

challenge paper

# EDUCATION

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The Case for Improving School Quality and Student Health as a Development Strategy  
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## I. Introduction

The World Bank's first effort to spur educational investments in children was in Tunisia in 1962. At that time, 41% of the world's children aged 6-11 were not in school.<sup>1</sup> In Sub-Saharan Africa, only 25% of primary aged children were in school, while enrollment rates in the Arab States (39%) and South Asia (44%) were only modestly better. Their parents were not in a position to produce the education in the home—only one-third of the adult population in low-income countries were literate and the average adult education level was 1.6 years. Even in Middle-income countries, about 20% of the primary-aged children were not in school, and one-third of their parents were illiterate with an average education level of 2.8 years. Given the overwhelming evidence that literacy and schooling can improve health and economic outcomes, the World Bank's focus was on expanding the supply of available schools and qualified teachers.

Over the next 49 years, the World Bank has invested \$69 billion around the world to increase schooling outcomes in developing countries. Schooling outcomes have improved dramatically in the developing world over that time. Only 10% of primary age children are not in school. The enrollment rates in the Arab States (86%) and South Asia (91%) are more than double the rates in 1960. Of the primary aged children out of school in these regions, just over half will never attend school while the rest have either dropped out after attending for at least some years or will enter eventually. Consequently, primary completion rates are approaching 90% or more in these areas as it is in the world as a whole.

Current children in low income countries had the added benefit of more literate parents: now 61% of adults in low income countries can read and write. In Middle income countries, 83% of parents are literate. As the children currently in school become adults, they will continue the process of making schooling investments self-sustaining. The link between education of parents and their children is strong in every country, whether through the added income that schooling generates or through the added appreciation for schooling among literate adults. Consequently, the cost of inducing parents to send their children to school declines as education becomes more widespread in the adult population.

Nevertheless, progress on school enrollment is quite uneven. In sub-Saharan Africa, 23% of primary aged children are not in school. This is an improvement from 1960 to be sure, but still a disturbingly high level in a world where universal completion of primary schooling by 2015 is one of the United Nations Millennium Development Goals. But even in sub-Saharan Africa, the problem is not common across all countries. Over 30% of primary aged children are not in school in Equatorial Guinea (46%); Côte d'Ivoire (43%); Niger (41%); Nigeria (37%); Burkina Faso (36%) and the Central African Republic (31%).<sup>2</sup> In South Asia where progress toward schooling for all has been impressive in general, Pakistan still has 34% of its primary aged children out of school. The source of these weakest educational outcomes in South Asia and Sub-Saharan Africa seems to reside outside the school system, however. All of these countries rank among the poorest governed according to the Fund for Peace Failed States index.

The interactions between incentives to invest time in schooling and the economic and political climate in which the schools reside are critically important if we are to make progress on universal primary education. To capture a return on investments in schooling, individuals have to have the expectation that the government can insure them from the threat of expropriation of life, liberty or property. And given that security, the rewards are greatest if the government provides sufficient mobility so that each individual can allocate their skills to the

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<sup>1</sup> These are UNESCO and UNICEF data compiled in Bellamy (1999).

<sup>2</sup>Data are from UNESCO (2011).

sector that offers the greatest reward. As shown in King et al (2012), the highest returns to schooling in the developing world are found in countries that score highest in economic freedom. It is in those countries that demand for schooling will be greatest and where progress toward schooling for all will be most easily made. Of course children can be compelled to attend school, but absent the freedom to use their skills, both the individual's and the country's returns will be small.<sup>3</sup>

