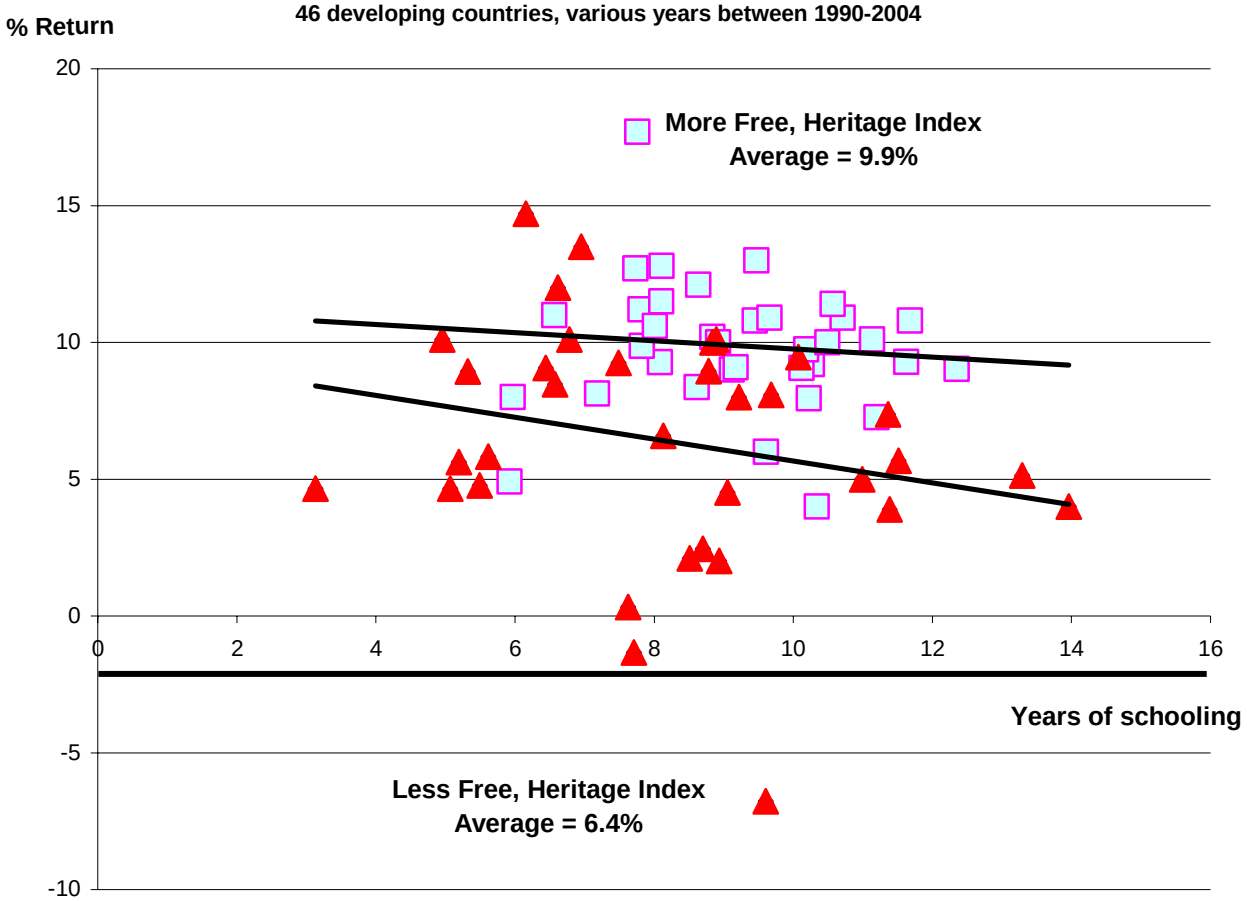
wage and price adjustments, and government enforcement of property rights. Returns to schooling are, on average, just under 10% in these "economically free' countries. In contrast, countries in the more regulated half of the index have returns to schooling averaging only 6.4%. The gap in average returns between more and less free countries is much larger than the gap in average returns between men and women or between urban and rural markets. More economically free countries have higher average returns at both high and low levels of average schooling, a proxy for the level of development in the country. This suggests that investments in schooling will be most valuable in countries that allow workers to find their highest returns across alternative sectors and occupations.[6]

There is considerable evidence that parents do respond to rising perceived returns to schooling. In India, Foster and Rosenzweig (1996) and Kochar (2004) found that rural enrollments rise in areas with greater perceived returns to schooling due to technological innovations or rising urban demand for labor. Evidence from South Asia and Central America suggests that the rapidly growing export-oriented sectors disproportionately hired more educated youth, and that hiring has frequently targeted educated young women. This has helped to increase enrollment for girls even without an explicit program aimed at raising girls' enrollment (Gruben and McLeod, 2006). Nevertheless, these responses are predicated on the ability of

[6] The negative estimated returns to schooling came from Azerbaijan in 1995; Moldova in 1998; Cambodia in 1997; and Vietnam in 1992 although Moock, Patrinos and Venkataraman (2003) found small but positive returns for Vietnam in 1992-93. More recent surveys available for Cambodia and Vietnam have generated positive returns to schooling as the countries have liberalized their economies and improved the climate for protection of life and property.

human capital to move to the area or sector where it can find its highest potential value in the economy, and on parental ability to perceive those potential rewards.[7]

Figure 1: Returns to schooling by high and low values of the Heritage Economic Freedom Index
46 developing countries, various years between 1990-2004



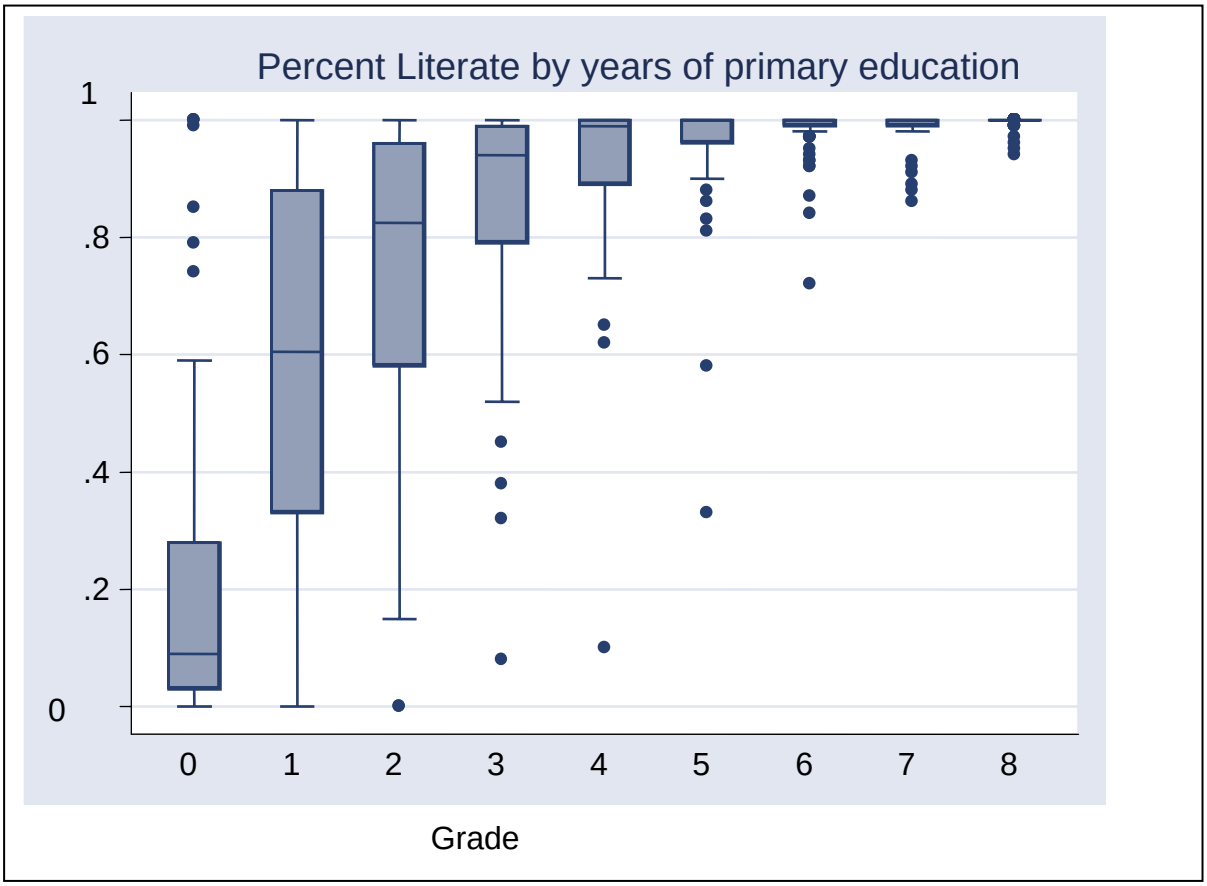
Source: Authors' compilation of 69 earnings regressions compiled by Claudio Montenegro using household data from 46 countries. Note that the data used for Table 1 are a subset of these data sets.

[7] Datt and Ravallion (2002) argue that economic growth in India has tended to benefit most those groups with more schooling. Sources of growth were complementary with skills. This is another way of saying that efforts to fight poverty through growth must include measures to raise the human capital assets of the poor.