This brief summary of the world's success in getting children into school suggests that the vast majority of children in even the poorest countries attend school and most now complete the primary cycle. Any effort to move children never in school to enroll will have to target children in failed states: the countries that now produce most of the exceptions to this general trend of rising enrollments. These are the countries that fail to provide many other public services besides education; that cannot provide its citizens the benefit of the rule of law; and whose governments are themselves ridden with corruption and criminality. Such countries are not good candidates for schooling investments. Rampant corruption means that any international transfer of funds directed to education in the country will likely be subject to large leakages to other purposes. Even if the funds go to their intended ends, parents will be unlikely to respond because there is little perceived return to human capital in countries that do not protect property rights, enforce contracts, or protect life. Even if the children go to school, the public and private returns will be lower because the child is less likely to have a long productive work life and because the skills learned in school will not be used for their most productive ends. Perhaps one could justify schooling investments in such countries on strictly moral grounds, but the investments cannot be justified using a Cost-Benefit criteria such as that underlying the Copenhagen Consensus.<sup>4</sup>

The more plausible returns come from schooling investments in developing countries whose market and political institutions instill confidence that schooling investments will be rewarded. Because these countries already have most of their children in school for at least some period of time, the investments possibilities will be either to increase the number of years of schooling or to increase learning per year of schooling. In the next section, we examine which of those options is more likely to capture a large return.

## II. Why School Quality Improvements are the Dominant Strategy in Theory

Our theoretical presentation is an adaptation of the framework developed by Bleakley (2010b). For a given country  $i$  in year  $t$ , the anticipated present value of devoting  $e_{it}$  years of life to schooling is given by  $b(e_{it}, q_{it}, h_{it}, I_{it})$ . The benefit is presumed to decline in years of

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<sup>3</sup> An example is Cuba where schooling rates and test scores are the highest in Latin America but the country remains much poorer than countries with lower levels of schooling but greater freedom to apply skills to their most productive ends.

<sup>4</sup> George Psacharopoulos argues that returns to schooling in 21 of the 60 states designated as failed states have returns to schooling that are as large as returns in more functional countries. It is possible that he is correct that returns to schooling are high in failed states, but I must note that estimated returns are lacking in 39 of the 60 states. I suspect that estimated returns are lacking in two-thirds of these failed states because it is not safe to conduct a survey which is also why returns to human capital investments are likely to be low in these states. In the remaining 21 failed states, I suspect that the surveys are confined to subregions where data is safe to collect. However, even if these estimates are accurate for individuals who receive schooling, they do not imply that the children not going to school will garner the same returns. As noted, the factors keeping these children out of school are not because schools are unavailable but are instead due to social, political, or familial factors that make the schooling lack in sufficient value to induce enrollment. Those same factors would lead to low returns from schooling should the child be enrolled.

schooling due to diminishing marginal productivity of schooling. School quality,  $q_{it}$ , and a health index,  $h_{it}$ , both raise the marginal benefit of schooling. Higher quality schooling increases the marginal increment in skills from a year of schooling, skills that raise wages every year after leaving school. Better health raises the ability to learn while in school and raises productivity of skills after leaving school.<sup>5</sup> Finally, better economic institutions,  $I_{it}$ , that improve the climate for applying skills to sectors freely without fear of expropriation also raises the efficient allocation of skills to tasks and hence raises returns to schooling.<sup>6</sup> The presumed shape of the marginal schooling benefit relationship is shown in Figure 1.

The parents' discounted cost of investing in an additional year of schooling is given by  $c(e_{it}, q_{it}, h_{it}, P_{it})$ . The primary source of these costs is the opportunity cost of time which rises with years of schooling and past human capital accumulations. We would also expect that higher school quality raises past skill attainment for every year of schooling, and so the opportunity costs of schooling also rise in  $q_{it}$ . Greater health makes anyone more productive in the labor market, and so opportunity costs also rise in  $h_{it}$ . The direct costs of schooling are given by  $P_{it}$  which includes distance to school and the fees or material costs charged to parents. The presumed shape of the marginal cost of schooling is also demonstrated in Figure 1. Parents evaluate the benefits and costs of the schooling opportunities afforded their children and decide to keep their children in school through age  $e^*$ .

There are several mechanisms that the government has at its disposal to influence parental schooling investments. These include building more schools, eliminating school fees, improving school quality, improving provision of government services that complement schooling such as public health, or improving economic institutions to enhance the market return on human capital investments. The relative returns to these policies depends on the country's current level of schooling investment and the fraction of children already in school.