We should emphasize that just spending time in school is not enough to generate a return. More important is what is learned during the time in school. Investments of time and money in a child's schooling that fail to produce basic cognitive skills such as literacy are almost surely wasted. In fact, studies that include both years of schooling and measures of cognitive skills find that it is the latter and not the former that drive earnings (Glewwe, 2002). Similarly, Hanushek and Kimko (2000) found that it is average cognitive attainment and not average years of schooling that drives economic growth. Hanushek and Woessmann (2007) show that the cognitive skills of the population – rather than mere school attainment – are powerfully related to individual earnings, to the distribution of income, and to economic growth. Their empirical results show the importance of both minimal and high level skills, the complementarity of skills and the quality of economic institutions, and the robustness of the relationship between skills and growth.

Nevertheless, as shown in Figure 2, the probability of attaining self-reported literacy rises with years of schooling, although there is considerable variation in the pattern across countries. Children who complete the primary cycle, about six years of schooling, are almost certain to attain literacy in most countries. While one could argue that these children could have attained literacy without schooling, the Figure shows that relatively few literate individuals never attended school. This presumption that schooling is needed for literacy underlies the Millennium Development Goal of attaining universal primary education (UPE) by 2015.

Figure 2: Distribution of self-reported literacy by grade attainment for youth aged 15-24, various countries



Source: Authors compilation of summary data from 73 household surveys spanning 57 developing countries provided by Claudio Montenegro of the World Bank

Various estimates generated by UNESCO, UNICEF, and the World Bank place the annual additional cost of attaining UPE at between $9-34 billion. These estimates use various applications of procedures that apply current average costs of schooling to the fraction of children not in school. Even these high cost may be understated because the children who are currently not in school are disproportionately located in areas that are expensive to reach with

schooling services or in households that are less keen to send children to school.[8] Others are not in school despite having access to local schools, and so adding more supply will not address the problem. We argue that in order to make efficient progress toward the UPE goal, we need to identify which illiterate populations can be served most economically.

III. Should investments concentrate on the primary level or other levels?

Much of our discussion will concentrate on raising the fraction of literate adults in the world, but for many developing countries that have already attained UPE, that level of schooling is no longer relevant. It is useful to comment briefly on why we focus on lower levels of schooling in identifying the highest benefit to cost interventions in the schooling arena.

It has commonly been presumed that schooling is subject to diminishing returns so that the returns to primary schooling would exceed those for higher levels of schooling. Estimates of social returns to schooling reported by Psacharopoulos and Patrinos (2004) support that conjecture. Reported per capita schooling costs also suggest that the highest returns must be at the lowest levels; government per pupil costs of secondary schooling in low-income countries are more than double the costs for primary schooling, and the per pupil tertiary costs are nearly 34 times the primary costs. It is unlikely that any gains in relative private returns are large enough to reverse the pattern of diminishing social returns to schooling.

Both theoretical arguments and empirical evidence support the view that interventions early in life will have the highest returns. Carneiro and Heckman (2003) and Heckman and Masterov (2007) present a wealth of evidence that earlier investments in human capital including

[8] Glewwe and Zhao (2006) present a summary of these estimates and a critique of the methodologies employed.

those occurring before the start of the formal schooling dominate efforts to remediate schooling later in life. It seems that because human capital development builds upon past accumulations of human capital, it is extremely important to develop a strong human capital base at an early age. Numerous pathologies including criminal activities, drug abuse, idleness and chronic illnesses can be linked to a weak human capital foundation in the form of nutrition, health and schooling from the youngest ages.

Nevertheless, in some settings, particularly those of more advanced developing countries, returns may be substantial at the secondary or even tertiary level. In industrialized economies, private returns to tertiary schooling rose relative to returns to secondary schooling as new technologies and investments in capital complemented the skills of college graduates (Schultz, 2004). One might suspect that similar changes are increasing the private returns to those with secondary or tertiary educations in developing countries.

This is particularly true in countries with strong growth in export trade. Xu (2000) argued that a developing country can expect to attract technology from multinational enterprises only if it has an adult population that meets a threshold level of education of roughly 10 years of completed schooling. That assessment is consistent with findings that workers in foreign-owned enterprises in Indonesia, Vietnam, Malaysia, Guatemala, and elsewhere tend to be drawn from the upper tail of the schooling distribution in those countries (Goldberg and Pavcnik, 2007), although the experience in Mexico appears to be in the opposite direction (Robertson, 2004). It is plausible that the rising returns to skill in the export sectors occurs when there is insufficient migration toward growing sectors of the economy and/or because there is an insufficient supply of the types of skills exporters demand.

The OECD (2000) revised the definition of literacy to progress well beyond basic facility with reading and mathematics to incorporate functioning efficiently in the information age. This presents another illustration of the Schultz hypothesis: the level of minimal functional literacy rises with the level and complexity of the economic environment. As a country develops, the minimal level of schooling required to function effectively will increase. However, in those economies, many of the barriers to obtaining the requisite skills will be falling as the country progresses. The countries we will focus on herein have not yet attained that level of development for a large portion of their citizenry.

IV. If parents respond to returns, what is the public role in schooling investments?

As we argued in section II, parents increase the intensity of their investments in schooling when expected returns rise. If true, then why don't parents select the efficient amount of time to send their children to school, the time at which the private rate of return to an additional year of schooling is equal to the market rate of return to other investments of comparable risk? Either there must be returns to schooling that are not captured by the households or there must be constraints on household schooling investments that prevent them from selecting the optimal investment.

Several external benefits are frequently associated with women's schooling. The fertility transition, the common result that the number of children per woman declines as economic growth occurs, has been tied to increases in women's value of time as their education increases (King and Mason, 2001; Schultz, 2002). Angrist et al (2002) and Schultz(2004) both found that increased schooling from randomly assigned vouchers and conditional cash transfers led to

reduced fertility behavior, although the evidence was somewhat weaker in the latter case. Increases in women's (and men's) schooling has also been associated with improvements in the health of their children and other family members, with improvements in the schooling of their children, and as a consequence, a rising quality of life from one generation to the next (de Walque, 2005; Oreopoulos et al, 2006; Paxson and Schady, 2007). More schooling is associated with later age of marriage and teenage birth rates which also improves health and schooling outcomes of the next generation (Black et al, 2004, 2005a; Cardoso and Verner, 2006). Many of the most recent studies utilize changes in truancy laws to generate plausibly exogenous changes in years of schooling (eg, Patrinos and Sakellariou 2005), increasing the confidence that these effects of parental schooling on children's welfare are causal. While in developed countries, some studies find only modest effects of parental schooling on their children (Black et al, 2005b), the effect appears to be stronger in developing countries. [9]

Markets are credited with improving the allocation of resources in an economy, but those resource allocation decisions require agents who are able to absorb and react to information. Schooling is credited with lowering search costs and improving allocative efficiency which have both private and social benefits. These efficiency gains will be spread broadly in the economy. For example, better educated people are better able to migrate from rural to urban markets or from less productive to more productive sectors, helping those markets allocate labor efficiently. This implies that the economy will be producing more output from the same inputs, increasing the total size of the pie available. Not all of these benefits will be captured by the migrants

[9] One could argue that to the extent that these transfers of schooling and health are confined within dynastic households, they are not really externalities. Parents will get utility from their children's health or future welfare. Nevertheless, there may still be external benefits to having healthier and more educated progeny that are not fully captured by the parents and their children.

themselves (for example labor that does not migrate will get higher wages as the migrators pursue their interests). Returns to capital are also enhanced by efficient allocations of labor.

Empirical studies have consistently found that it is the better educated who are the most likely to adopt new technologies. Of course these agents are acting in their own self-interest, but there will be benefits that are acquired by others as well. For example, because food demand is relatively inelastic, improved productivity in the agricultural sector from newly adopted technologies or enhanced farming ability will lower food prices which raises consumer surplus. Lower food prices will tend to raise the purchasing power of urban wages and will hasten the shift of labor out of agriculture to the industrialized sector of the economy.

In Foster and Rosenzweig's analysis of the distribution of benefits from India's Green Revolution, it is first apparent that the technologies were adopted by relatively skilled farmers in areas with complementary land and irrigation. The social or private returns to the technology would have been negligible without a group of framers able to successfully implement the technologies. Falling food prices did displace some farmers, but the displaced agriculture labor fueled a rural industrialization. There was an expansion of manufacturing employment, wages and incomes in rural areas that were less suited to the Green Revolution, areas that benefited nevertheless from the increased productivity of the farmers in the Green Revolution districts.

Improved schooling opportunities can raise the quality of public servants and hence of public good provision. Indeed, improved human capital is believed to improve the quality of governance in democracies.[10]

[10] Haveman and Wolfe (1984) have a detailed review of the sources of private and social returns to schooling.

Another reason private schooling decisions may deviate from social optima is if parents face borrowing costs that exceed the market interest rate. Becker and Tomes (1986) showed that if households are credit constrained, they will underinvest in their children's schooling, but all intergenerational transfers will be in the form of human capital and not wealth. Households that are not credit constrained will invest optimally in their children's schooling and then make any additional transfers in physical wealth. This may be why there is a stronger apparent tie between parental and children's schooling in developing countries. In developed countries, credit constraints may not be important and so variation in children's schooling is not as strongly tied to parents education or wealth (Carneiro and Heckman, 2003; Cameron and Taber, 2004). However, substantial segments of poorer countries are more likely to face credit constraints that will limit children's schooling opportunities.

The best evidence regarding these credit constraints is that child schooling appears to be atypically sensitive to unforeseen fluctuations in household income, positive or negative. Edmonds et al (2006) found that unexpected pension income raised schooling of grandchildren in South Africa. In another setting, opening the Vietnam market to trade caused rapid increases in household income that increased child schooling in Vietnam (Edmonds and Pavcnik, 2006). Negative income shocks from weather or national recessions cause poor households to reduce child time in school (Jacoby and Skoufias, 1997, 1998; Funkhouser (1999); Thomas et al. (2004); Glewwe and Jacoby, 2004). There is evidence that better educated parents can absorb these shocks more effectively (Glewwe and Hall, 1998).

The existence of liquidity constraints creates a second role for government provision of schooling, even in the absence of external benefits. Underinvestment in schooling by poor

households means that the level of national skills will be lower than optimal. Furthermore, the underinvestment will be concentrated among poor children who will then be consigned to poverty in the future due to their poor human capital endowments. Government provision of schooling can therefore be justified also as a means of equalizing the opportunity to escape poverty across households of varying economic status.

V. Where are the most serious gaps in enrollment rates?

One of the Millennium Development Goals is to attain universal primary education by 2015. Despite the consistency in estimated returns to schooling across countries, genders, and regions within countries, it is unlikely that this goal will be met. This section highlights which groups lag the furthest behind in attaining the goal and which lagging groups can be aided in the most cost effective manner.

To illustrate the magnitude of the problem, we make use of 72 household data sets on schooling attainment compiled by Deon Filmer of the World Bank. All data sets were collected between 2000-2006. We computed the fraction of 20-29 year olds who completed grades 1, 5 and 9 in order to show how rapidly educational attainment drops off in these developing countries. The grade 5 information is of particular interest in that completion of five years of schooling represents near assurance of lifetime literacy and numeracy. Separate estimates were generated for males and females and for urban and rural residents.

Figures 3a-b show the first illustration. Each point represents paired male and female proportions of the 20-29 year old population that completed a given grade level in a country. Figure 3a shows the relationship for urban areas and Figure 3b for rural areas. The dotted 45^{o}

line indicates combinations where males and females are equally likely to attain the grade level. Values on the axes range from 0 to 1 with 1 representing universal attainment. The average schooling attainment combinations also indicated for each grade level using dashed lines. Note that by construction, the pattern of dots will move toward the origin as the level of schooling increases because the fraction completing grade 9 or more must be smaller than the fraction completing at least grade 5 which will, in turn, be smaller than the fraction completing grade 1.

Figure 3A: Proportion of Male and Female Urban Population Completing Grades 1, 5 and 9 in 72 Developing Countries

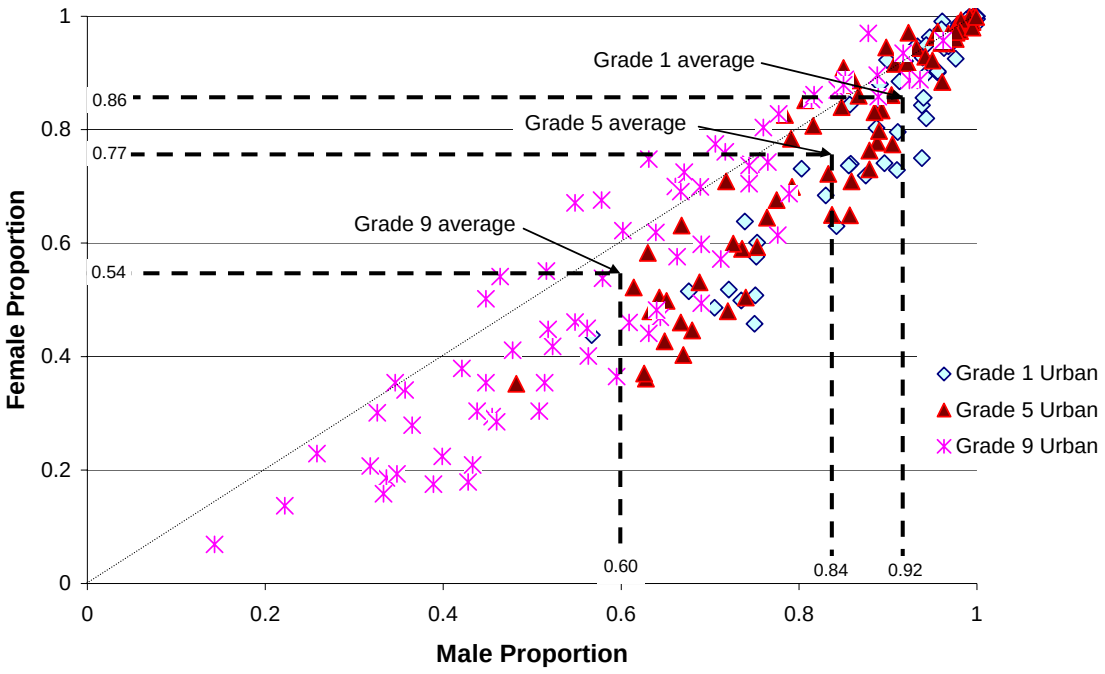


Figure 3B: Proportion of Male and Female Rural Population Completing Grades 1, 5 and 9 in 72 Developing Countries

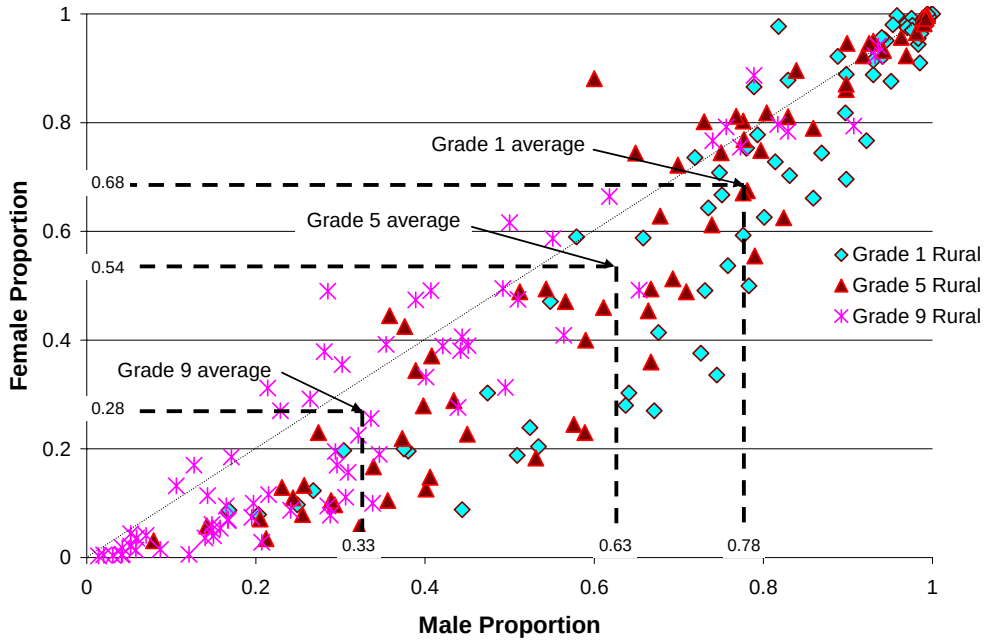


Figure 4A: Proportion of Male Urban and Rural Population Completing Grades 1, 5 and 9 in 72 Developing Countries