When a country has a large share of the children out of school so that schooling costs exceed benefits at all positive values of  $e$ , policies that shift the cost function downward are most effective. These would include building more schools to lower travel costs of attendance or lowering fees. This could also tie school attendance with transfers to the household, whether in kind (meals or health services provided at the school) or in cash transfers. Programs that shift schooling investments from 0 to some positive level will capture returns equal the area under the marginal benefit curve. Because the highest marginal benefits are at the lowest levels of schooling, such strategies can capture substantial returns. However, these policies will have much smaller returns if a substantial portion of the school aged population is already in school.

It is apparent that households can be quite sensitive to changes in schooling fees. Several African countries have eliminated fees over the past 15 years. The increase in the proportion of primary aged children attending school is often dramatic, as shown in Table 1. Countries that eliminated fees experienced much larger increases in school enrollment than did their neighboring countries that continued to charge fees. Furthermore, several studies have shown that the dramatic increase in school enrollments has not seriously eroded school quality and may

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<sup>5</sup> See Bleakley (2010) for a comprehensive review of the evidence supporting the role of improved health on earnings and education.

<sup>6</sup> Murphy et al (1991, 1993 ) provide theoretical and empirical arguments explaining why free and open economic institutions are conducive to growth. Acemoglu and Johnson (2005) and Acemoglu, Johnson and Robinson (2001) show how protection of property rights and rule of law benefit growth. Acemoglu and Robinson (2005) argue that more democratic political institutions benefit growth. King et al (2012) show these same factors raise returns to human capital.

even be accompanied by improvements in test scores.<sup>7</sup> Nevertheless, these policies are only cost effective when a large number of parents are withholding children from school because of the fees. As indicated above, the remaining countries with substantial proportions of children being withheld from school tend to be ones with poor prospects for a return to investments in schooling.

Consequently, our better strategy is to focus on policies that will raise returns in countries that already have their children in school. In such countries, a policy that moves average years of schooling from  $e^*$  to  $e^{**}$  as in Figure 1 will have only a modest return. Instead, policies should focus on shifting the entire schedule of marginal benefits upward through improved economic institutions, improving child health, or providing higher quality schools.

The least expensive of these options is to improve the climate for economic freedom. King et al (2011) showed that countries with low costs of establishing a business, strong protection for property rights and a low tax burden for supporting the government had significantly higher returns to schooling than did similar countries with more restrictive economic climates. The improved marginal benefit from these institutions are substantial. An additional year of schooling increased annual income by 9.7% in developing countries in the upper quartile of the Heritage Foundation's Economic Freedom Index, but only 6.3% for developing countries in the bottom quartile of the Index. In other words, a country can increase the returns to schooling by a third by making it easier for their population to pursue entrepreneurial ventures and by insuring that the gains to success will not be expropriated by the government or by criminals. While the cost of these reforms is low in one sense, it often requires a complete reorientation of the economy and the government to a market system. The experience of the transition to market in the former Soviet states suggest that the cost of the conversion can be substantial, even if the benefits once the transition is completed are also substantial.

The theoretical effect of improvements in school quality are similar to the theoretical effects of improved health—both will shift up the marginal benefit curve and both will increase the cost of additional schooling because of added opportunity costs. In Figure 1 we demonstrate the theoretical effects of an improvement in school quality from a level  $q_{it}$  to a level  $q'_{it}$ . Notice first that because both marginal benefits and marginal costs rise, the effect of improved school quality on years of schooling is ambiguous. Children may actually spend less time in school when school quality improves, although in our example, we let years of schooling rise modestly as a particular example.<sup>8</sup> What is unambiguous is that the present value of any given year of additional schooling rises with school quality.

Not shown in Figure 1 is that an improvement in health from a level  $h_{it}$  to  $h'_{it}$  will shift the marginal benefit and marginal costs curves in the same direction as an improvement in school quality. Improved health will raise the present value of schooling in any given year, but it may cause years of schooling to decrease.

The other important implication is that the gains from an increase in  $q_{it}$  or  $h_{it}$  come mainly from their effect on increased productivity of schooling for years 0 through  $e^*$  and not from any induced change in years of schooling. As school quality rises from  $q_{it}$  to  $q'_{it}$ , or as health rises from  $h_{it}$  to  $h'_{it}$ , the value of the induced increase in schooling productivity is the change in area under the two marginal benefit curves as the school leaving age increases from 0 to  $e^*$ . The gain

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<sup>7</sup> See reviews by Kattan (2006) and the World Bank (2009).

<sup>8</sup> Cross country analysis by Castelló-Climent and Hidalgo-Cabrillana (2012) is consistent with modest increases in attendance as school quality improves.

attributable to the induced increase in years of schooling is the area below  $b(e_{it}, q'_{it}, h_{it}, l_{it})$  between  $e^*$  and  $e^{**}$ . Of course, it is possible that the age of school leaving actually declines as school quality or health improve, which implies that all of the gain from improved school quality or health comes from the increased efficiency of producing human capital per year of schooling.

This chapter is supposed to evaluate alternative development strategies for the education sector. Now that the vast majority of children in developing countries are in school or else in a country where education investments hold little value, the best option is to try to bump up the marginal benefit per year of schooling in countries where children are already in school rather than to add additional years of schooling. As this section demonstrates, investments in health behave much like investments in school quality. Therefore, it is useful to compare the case for improving school quality versus an alternative use of the funds: to invest in child health. If education investments are to meet the Copenhagen Consensus Cost-Benefit bar, they must hold greater promise than investments in health, and issue we will address in the last section.

The World Bank's recently adopted education strategy, *Learning for All* (World Bank, 2011) also focuses on school quality as the preferred mechanism to stimulate human capital development in LDCs. The World Bank's rationale for focusing on learning rather than years in school is quite different from the theoretical argument presented above. The World Bank's strategy is predicated on the perception that many schools in developing countries are of poor quality. As evidence, the report cites findings that school achievement in developing countries lags that in developed countries for similar years of schooling and that often children complete the primary cycle unable to read and write. Indeed, studies show that cognitive attainment is more highly correlated with economic growth and per capita income than is years in school. But that finding is hardly surprising when we consider the implications of Figure 1. Cross-country variation in years of schooling has to explain less of the variation in per capita incomes than would direct measures of schooling outcomes such as test scores: Better schools and better complementary inputs such as health do not necessarily raise years in school but they do raise schooling outcomes. However, we do not know how much of the higher test scores in developed countries are attributable to better schools and how much is due to better complementary inputs such as better child health.

Focusing on school quality makes sense because the returns from expanding access to schools have been exhausted and not because the schools in developing countries are poor. The schools have always been poor, but they were better than no schools. We should now focus on quality of schooling offered those already in school because the return from getting the last 5% of children never attending school to enter a school is outweighed by the cost.

There are several options that have been proposed to improve school quality in developing countries. The three that I will review in detail include efforts to improve school management through decentralizing decision-making or increasing parental involvement; increasing the quality of teacher-student interactions through incentive programs or greater accountability that increase teacher effort; and efforts to increase the quality of child effort in school. These three strategies will be evaluated with respect to the quality of our current knowledge of their effectiveness, their costs of implementation, and how easily strategies that prove effective in a local area can be generalized to the country-level or to other countries and to their promise compared to a like sized investment in child health.



### **III. Do investments in child health contribute to economic growth?**

Madison (2001) developed series of world populations and output that spanned 2000 years. His data provide a useful perspective from which to judge the role of health and nutrition on growth. At the time of the first Roman Census, there were 231 million world inhabitants. By the cusp of the industrial revolution in 1700, the world population was 603 million—a net increase of 0.06% per year. Labor productivity grew at an even slower pace of 0.02% per year so that a worker in 1700 was only 1.4 times more productive than a worker in year 0.