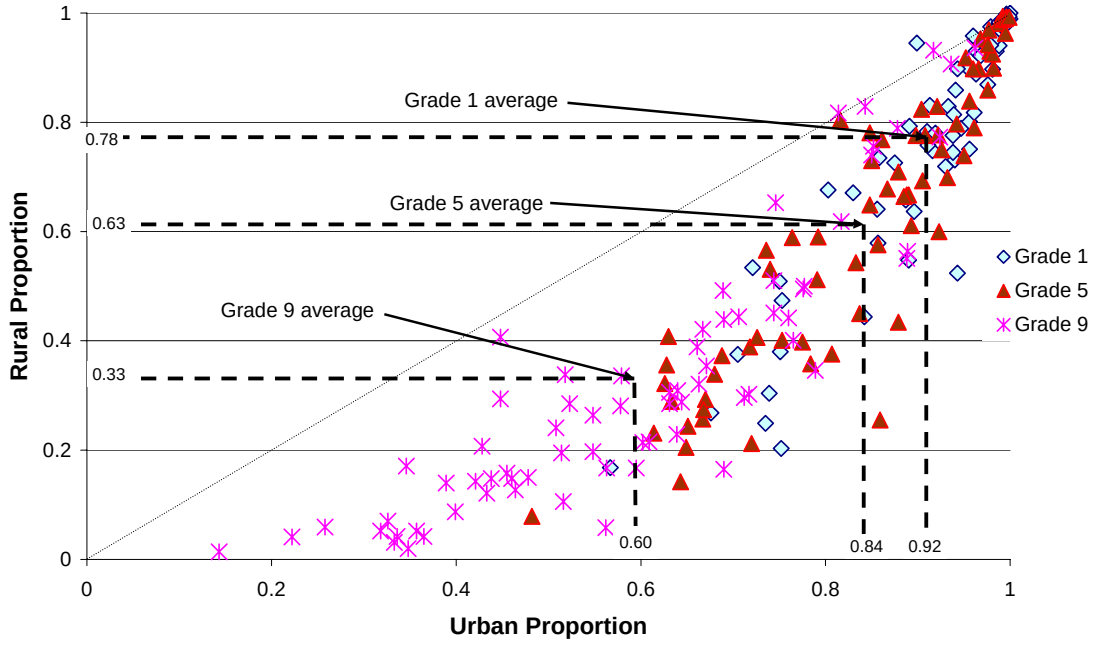
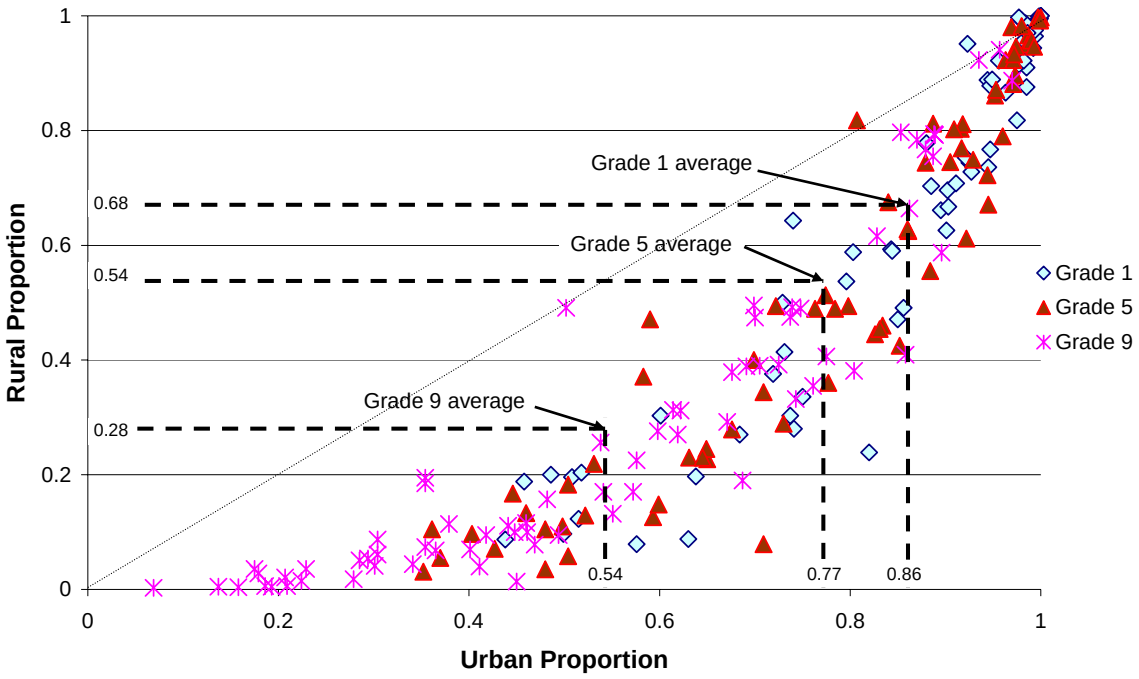


Figure 4B: Proportion of Female Urban and Rural Population Completing Grades 1, 5 and 9 in 72 Developing Countries



Source: Authors' compilation of educational attainment data compiled by Deon Filmer from 72 original household surveys collected from 2000-2006. http://www.worldbank.org/research/projects/edattain/

Several facts emerge. First, most of the grade 5 points lie well below (1,1), and so most developing countries have yet to meet the goal of UPE. This is particularly true in rural areas. In urban areas, the norm is for 77% of women and 84% of men to complete grade 5. In rural areas, the norms are 54% and 63% respectively. Aggregating across the 72 developing countries using population weights, 13% of urban residents and 28% of rural residents fail to complete 5 years of schooling. Second, in both urban and rural markets most combinations lie below the 45^{o} line, indicating that on average, males are more likely to reach each grade level than females. Women are farther away from UPE than men. The population-weighted aggregates are that 20%

of men and 26% of women fail to complete 5 years of schooling. Nevertheless, in some countries, girls do receive more schooling than boys. Third, rural points tend to be farther from the 45° line, and so male-female schooling gaps tend to be largest in rural areas. Finally, there is considerable heterogeneity across countries in schooling attainment levels, and so it is unlikely that the same strategy to raise enrollments would work in all countries. Some have yet to get a majority of children to complete grade 1 while others are approaching universal completion of grade 9, at least in their urban areas.

Figures 4a and 4b repeat the exercise except that the points are combinations of urban and rural schooling attainment levels for males and females separately. Almost all combinations lie below the 45° line, indicating that urban residents get more schooling than rural residents. The degree of schooling inequality between urban and rural children, as indicated by the distance from the 45° line, increases with schooling level. Only 8% of urban males fail to complete the first grade compared to 22% of rural males. Sixteen percent of urban males and 37% of rural males failed to complete grade 5, the gaps that must be filled to attain UPE. For both urban and rural males, there is a sharp drop off in attainment after grade 5. In only 60% of countries do a majority of male children complete grade 9, and only rarely do rural males reach that level.

Schooling levels are even lower for females. As shown in Figure 4b, almost all combinations lie below the 45° line indicating that urban females almost always get more schooling than their rural counterparts. A large advantage for urban females opens up immediately upon school entry. Just over two-thirds of rural females complete one year of schooling, but only 54% manage to complete grade 5. Of urban females, 86% complete at least one year of schooling and 77% complete grade 5. The UPE goal has not yet been satisfied for

about one quarter of urban girls and one half of rural girls in developing countries. Consequently, while problems are not the same across countries, a significant proportion of developing countries have yet to attain the UPE goal.

VI. Where can schooling be increased are the most serious gaps in enrollment rates?

Given the substantial gap from UPE, our task is to identify where schooling attainment can be expanded most efficiently. In Table 2, we present the stylized facts regarding the population of youth aged 15-19 that failed to complete grade 5 by region of the world. All youth in this age range should have been able to complete grade 5. We decompose the population failing to complete grade 5 into two groups, those who never went to school and those who dropped out before completing grade 5. We present the data by population-weighted averages of geographic regions.

Our contention is that it is less expensive to get the children who have dropped out to complete the primary cycle than it is to get children who never attended school to attain literacy.

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Table 2: Percent of youth 15-19 years old not completing grade 5 by region and by dropout versus never starting school									
	Africa		Asia			Eastern Europe	Latin America		Middle East
Sample	East-South[a]	West-Middle	East-Pacific	South	China	Central Asia	Central	South	North Africa
	[15]	[20]	[11]	[6]	[1]	[11]	[10]	[9]	[3]
All children									
Not completing[b]	40.9%	46.5%	12.6%	32.2%	1.3%	4.8%	17.5%	14.3%	19.1%
Never starting[c]	14.4%	24.6%	2.6%	17.1%	0.0%	3.5%	6.9%	0.8%	7.4%
Drop out[d]	26.5%	21.9%	10.0%	15.1%	1.3%	1.3%	10.6%	13.5%	11.7%
Males									
Not completing[b]	39.9%	40.9%	13.1%	25.0%	1.0%	3.3%	18.1%	16.5%	15.2%
Never starting[c]	12.5%	20.7%	2.4%	11.1%	0.0%	1.6%	7.8%	0.9%	4.2%
Drop out[d]	27.4%	20.2%	10.7%	13.9%	1.0%	1.7%	10.3%	15.6%	11.0%
Females									
Not completing[b]	41.9%	51.9%	11.9%	39.9%	1.8%	6.3%	16.8%	12.2%	22.9%
Never starting[c]	16.7%	28.5%	2.8%	23.5%	0.0%	5.0%	6.1%	0.7%	10.6%
Drop out[d]	25.2%	23.3%	9.2%	16.3%	1.8%	1.3%	10.7%	11.5%	12.3%
Urban									
Not completing[b]	20.4%	29.0%	7.3%	18.5%	1.2%	4.0%	11.4%	10.6%	10.6%
Never starting[c]	5.0%	13.2%	1.6%	8.1%	0.0%	2.2%	4.4%	0.6%	3.2%
Drop out[d]	15.4%	15.7%	5.7%	10.4%	1.2%	1.9%	7.0%	10.0%	7.4%
Rural									
Not completing[b]	46.6%	56.8%	15.1%	37.6%	1.4%	6.2%	23.9%	29.0%	27.9%
Never starting[c]	16.3%	30.6%	2.9%	20.6%	0.0%	5.4%	8.9%	1.7%	11.4%
Drop out[d]	30.3%	26.2%	12.1%	17.0%	1.4%	0.8%	15.0%	27.3%	16.5%
Bottom two household income quintiles									
Not completing[b]	55.0%	64.7%	24.0%	54.0%	1.8%	6.8%	44.6%	15.3%	35.2%
Never starting[c]	22.2%	36.8%	5.5%	27.8%	0.0%	5.7%	8.9%	1.7%	15.2%
Drop out[d]	32.9%	28.0%	18.5%	26.2%	1.8%	1.1%	35.8%	13.6%	20.0%
Source: Authors compilation of data compiled by Deon Filmer from the most recently available household surveys conducted in each of 86 developing countries between 1994-2005. http://www.worldbank.org/research/projects/edattain/									
[a] Population-share weighted averages of countries in the region. Number of countries included in the regional average is in brackets									
[b]The share of 15-19 year-olds who did not complete grade 5									
[c]The share of 14 year-olds who never attended school									
[d]Estimated share of 15-19 year-olds who started school but dropped out before completing grade 5									

We know that for children who at least started school, there exists school capacity that induced parents to send the child to school. In addition, these parents at least cared enough about their children's schooling to make an initial investment of child time. More difficult is to induce parents who have not sent their children to school to enroll the child for the first time and to take the child through the primary cycle. The reason we focus on completing at least five grades is the result from Figure 2 that five grades are sufficient to attain literacy. Investments that do not successfully carry the child through grade five are likely to be wasted.