In the subsequent 300 years, the world population increased ten-fold, a rate of 0.8% per year. Even so, the average person was becoming better off because labor productivity was also rising at 0.8% per year. As a result, living conditions improved rapidly along almost any metric. Life expectancy in England stood at 32 years at the start of the industrial revolution, and rose to 48 by 1900. Similar gains occurred elsewhere in Europe (Fogel, 2004).

One key factor was rising scientific knowledge that led to improved sanitary and health conditions for peoples living in close proximity to one another, and a rising literacy base that enabled individuals to learn about how to avoid disease. But none of that would have been possible, as persuasively argued by Fogel(2004), without the dramatic improvement in agricultural technology that led to rising nutritional status of the average citizen, the freeing up of rural labor for industry, and the rising purchasing power of urban wages due to cheaper food. The role of the agricultural revolution in setting the stage for rising living standards is so important that Huffman and Orazem (2007) could point to only two cases where growth had occurred without a dramatic increase in agricultural yields, Hong Kong and Singapore. In those two cases, the city states were able to trade their way into the agricultural revolutions occurring elsewhere.

Before 1700, the Malthusian prediction that the population expanded to consume any available increases in food production was essentially correct, as evidenced by the absence of appreciable growth in per capita output. During those 1,700 stagnant years, per capita food production was too low to energize the labor force for hard work. Fogel (2004) estimated that at least 2,000 calories per person would be necessary to support a full day of productive work. IN the late 1700s, about 40% of the French males and 20% of the British males did not attain this minimal level of nutrition, meaning that they were too undernourished to perform a full day of work. Because the location of crop failures and food shortages varied from year to year, even those who attained the minimal level of nutrition on average were so stunted that they were at substantially higher risk of incurring chronic health conditions and of premature mortality. Only after the improvements in fertilizers, animal husbandry, plant and animal breeding, transportation, storage, and sanitation were the populations of Europe sufficiently nourished to do the work of the industrial revolution. Only with the resulting rise in life expectancy did the average citizen have an incentive to acquire added skills including literacy and numeracy. Only then was there a critical mass of educated citizenry necessary to spur the technological revolutions that followed.

Applying Pritchett's (1997) estimate of the minimum income necessary to attain nutritional subsistence to Maddison's (2001) estimates of GDP per capita, we know that most of the world's population in 1700 was too malnourished to perform significant work. In much of subSaharan Africa, diets today are comparable to the diets available to the OECD countries at the start of the industrial revolution. It is doubtful that we will see dramatic growth in per capita incomes in Africa without the same attainment of nutritional adequacy that has predated the industrial revolutions on all the other populated continents.

UNICEF compilations indicate that 28% of children in developing countries are moderately or severely undernourished. In areas where malnutrition is common, nutritional supplements and/or treatments for intestinal diseases or parasites offer an inexpensive way to raise school attendance and physical and mental capacity. The earliest efforts to use nutrition as a development tool date back to the 1969 intervention designed by the Institute of Nutrition of Central America and Panama (INCAP) in Guatemala. Researchers provided food supplements to pregnant women and young children in four villages. Two villages were given a high-protein, high-energy drink and two were provided a no-protein, low-energy drink. Both supplements contained vitamins and minerals. For seven years, information was collected on physical growth, mental development, school attendance, and morbidity along with information on nutrient intake and on characteristics of the family.<sup>9</sup> Because the assessment reflects a comparison of two nutritional supplements that differ only in protein, the effects understate the benefits of more general improved nutrition that would include vitamins and minerals. Nevertheless, the effects were quite impressive. Taking the more complete dietary supplement led to increased birthweights, lower infant mortality, and faster physical growth through the first three years. Thereafter, both groups of children grew at rates comparable to those of well-nourished children.

The more impressive results came from a follow-up survey of the children when they reached 11-27 years of age. Both boys and girls who received the high protein-high energy drink demonstrated better cognitive abilities. The males were able to engage in more physical labor and they earned a third more than comparable males in the control villages. The young women who took the more nutritious drink were taller and had lower body fat. The boys did not attend school longer but they learned more. The girls attended school 1.4 years longer and learned more. While there are weaknesses in the studies design that might give pause, the weight of the evidence is quite impressive that improving nutrition improves human capital outcomes.

A key advantage of these nutritional supplement interventions is their modest cost. Damon and Glewwe (2009) estimated that the program cost \$23.25 per year per child including a \$5 annual cost for medical care. There are additional efficiencies from distributing these supplements at school which limits costs of transportation and storage. One could even consider making the supplement conditional on child attendance although that seems unnecessary. Parents who value the supplement may end up sending their children to school longer even if attendance is not required as was true in the INCAP case for girls. Furthermore, if the treatment is not for nutrition but for disease prevention or eradication, as with vaccinations or treatments for intestinal worms, broader distribution increases the effectiveness of the treatment by lowering the number of children in the area who are at risk for contracting and spreading the disease.

Improved health increases the efficiency of child time in school through several avenues. Properly nourished children can better concentrate on school work. Moreover, brain development is adversely affected by nutrient deficiencies so that supplements of micronutrients such as iodine, zinc or iron or additional calories available from school meals can improve cognitive ability (Zimmerman et al, 2006; Horton et al , 2009). As shown in the INCAP study, these nutrient advantages even pass from mother to child, as children undernourished *in utero* are also disadvantaged in cognitive development (Doblhammer et al, 2011; Zimmerman, 2009) and infant health. Finally, if the nutrients are made available at the school, there is an additional reason for the parents to send their children to school.

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<sup>9</sup> Summaries of the study design and findings can be found in Martorell (1995) and Martorell et al (1995). Behrman (2009) provides a comprehensive review of the short- and long-term studies from an economic perspective.

Just as there is evidence that improving nutrition can have lifetime benefits, there is also evidence that malnutrition during a child's formative years compromises both cognitive and physical development later in life. Glewwe, Jacoby and King (2001) found that controlling for other household background measures, children who were malnourished early in life start school later, complete fewer years of schooling, and learn less per year of schooling. In a series of studies examining the role of armed conflicts on child welfare, Richard Akresh and his colleagues<sup>10</sup> demonstrated that crop failures and disruptions in food supply consistently led to stunting of young children and to decreased completed years of schooling which would permanently lower lifetime earnings.

There are strong theoretical reasons why interventions aimed at raising human capital accumulations should occur early in life. Examination of Figure 1 shows that an early intervention with persistent effects can raise the marginal benefit curve at every stage of life, but waiting limits the benefits to whatever length of life is left. James Heckman and his colleagues have a series of studies that argue that it is the earliest interventions in schooling that are the least costly and most effective.<sup>11</sup> Indeed there is ample evidence that early nutrition interventions are successful and they can have lifetime favorable impacts in both developed and developing countries. In the U.S., Bhattacharya et al. (2006) found that recipients of school breakfast programs build better eating habits by reducing the percentage of calories from fat and increasing fiber intake. Recipients also had fewer deficiencies in vitamin C, vitamin E, folate, potassium and iron, all of which have important implications for improved health or cognitive development.

In Bolivia, Behrman, Cheng, and Todd (2004) conducted an experimental evaluation of the *Proyecto Integral de Desarrollo Infantil* (PIDI) program in Bolivia. This program provides 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 similar program aimed at stunted infants in Jamaica, as do Armezin et al. (2005) for low-income rural households in the Philippines.

Nevertheless, nutritional interventions can still be cost effective later in life, even if they would have been even more effective had they been implemented earlier. The benefits are not confined to early childhood interventions. McGuire (1996) reports 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. These nutrients can even improve cognitive abilities in adults, as was found by Brown et al (2006) who found that Indian textile workers became more productive after being given inexpensive iron supplements and treatments for intestinal parasites.

Parasitic infestations can rob a child of necessary nutrients even when the child has enough food. Worm infestations cause symptoms from chronic fatigue and weakness to protein malnutrition, abdominal pains and anemia. Malaria is a parasitic invasion of the blood stream that can result in recurring bouts of chills, sweats, nausea, aches and fatigue in the milder cases to seizures, kidney and liver disease and death in the more severe cases. Numerous studies have shown that children exposed to intestinal worms or malaria miss significantly more days of school (Miguel and Kremer, 2004; Bobonis, 2006; Bleakley, 2010a).