The fraction of children not completing grade five varies from very small proportions in China, Eastern Europe and Central Asia to over 40% of the children in Africa. Worldwide, excluding China and the Eastern Europe and Central Asian countries, 30% of children in developing countries fail to complete the fifth grade. Of these, 55% started school but drop out. To put these proportions into perspective, about 112 million children were born in developing countries in 2004. We estimate that 26 million of these children will fail to complete grade 5. Of these, 14.4 million will start school and drop out before attaining literacy and numeracy.[11] Those 14.4 million represent the most cost effective target for raising literacy rates in the world. If we were to get these 14.4 million children to complete the primary cycle, the gap from UPE in these countries will decrease from 23% to 10%.

The other statistics in Table 2 demonstrate that for almost all demographic groups, substantial progress toward UPE can be made by reducing dropouts. Aggregating across countries, 61% of males and 49% of females who failed to complete grade 5 did so because of dropout. The corresponding ratios for urban and rural residents are 62% and 55% respectively. We also add information on children in the lowest two quintiles of the income distribution.

[11] Our fraction of children not completing grade 5 is reasonably close to the UNESCO estimate of the fraction of children who are illiterate.

With the use of the younger cohort, we can show one additional result: the school entry, completion and dropout rates for children living in households in the poorest two income quintiles. Children in the poorest households fail to complete grade five in higher proportions in every part of the world. Thirty-seven percent of the poorest children fail to complete grade five compared to 23% overall. Of these, 54% dropped out after starting school. For all these groups, therefore, reducing the incentives to dropout would generate substantial progress toward Universal Primary Education for all demographic groups in all regions of the developing world.

VII. Supply-side interventions

There are two avenues through which governments can influence parental schooling choices. Supply-side policies aim to improve the quantity or quality of schooling offered. These policies include direct provision of newly constructed schools or of school supplies by the central government, but they can also involve the decentralization of school control to local authorities who are believed to be able to allocate resources more efficiently to meet school needs. Demand-side policies attempt to directly influence parental incentives to allocate more of their children's time to school. We will argue that demand-side policies show more promise for cost-effective means of enhancing schooling outcomes, but we will first explain why we view supply-side mechanisms as less promising.

1) If you build it, they may not come.

The biggest concern with new school construction is that most of the costs of new building and staffing are incurred before we find out if parents will send their children to the school. Duflo's (2001) analysis of Indonesia's massive public works project that doubled the number of primary schools in a six year period resulted in a statistically significant but small 3% increase in average years of

schooling. Similarly, Filmer's (2004) analysis of the relationship between distance and enrollments across 21 developing countries generally found very small marginal effects of lowering distance. Enrollments do not appear to be highly sensitive to distance to school. This does not imply that school provision is unimportant—only that the existing supply is already located in the most dense child populations. New schools will be disproportionately located in relatively remote places where there are relatively few children to add to the rolls and relatively high costs of adding capacity.

Frequently forgotten in the analysis of new school construction projects is that they may cause some students currently going to private schools to switch to the new public schools. This is particularly true in urban areas of developing countries where private schools are more plentiful. As public school supply is expanded, some private school students will switch to the public schools and some private schools will close, diminishing the benefits of the supply expansion.[12] In rural areas where private schools are frequently nonexistent, there is no crowding out effect of government school expansion.

2) Quality matters, but we don't know how to foster quality

It is undoubtedly true that higher quality schools enhance human capital production and raise school demand. However, research has failed to identify how to foster improved quality. For example, Rivkin, Hanushek, and Kain (2005) found that good teachers systematically produce better academic outcomes than do bad teachers. Unfortunately, good teachers and bad teachers look very much alike statistically—they have the same education levels, similar demographics, receive the same in-service training and are compensated similarly. In other words, teacher quality matters, but we don't know what matters for teacher quality. As teachers represent 74% of recurring school

[12] See Jimenez and Sawada (2001).

expenditures in developing countries (Bruns et al, 2003), it would seem that any policy aimed at improving school quality would have to confront teacher quality. The lack of agreement about how to foster teacher quality thwarts any general prescription regarding likely cost-effective avenues for improvement.

There have been many studies of the educational production process with very inconsistent findings. Teacher or school attributes that appear critically important for student performance in one study prove unimportant or even detrimental in another. Experimental designs don't really resolve the problem because the value of one type of input (textbooks, say) may depend on what other assets the school has available (trained teachers, English medium instruction). A particular experimental infusion of inputs may succeed in some settings and not others, complicating the applicability of the lessons to other schools and settings. As an example, Glewwe, Kremer and Moulin (2007) found that making textbooks more available in Kenya benefited students in the upper tail of the ability distribution who were prepared for the English medium texts, but the texts had no impact on below average students who could not read those textbooks.

Chaudhury et al (2006) report that in developing countries, teachers are absent about 20% of the time. Such absenteeism rates have a tremendous impact on the education sector. In terms of direct loss of financing, it is estimated that between 10 and 24 percent of recurrent primary education expenditures are currently lost to teacher absenteeism. Losses from teacher absenteeism range from $16 million a year in Ecuador to $2 billion a year in India (Patrinos and Kagia 2007). Many of the absences are perfectly legal as schools offer numerous benefits for teachers, including many days of sick leave and annual leave. One might guess that simply removing these legal absences would help resolve the problem, except that comparisons of spot-check attendances with official attendance

registries indicates that off-contract absences are rarely reported. Duflo and Hanna (2005) report on the effect of placing cameras with time indicators into remotely sited schools in India. Compared to schools without cameras, teacher attendance rises substantially. When teachers attend more regularly, their students attend more regularly as well, and the students appear to perform better on standardized tests. This experiment holds promise as a means of reducing shirking by teachers in a cost-effective manner, but we do not yet have enough information in other settings to know if these results generalize.

It is undoubtedly true that higher quality schools enhance human capital production and raise school demand. However, our lack of clear rules of thumb regarding how to improve school quality suggest that we are not yet prepared to make general propositions regarding likely cost-effective avenues for improvement.

3) Are better managed schools better or are better schools better managed?

International agencies have made decentralization of school management a central theme of new efforts to improve the efficiency of public service delivery in developing countries (Bardhan, 2005). The clear attraction of the strategy is that it offers the potential of improving school outcomes without spending more on the schools—we simply "spend smarter and not harder" to modify the common aphorism. The available evidence, even that often used by proponents of decentralization, is really too uncertain to provide a high degree of confidence that local management can work in all settings, without complementary investments. Studies by Jimenez and Sawada (1999) of the EDUCO[13] schools in El Salvador and by King and Ozler (2001) of the autonomous schools in Nicaragua found that schools that exercised more local autonomy experienced gains in student attendance or test scores

[13] EDUCO comes from the Spanish acronym "Educacion con Participacion de la Comunidad" or "Community Managed Schools".

compared to other schools. However, participating schools are not randomly drawn – local authorities had to self-select into the programs and would be dropped if they did not fulfill their obligations. It is likely that the schools opting to accept local responsibility differ in ways that could vary school outcomes compared to communities that did not elect to participate in the program. In other words, a finding that autonomous schools outperform schools that do not behave autonomously does not imply that the nonautonomous schools would have better outcomes if they too behaved autonomously.

More recent papers continue to find that schools that behave more autonomously differ in important ways from those that do not exercise authority. Gertler, Patrinos and Rubio-Codina (2006) find that Mexico's rural school-based management intervention resulted in a small but statistically significant reduction in repetition and failure rates for schools in poor areas. Galiani, Gertler and Schargrodsky (2005) found that early adopters of a school management program in Argentina experienced the largest improvements n schooling outcomes, although the reason schools adopted earlier is unlikely to be random. For example, in Argentina, the early adopters were the wealthiest schools.

Even if decentralization were known to raise schooling outcomes using the same inputs, it is not clear how governments can best foster decentralization. Gunnarsson et al (2007) found that most of the variation in the practice of local school autonomy occurs within and not between countries, suggesting that national policies to foster decentralized decision-making may have little effect on actual school autonomy.

We may eventually have a better grasp of how to foster local school management and how to generate the skills needed to manage schools in areas that do not already have those skills. At the

current level of knowledge, it is premature to make a general recommendation that local school management will improve schooling outcomes.

4) Returns to increased school supply come after a long lag

Supply-side interventions generally require the allocation of funds upfront with the hoped for child or parental response only becoming apparent later. Once built, there is no economic return to a new school unless children attend, but it may be five years before children attain permanent literacy. It may take some time for parents to react to school quality improvements. Similarly, it may take some time for teachers and students to respond to better local school management. The combination of upfront costs, uncertain response, and delayed benefits place supply-side interventions at a cost-benefit disadvantage compared to the demand side alternatives we examine next.

Efforts to shift the demand for schooling have some distinct advantages over efforts to influence supply with regard to benefit-cost comparisons. Demand-side stimulus can be targeted to the particular population currently not in school, whereas supply side interventions will generally involve some redistribution of children who are already in school to new schools. Demand-side interventions can be made contingent on the child being in school, meaning that payment only occurs if the program is working. In contrast, supply-side interventions generally require the allocation of funds upfront with the hoped for child or parental response only becoming apparent later. Finally, demand-side interventions can immediately influence behavior and so they have an advantage relative to the more heavily discounted benefits of supply-side interventions, at least in terms of increasing enrollment. Even so, some supply-side interventions may be justified for learning outcomes gains and on equity grounds, even though they could not yet be justified under strict application of benefits against costs. Adding schools to rural areas is expensive, and there may be insufficient numbers of students to take

advantage of the returns to scale needed to make the school cost-effective, even with 100% enrollment. Similarly, some reforms may be needed to shift the incentives for teachers or the aspirations of students, even if the reforms will only take hold over a long time.

VIII. Demand-side interventions

There are three types of interventions that we will review, interventions in child health or nutrition that attempt to improve the child's physical or mental ability to learn; efforts to lower the cost of public or private schooling that enhance the household's ability to pay for schooling; and income transfers to the households made conditional on the child's enrollment that enhance the household's ability to afford schooling while lowering the opportunity cost of child time in school.

Demand side interventions will be most effective in settings with high income and price elasticities of demand for schooling and in areas where the schooling supply is also very elastic with respect to household willingness to pay for schooling. Stimulating demand in settings where additional school space cannot accommodate more students will have little impact. Consequently, demand-side strategies work best where there is existing excess capacity of available schools so that more children can be added at low marginal cost.

a: Health and schooling

There is a high incidence of malnutrition in developing countries. UNICEF compilations indicate that 28% of children in developing countries are moderately or severely undernourished. In areas where malnutrition or worm infestations are common, nutritional supplements or treatments for intestinal parasites offer an inexpensive way to raise school attendance and physical and mental capacity.

Numerous policies aimed at improving child health have been administered to children currently in school, including the distribution of nutrition supplements, provision of school lunches, school-based immunization programs, and delivery of health education for students. These programs have been installed from preschool through the balance of the schooling cycle, although the most rigorously evaluated have been the ones targeted at younger children.

There is substantial evidence that malnutrition early in life affects both cognitive and physical development that may be only partially reversible by better nutrition later in life. For example, Glewwe, Jacoby and King (2001) found that controlling for other household background measures, children who were malnourished early in life start school later and complete fewer years of schooling. Alderman, Hoddinott and Kinsey (2003) report similar findings for children who were malnourished because of exposure to civil war and drought in Zimbabwe. Evaluations of efforts to provide nutritional supplements to at-risk preschool children in developed countries have shown permanent improvements in physical stature and cognitive development, both of which can raise life-time earnings.[14]

Behrman, Cheng, and Todd (2004) conducted an experimental evaluation of the *Proyecto Integral de Desarrollo Infantil* (PIDI) program in Bolivia. This program provides support for daycare, nutritional inputs, and preschool activities for low-income children aged 6-72 months. For children exposed to the program for periods exceeding one year, the authors report permanent gains in cognitive development and fine motor skills. Grantham-McGregor et al. (1991) report comparable findings for a

[14] There have been several reviews of early childhood interventions that combine schooling and nutrition in developed countries. Reviews by Currie (2001), Carneiro and Heckman (2003) and Heckman and Masterove (2007) conclude that the benefits of these program frequently exceed their costs and that the programs dominate interventions that occur later in life. Recipients of early childhood training are less likely to drop out of school or engage in criminal activities. Recipients of school breakfast programs do have healthier diets (Bhattacharya et al (2006) which can benefit cognitive development.

similar program aimed at stunted infants in Jamaica, as do Armecin et al. (2005) for low-income rural households in the Philippines. Vermeersch and Kremer found that providing free breakfast to preschoolers raised attendance by 30% in Kenya but did not raise average measured skills. An analysis of a program that combined deworming medication with an iron supplement for preschoolers in India also raised attendance and physical stature.

Health programs have been shown to raise schooling investments for young school-aged children as well. Afridi (2007a,b) found that a school lunch program in India increased attendance of girls but not of boys. The program did lower the incidence of malnutrition for both boys and girls. Both of these program cost just pennies per day. In a widely publicized study, Miguel and Kremer (2004) examined the impact of a program which administered deworming medicine to school children in Kenya. The treated children increased their attendance by 0.15 years per pupil, or an implied cost of $3.50 per child-year of schooling.

Nutritional programs can also have benefits at older ages. McGuire (1996) reported that giving iron supplements to secondary school age children (13-15 years) in a low income country can raise cognitive abilities by 5-25% or the equivalent of 0.5 years of schooling. Brown et al (2006) found that provision of iron supplements and treatments for intestinal parasites to adult apparel factory workers in India improved productivity. Even for these teenage or older recipients, nutritional supplements are not expensive and can generate benefits well in excess of costs.

One reason these health interventions can be viewed as particularly cost-effective in raising schooling investments is that the schooling is a collateral benefit. The main aim for the programs is to improve child health which has a value in itself, raising the benefits side of the equation. On the cost

side, expenses are incurred only if the children participate and so there is much less potential for wasted investments than is the case for supply-side interventions.

How generalizable are these studies to other developing country settings? Miguel and Kremer (2004) argue that the potential impact of deworming on school attendance could be very large if expanded world-wide, in that 25% of children in developing countries are infected. However, it is useful to keep in mind that the impact is in raising the attendance of children already in school and not necessarily inducing children not in school to enroll. Secondly, their population of students had an infection rate of 92% and so the magnitude of the impact is likely related to fact that they selected sites atypically needing the intervention—areas with more modest infection rates would have smaller impacts. Demographic and Health Survey data suggest that health reasons are less often cited as a reason for children not being in school than are child work inside or outside the home, poverty, or lack of interest on the part of the child (Table 3). Health is cited more often in Africa and in urban areas of Latin America, but is less often cited elsewhere.

Nevertheless, school-based nutrition and health programs will have particular relevance for the poorest households that have a disproportionate share of the children who are dropping out before completing five grades. They are not expensive to deliver. Most importantly, the benefits they offer from improved health may be sufficient to rationalize the expense, even if they have no impact on schooling.

b: Lowering schooling costs

In many countries, parents face significant expenses from sending their children to school, ranging from uniforms and school supplies to tuition fees and after school tutorials. These expenses can represent a significant share of household income for poor families. Several countries have cut or

eliminated the school fees charged by government schools, including Ghana, Kenya, Tanzania, and Uganda. Results in Uganda were dramatic with a reported doubling of school enrollments. In Tanzania, enrollments rose by 1.2 million children. An evaluation by Deininger (2003) of the Uganda case found that elimination of primary fees lowered costs by 60% on average or by about $16 per child. As a result, enrollments increased 60%. Consistent with the presumption of larger price elasticities in rural area, rural enrollments more than doubled while urban enrollments rose only 16%.

The expansion came at the cost of some considerable crowding as school supplies did not keep up. Pupil teacher ratios rose from 48:1 to 70:1 in rural areas and from 38:1 to 65:1 overall. In the India school meal program, Afridi also reported that pupil teacher ratios were higher in participating classrooms because supply did not keep up with demand. It is not clear how damaging this crowding is to student learning, and presumably children would learn more in school than out of school. Nevertheless, children who were in school already may be disadvantaged as these programs raise the number of students per teacher.

Table 3: Reasons for Not Attending School in Urban and Rural Populations, by World Region

	All World Regions		Sub-Saharan Africa		North Africa & Middle East		Central Asia & Europe		South & East Asia		Latin America & Caribbean	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Work outside the home	7.4	4.2	3.3	1.8	0.7	0.7	9.3	7.8	8.7	4.4	18.3	10.0
Housework	7.3	11.5	5.3	7.9	5.6	9.9	6.3	9.3	10.7	19.7	11.7	17.9
Inadequate school supply	1.9	4.9	1.8	3.2	2.0	6.2	1.3	3.0	1.7	2.7	2.6	10.8
Poverty	18.2	18.1	24.1	23.9	4.6	3.4	1.3	0.8	24.2	26.3	11.9	11.3
Lack of interest	47.3	44.0	45.2	42.7	76.6	69.4	65.0	58.2	49.3	41.7	34.0	33.5
Health reasons	6.3	5.0	7.9	7.6	1.2	0.5	0.7	0.4	1.5	0.9	9.4	4.2
Others	11.5	12.3	12.4	12.9	9.3	9.9	16.0	20.5	4.0	4.3	12.1	12.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source- Computations provided the author by Elizabeth King based on data from Demographic

The findings of large enrollment responses have been confirmed elsewhere, although none as dramatic. The contrast with the very small increase in schooling that resulted from the doubling of the number of schools I Indonesia reported by Duflo (2001) is striking. A program that cut household costs of uniforms and school materials in Kenya, a cost of about $15 per child, increased years of schooling completed by 15% (Kremer, Moulin and Namunyu, 2003) .

The availability of less expensive teaching and infrastructure inputs is a major reason to consider private rather than government school options to serve expanding school demand. James (1993) demonstrated that in many developing countries, private schools are an important component of school supply. In many countries, private schools have excess capacity as measured by relative numbers of students per teacher. In addition, private schools may have a lower marginal cost of adding additional capacity than would government schools. In these circumstances, modest public subsidies that induce private school suppliers to contribute additional resources may increase enrollments at a fraction of the cost of pure public provision of schooling.

One way to accomplish this objective is through capitation grants to school operators. A program in Balochistan province in Pakistan attempted to spur both school demand for girls and to provide an incentive for private school entry by providing scholarships to girls. Randomly selected neighborhoods were given the option of packaging up to 100 girls' scholarships of 100 rupees per month (equivalent to $3) to try to induce a school operator to open a school in the area. The scholarship was offered on a declining basis so the subsidy went to zero after four years. In urban areas, even this modest subsidy was sufficient to get schools to open (Kim, Alderman and Orazem, 1999) and enrollments for both girls and boys rose relative to enrollments in control neighborhoods. A similar program in rural areas enabled schools to open, but the communities were too poor and the

number of girls too few to allow the schools to become self-sustaining (Alderman, Kim and Orazem, 2001). This raises an important lesson for the likely success of private school options to raise enrollments—invariably they will be most successful in areas that would have been able to support private schools in the absence of a subsidy, in other words, places with the greatest elasticity of supply for private schools.