Protection from the worms is amazingly inexpensive. A twenty cent pill provides protection for four months with 99% efficacy, meaning that less than a dollar a year can protect

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<sup>10</sup> See Akresh and de Walque (2011), and Bundervoet et al (2009, 2011).

<sup>11</sup> See Heckman and Masterove (2007) for a review of this literature.

99% of the children from the disease. Because the disease is spread by fecal contamination of water or soil by infected people, as the number of infected people decreases, the probability of infection falls even for people who are not treated. Therefore there is a significant external benefit to untreated people from treating a subset of the population.

Miguel and Kremer (2004) examined the effects of an intervention in which a subset of schools received treatments and a second set of schools were excluded from treatment. The cost of the program including the pills along with the costs of distribution and administration came to \$3.50 per student. As expected, infection rates were cut in half in treated schools. However, student absenteeism in treated schools fell 25%. Follow-up surveys of the children who were exposed to the program early on worked 13% more hours and earned 20-29% more than did the children in the control schools who were not exposed to treatment until 2-3 years later (Karlan and Appel, 2011).

Bobonis et al (2006) repeated the intervention for a sample of preschool students in Delhi, India. Treated children received deworming medicine along with iron and vitamin A supplements. Attendance increased 20%.

By now, we have high confidence that nutritional supplements and treatments for parasites can make children healthier and increase the productivity of the time spent in school, at least in experimental settings. We also have strong evidence that protracted interventions on a broader scale have significant positive effects on student time in school, learning and lifetime earnings. Bleakley (2007) studied the impacts on health, education and income from a large-scale hookworm eradication program that was initiated in the Southern United States in 1910. Infection rates were 30-40%. Children who grew up in the areas where the eradication campaign was focused most intensively increased school attendance and literacy attainment significantly. The estimated impacts on adult income suggest that going from an area with 100% probability of infection to zero raises adult income by 43%.

Bleakley (2010a) performed a similar analysis of the effects of growing up in an area that experienced malaria eradication in the United States, Brazil, Colombia and Mexico. Children growing up in areas with successful eradication were much more likely to attain literacy and had significantly higher incomes later in life: from 12% higher in the United States to 40% higher in Latin America.

In short, there is substantial evidence from small scale experiments to large scale parasitic eradication and nutrition programs that children can gain lifetime benefits from improvements in their nutritional health. These interventions are frequently of modest cost compared to other programs aimed at raising human capital development. They also have substantial external benefits in that even untreated recipients can benefit, whether *in utero* children are born healthier when their mother receives nutrient supplements or untreated children face lower risk of infection because their friends are receiving deworming medicine. It is against this backdrop that other programs aimed at improving schooling outcomes must be judged for cost effectiveness.

#### **IV. Do school investments contribute to economic growth?**

##### **A. *Years of Schooling***

Before embarking on strategies expending public funds for schooling, we have to establish whether such investments contribute to the public good. Human capital has played a prominent role in explanations of economic growth since the time of Adam Smith (1776) who pointed to the ability to specialize according to skill as the source of increasing labor

productivity. Schultz (1975) emphasized the ability to combine managerial skills with other inputs as a source of increasing returns to scale that is essential to economic growth. Lucas (2002) saw spillover benefits from placing educated peoples in the presence of other educated peoples. All of these ideas suggest that investments in education make the individual more productive but make other workers and other factor inputs more productive as well.