In the Balochistan case, the schools that opened were opened at one-quarter of the cost of a public school, in part because the schools were able to access property at a much lower cost than building a school and because the schools were able to hire teachers at well below the government scale. Despite that fact, school quality was sufficiently high that students in the newly formed scholarship schools outperformed students from similar backgrounds in government schools.

In areas where existing private schools are undersubscribed, vouchers are an excellent mechanism by which governments can expand access less expensively than building additional government schools. One example of this strategy was the Colombia PACES program that provided subsidies to municipalities to provide secondary school vouchers to poor children. There was ample evidence that the existing government school supply was insufficient to meet demand, and that private schools could add additional students without requiring additional teachers or classrooms (King, Orazem and Wohlgemuth, 1999). Vouchers were offered only to children in the lowest socioeconomic strata in municipalities where private schools had committed to participate. The program cost of $193 (Knowles and Behrman , 2005) is much higher than the cost of the primary school programs discussed above. Because the Colombia voucher aimed at secondary students, the opportunity cost of the children's time is much higher than would be the case if they were of primary school age.

Angrist et al (2002, 2006) demonstrated that children who were randomly sorted into the program were 10% more likely to complete the 8th grade and also scored .2 standard deviations higher on standardized tests, equivalent to adding an additional year of school. For those in doubt of external benefits from education, it is interesting that voucher recipients also were less likely to marry young or cohabit and were less likely to engage in child labor. A follow-up analysis confirmed that educational gains were permanent and not transitory.

A program in India provides a third mechanism to enable poor households to access schooling services. In many developing countries, students are expected to get tutoring after school with the tutoring often provided by the same teacher they have in class. Poor children cannot afford these services and may fall behind their peers. A program in India hired local women with high school degrees to provide remedial tutoring to grade 3 and 4 children who had fallen behind in school (Banerjee et al, 2007). At a cost of $5 per child, the program raised the likelihood of a child performing at first grade math level by 11.9 percentage points and at second grade language levels by 9.9 percentage points. By the end of the two year program, children were performing on average .28 standard deviations higher on the test scores, roughly equivalent to having attained one additional year of schooling.

The reason the program is so inexpensive is that they hired less qualified tutors at the market rate rather than mandating teaching certifications and paying the government rate for teachers. These tutors (called *balsakhis* or children's friends) were paid only $10-$15 per month, roughly one-eighth of the government school teaching scale.[15]

[15] This should probably have been discussed as a supply-side intervention except that it is virtually indistinguishable from the capitation and voucher systems discussed elsewhere. This system could have been designed as a voucher that would give households the resources to hire a tutor.

Programs to reduce the costs of schooling to parents can have dramatic and quick impacts on children's achievement and years of schooling completed. Additionally, they can take advantage of existing underutilized capacity in the form of potential teachers and spaces in private schools at costs that are a fraction of the cost of building and staffing new schools. They have the additional advantage of using resources only if the children use the services.

c: Conditional cash transfers

Latin American countries have moved rapidly to the use of conditional cash transfers to induce parents to send their children to school. These programs transfer income to a household in exchange for the household sending their children to school. Many of these programs include other components, typically adding nutritional supplements and mandating health clinic visits for pre-school children and health training for mothers, so the programs are not just aimed at education. Programs have been or are being implemented in Argentina, Bangladesh, Brazil, Chile, Colombia, Costa Rica, Ecuador, Honduras, Jamaica, Mexico, Nicaragua, Peru and Turkey. As with other demand-side interventions, these programs will be most effective in environments in which schooling demand is highly income and price elastic and where large numbers of children are not in school. These circumstances naturally fit poor households, neighborhoods and communities. These programs have in fact been aimed at the lowest income strata of society, and considerable attention has been paid to identifying which households truly deserve the program. Some of this effort seems misguided in that the poor often face transitory income streams that may make them appear poorer some months and better off in others. The transitory nature of income for the poor suggests that current income is a poor targeting mechanism. In urban areas, it can be costly for authorities to try to establish which households qualify on the basis of income and which don't, and such efforts lead to moral hazard problems in which

households may take on activities that lower their earned income but increase their chance of getting the government transfer. There are significant advantages to using geographic targeting in populations where poverty is nearly universal such as poor rural villages. In urban areas, targeting on parental education may be less expensive and will be a better proxy for permanent income than is current income. In addition, parents cannot hide schooling as easily as they can alter their income and so the moral hazard problem is less severe.

Conditional transfer programs will be most successful when they are aimed at populations not currently in school. In Brazil, where individual municipalities established their own programs until they were recently centralized under the federal *bolsa familias*, some programs targeted children who were sufficiently young that the vast majority were already in school. Allowing self-selection into the program allowed families whose children would have been in school anyway to opt into the program and receive the transfer. Perhaps that is why the most careful evaluation of the Brazil program failed to show large benefits (Cardoso and Souza, 2006).

The Bangladesh Food for Education program transfers a grain ration to poor households that have a child regularly attending school instead of a cash transfer. In other respects, the program is similar to the Latin American programs discussed below. Meng and Ryan (2007) found that beneficiaries stay in school around one year longer than comparable eligible children who did not receive the transfer, with the larger effect for girls.

The most efficient targeting mechanism would be to focus on ages at which school dropout occurs. In the least developed countries, the target age would be children of primary school age. In more advanced developing countries, it would be more appropriate to target secondary school aged children. Illustrating this point is the finding that in more developed Mexico, conditional transfers had

almost no impact on primary enrollments (Schultz, 2004) while in less developed Nicaragua, there were substantial gains to primary enrollments (Maluccio, 2006). While most programs report positive impacts on enrollment, the gains are slight in some countries and substantial in others. For example, there was little impact in Honduras where most of the targeted children were already in school and the transfer was considered too small to effectively move children away from child labor to schooling (Glewwe and Olinto, 2004). On the other hand, enrollment rose by 23 percentage points in Nicaragua during the initial pilot phase with most of the gains in the form of children spending time in school exclusively, rather than combining school and work.

Summarizing across programs, it appears that the largest effects from conditional transfers have been in rural areas and in areas that were particularly poor. The most efficient programs target transfers to groups that are not already in school so that households are not receiving incentive payments for actions they would have undertaken even without the program.

IX. Benefit-Cost Summary

Our task in this exercise is to identify the low-lying fruit for raising educational attainment in developing countries—what programs will raise returns most per dollar spent. We argue that demand-side policies dominate supply-side policies because it is cheaper to stimulate schooling demand and because the costs are conditional on households fulfilling the program's objectives. If households do not send their children to school, the government does not expend resources.

In this section, we report on estimated benefit-cost ratios for some of the policy interventions we discuss above. These estimates must be taken with a considerable grain of salt. First, while we have good data on the costs of these programs, the benefits are based on the increase in projected

lifetime earnings from the expected impact on years of schooling. Our review of returns to literacy and to years of schooling demonstrated considerable consistency across countries, genders, and urban and rural markets in the estimated returns to schooling. In the estimates we report, we assume that the return to schooling is an increase of 8% per year of schooling completed over an estimated average earning for labor in the country. Modest variation in the returns to schooling will not be sufficient to reverse the conclusions regarding whether the interventions are expected to pay for themselves. Nevertheless, we are applying these expected returns to interventions that target young children who are not yet working, and so we do not have dirwect evidence of the impact of these interventions on wages.

Second, the returns to increased schooling will depend on labor market and schooling factors that will differ across countries. Returns will depend on the degree of economic freedom in the country—the ability of human capital to move to its highest reward. The magnitude of the schooling increase will depend on how successfully the program can be targeted to those populations that will respond most elastically to the intervention. To be most effective, programs should focus on the grade level where dropouts are most prevalent: at the primary level in rural areas and in urban areas of the least developed countries; at the secondary level for urban populations in countries with more advanced economies. However, there is consistent evidence that the most productive interventions will be early in life because the costs of interventions increase with the child's age; because early health and schooling interventions have been shown to be more productive than remediation later in life; and because the earliest interventions have a longer lifetime left in which to recoup the benefits of the program. Generalizing across interventions, the most responsive populations to these interventions

have been poor, rural and female; the very groups that are currently farthest removed from universal primary education.

Skeptics will argue that the children who are receiving schooling through these demand-side initiatives will get below average returns to schooling which will bias our benefits upwards. The rationale for these arguments is that adding more educated workers will crowd the market and lower wages for all and that these children will overcrowd existing schools and lower quality for all.

The first of these arguments seems unlikely to hold. First, even if every dropout is induced to stay in school until grade 5, they will be a relatively small fraction of the literate workforce. The outward shift in the supply of literate workers will be modest. Second, in developing countries, returns to schooling have tended to be larger at primary than at secondary levels of schooling, and so any adverse impact on returns will be starting from a higher base. Thirdly, dropouts are disproportionately going to be in households facing liquidity constraints which means the returns to schooling re being equated to a higher than market rate of interest. Therefore, their current level of schooling is inefficiently small and the return to schooling artificially higher than the market rate. Fourth, returns to schooling in both developed and developing countries have remained remarkably stable over time despite very large increases in the supply of educated labor, potentially because there are external productive benefits from increasing fractions of educated workers that raise the efficiency of production.[16] Finally, even if the argument that raising the literacy rate would lower the return to literacy, a policy prescription that we keep some predominantly poor children illiterate so that we can raise the returns to schooling for literate children fails on almost any ethical dimension.

[16] See Kremer (1993) for an example of such a model and Acemoglu (2002) for a review of others.

Table 4: Overview Table of Benefit-Cost ratios from various efforts to reduce illiteracy								
	Low Discount (3%)				High Discount (6%)			
	Benefit	Cost	BCR		Benefit	Cost	BCR	
Health and Nutrition Programs								
Bolivia PIDI: preschool and nutrition[a]	$5,107	$1,394	3.7		$2,832	$1,253	2.3	
Kenya: deworming[b]	2246!	3.5!	642		1448!	3.5!	414	
Kenya: preschool and nutrition[c]	2246!	$29.13!	77		1448!	$28.6!	50.6	
Iron supplements to secondary schoolers[d]	$474!	$10.49!	45.2		$289!	$10.29!	28.1	
Scholarship/Voucher Programs								
Pakistan urban girls' scholarship[e]	$3,924!	108!	36.3		$2,530!	$118!	21.4	
Pakistan rural girls' scholarship[e]	$3,139!	$311!	10.1		$2,024!	$326!	6.2	
India *balsakhis* tutorial program[f]	$7,002!	$9.85!	711		$4,515!	$9.76!	463	
Uganda free primary school program[g]	3675!	$140!	26.3		2370!	$140!	16.9	
Colombia: PACES secondary school urban voucher[h]	$476	$193	2.5		$205	$190	1.1	
Conditional Cash Transfers								
Mexico Progressa[i]	$17,565!	$2585!	6.8		$12,923!	$2535!	5.1	
Nicaragua: RED[j]	$5,920!	$1574!	3.80		$3,818!	$1574!	2.4	
[a]Behrman, Cheng and Todd(2004)#								
[b]Miguel and Kremer (2004)*								
[c]Vermeersch and Kremer (2005)*								
[d]Knowles and Behrman(2005)								
[e]Alderman, Kim and Orazem (2003). Cost does not include value of in kind donation of building								
[f]Banerjee, Cole, Duflo and Linden (2003)								
[g] Deininger (2003)**								
[h] Angrist et al (2006). Estimate does not include the value of reduced fertility behavior								
[i] Schultz(2004)								
[j]Maluccio (2006)								
#Benefit cost ratio computed in the cited paper with slight adjustments for differences in discount rate								
*Cost per year of schooling reported in M.I.T. Abdul Latif Jameel Poverty Action Lab. (2005)								
!Per year of schooling induced								
**Assumes that the government expands school space to accommodate additional students at the average cost per primary student								

The argument that the children who are devoting more time to school will be spending that time in bad schools or else will be raising pupil-teacher ratios is a more credible concern. If true, then perhaps increased time n school will not result in greater literacy. For example, the results of cognitive tests for the Kenya de-worming experiment found that even though students spent more time in school, their performance on cognitive exams did not improve significantly, although follow-up surveys may yet find an impact. The increased enrollments in Uganda and India were apparently only modestly accommodated by increased school materials and so school quality may have suffered for all children. Nevertheless, there is not a consistent finding that students perform more poorly in larger classrooms, especially in the range of pupil-teacher ratios observed in developing countries. Furthermore, our strategy begins with the group of students who started school, and so any increase in pupil teacher ratios would occur because more students are staying in school and not because formerly absent students are now attending. Our view is that the tie between years of schooling and lifetime earnings is sufficiently strong that the benefits will yet become apparent as these children age, even if they do not show immediately. It should be emphasized that in most of the cases summarized in Table 4, improved cognitive ability did accompany the increased time in school when both were measured.

In designing these programs, efforts to supplement existing supply by working outside the government school system are generally less expensive and subject to fewer regulatory constraints. Such private sector educational programs will be most effective in urban areas where the elasticity of educational supply is greatest. Health programs offer opportunities for collateral educational benefits while improving child welfare.

We should emphasize that where there are binding space constraints in school, stimulating demand will not be effective without a concomitant increase in supply. However, programs that require an increase in supply are much more expensive than programs that exploit existing excess school capacity. Secondly, programs that can make better use of existing resources such as those that reduce teacher absenteeism or enhance parental commitment to the school show promise but are still in preliminary testing. More work is needed to see how these programs can be generalized. Finally, we know teacher and school quality matter, but we do not know how to foster quality. Until we do, we cannot make a proposal focusing on quality enhancements.

In our measures of the benefits of demand-side policy prescriptions, we assume a 45 year work career in our estimates. In our projection of lifetime earnings, we are implicitly assuming that the value of time outside the market rises in value at the same rate as the value of time in the labor market. This assumption is particularly suspect in the cases where women are not commonly found in the labor market, as in the Pakistan example. On the other hand, we do not make any adjustments for possible external benefits of women's education such as healthier children and reduced fertility which would create a bias in the other direction, and we should further note that the literature has not demonstrated that returns to girls' schooling are substantially lower than are returns to boys' schooling. We also make no adjustments for any possible additional external benefits from better functioning labor markets, more efficient use of capital and technology, or better functioning government institutions. Finally, we assume that the benefits of the intervention are confined to the individual child who was the target of the intervention. It is plausible that benefits may cross generations in that more educated parents can better provide for their children, but such projections are even more heroic than the labor market earnings projections that underlie our current projections, and also those benefits are occurring

sufficiently far into the future as to be heavily discounted. We expect that our more limited measure of the likely returns to schooling will counteract any upward bias in returns attributable to weak school quality available to these children.

We provide summary information on benefit-costs ratios for many of the programs mentioned above. Our estimates concentrate narrowly on the returns from additional years schooling induced by the program. This can be misleading in either direction. The reported benefit cost ratios will be biased downward in that they ignore external benefits and benefits from health improvements. These biases can be large. Adding the impact of increased years of schooling on reduced fertility behavior of young women, as was found in the Colombia PACES case, benefit cost ratios rise substantially to 25.6 instead of 3.3 when only the earnings benefits of schooling are included (Knowles and Behrman, 2005).

Estimated benefit-cost ratios for discount rates 3% and 6% are reported in Table 4. We report the estimates of other authors when we assess that they are more carefully done than anything we could do from reading the paper, although we make adjustments when the authors used other discount rates.

X. Why Benefit –Cost Ratios Vary

It is immediately clear that many of these benefit cost ratios are large, and some are extremely so. The largest tend to be very low cost health interventions in areas with a very clearly defined need such as 92% worm infestation in Kenya. Others are low cost provision of private teachers or tutors for underserved poor children in urban Pakistan and in India. The very high benefit-cost ratios are attributable both to the selection of very low cost interventions and to the placement of these interventions in settings where they would be disproportionately successful. The expansion of these

programs more broadly would occur in less fruitful areas and so the benefit cost ratios would fall. The key point is that even very substantial corrections for selection would still suggest that these programs are worthwhile.

The more broadly distributed interventions such as the conditional cash transfer programs or the voucher plans are less selective in terms of the places where the interventions are implemented and the benefits are more modest as a result. In those cases, the largest benefits are found when they target populations that are initially out of school. For the Mexican Progresa intervention, cash transfers to younger children were almost certainly not cost effective because most of the children were already in school. The cost per increased year of schooling at the primary level was roughly six times the cost of inducing an additional year of schooling at the secondary level.

Another generalization that is apparent in Table 4 is that the largest benefit-cost ratios are interventions early in the child's life because the interventions cost less and the child's opportunity costs are small. Nevertheless, some programs targeted at older children can still be cost effective if the costs are modest. The iron supplement aimed at secondary students had substantial benefits because the costs were so low. The benefits were more modest from the Colombia PACES program because the voucher was more costly, although we repeat that the benefits are more substantial when the collateral benefit of fertility control is included. Importantly, neither program required building more schools or adding capacity, a key to keeping cost low relative to benefits.

XI. Conclusions

In examining the pattern of results in table 4, it seems clear that the most cost effective interventions occur when children are dropping out for reasons of malnutrition or treatable illness. Often very low cost interventions offered at the school site correct the health problems, improve the

cognitive capacity of the child, and increase attendance. While this represents perhaps only 10% of the illiteracy problem, it is by far the most cost effective solution. School dropout attributable to poverty or child labor is a more prevalent problem and requires more expensive interventions to correct. Nevertheless, use of conditional cash transfers, capitation grants or school vouchers can sufficientl;y increase literacy rates so that the benefits outweigh the costs.

To put our strategy in perspective, we estimate that every year, approximately 14.4 million children could be induced to attain literacy in a cost-effective manner because they at least start schooling but drop out before completing grade 5. We take the fact that they start school as evidence that there is some source of school supply in close proximity to the home, and so it is the demand side that is constraining their completion of five years of schooling. Several modest cost mechanisms have been tried to stimulate schooling demand for such children by lowering the cost of attending school or by tying the receipt of health services, nutritional supplements or income to child attendance at school. Although some programs had higher costs, $250 would pay for all but the most expensive of the interventions summarized in Table 4. That means that for $3.6 billion, we could significantly raise the schooling attainment of these 14.4 million children.

Where possible, education and health interventions should be married as the one will enforce the other. It is cheaper to distribute health and nutrition services at the school site, and in so doing, parents are more likely to send their children to school. When the mechanism used to increase school demand involves transfers that improve the child's health and nutrition, we also improve the child's cognitive capabilities and school performance, raising the returns to the program. Any additional external benefits from individual schooling just add to the plus side of the ledger. These collateral benefits come at no added cost, lowering the risk and raising the expected return to the intervention.

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