Given the prominence of human capital in theoretical explanations of economic growth, the empirical evidence supporting the existence of spillover benefits from private educational investments is decidedly mixed. Punctuating that view are three recent reviews of social returns to schooling in developing countries, all three basing their conclusions using a different approach to comparable cross-country data sets and all using level or growth of output per worker as the dependent variable. Patrinos and Psacharopoulos (2011) found large positive spillover benefits that were much larger than private returns to schooling. Lange and Topel (2006) concluded that social returns were no smaller than private returns but were not much larger. Pritchett (2006) concluded that there was no evidence of spillover benefits.<sup>12</sup>

It is tempting to dismiss these macroeconometric studies of the role of educational attainment on the productive capacity of an economy, given the lack of agreement on how to properly specify empirical formulations of economic growth. Durlauf, Johnson, and Temple (2005) reported that across over 400 studies, 145 different variables had been shown to explain the cross-country pattern of growth in at least one analysis. Consequently, it is not surprising that schooling has been shown by some to be critical to economic growth while others conclude that it lacks any social benefit beyond the private return earned by those receiving the schooling. Nevertheless, this research has played a significant role in the debate on public support for schooling including in past Copenhagen challenge papers, and so I provide my assessment of this research.

One reason for the lack of consensus on the magnitude of social returns to schooling investments is that the presence of these spillover benefits depends critically on the ability for individuals to apply their human capital to productive ends. Countries that protect property rights and allow individuals to apply their skills to their highest rewards will encourage the types of productive contracting that Schultz (1975) and Lucas (2002) argued would generate spillover benefits. Schultz (1975) went further to explain that managerial skills are most productive in the face of rapidly changing technologies and markets conditions, but that human capital has little value in economies where traditional technologies are used. On the other hand, corrupt political institutions encourage unproductive applications of skills where the most able try to extract resources from their neighbors (Murphy et al, 1991, 1993). Studies that fail to control for the economic environment in which the educational investments occur will have trouble identifying spillovers.

An additional concern with the macroeconomic studies that conclude schooling does not affect economic growth is their reliance on measures of years of schooling that are subject to numerous errors. Classical measurement error would bias the coefficients toward zero. Cohen and Soto (2007) reevaluated the effect of years of schooling on economic growth. They show that earlier results that years of schooling cannot explain economic growth are driven by the use of noisy schooling measures. Correcting these errors generates large and significant increases in labor productivity growth from increases in average years of schooling in the workforce.

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<sup>12</sup> Breton (2012) presents evidence that when properly specified, macroeconomic estimates of the augmented Solow model that generates substantial external productivity effects are consistent with the returns to schooling estimated from microeconomic Mincerian earnings functions.

We can illustrate the importance of economic and political institutions by replicating the specifications used by Lange and Topel (2006) and Pritchett (2006) with a data set composed solely of developing countries over the period 1960-2010. The growth in GDP per worker, is regressed on initial levels and changes in average years of schooling, holding fixed capital per worker and a trend measure. Results are shown in Table 2. The first column shows that starting a decade with an additional year of average schooling leads to 2.3% faster productivity growth over the next ten years. While the effect is statistically significant, it is quite small in magnitude. Column 2 adds interaction terms with measures of economic and political freedom. Column 3 adds terms in the change in years of schooling over the decade as well as the start-of-period level of schooling. The change in years of schooling does not add significantly to our ability to explain labor productivity growth so we will focus on the results in column 2.

The level of effect of years of schooling on growth turns out to be negative—implying literally that a country that has no democracy and no economic freedom loses 13.4% of its productivity over ten years per year of schooling. Counteracting that effect is that as the country moves up the distribution of economic and political freedom, the returns to schooling in the form of productivity growth turns positive. While the coefficient on the interaction between *Polity* and years of schooling is not significant, the joint effect of schooling including the interactions with *Polity* and *Heritage* were significant.

In Table 2B, we simulate the effect of rising schooling and rising economic and political freedom on labor productivity growth. At the lowest freedom quartile, even being in the upper quartile of years of schooling only raises ten-year productivity growth by 1.2%. In contrast, the same level of schooling in a country at the upper quartile of economic and political freedom will experience 22% labor productivity growth over the next ten years. Effectively, if a country wishes to reap a reward from its schooling investments, it needs to provide its citizens sufficient freedom to apply their human capital. King et al (2011) found corroborating evidence that it is the freest societies that have the highest returns to schooling.

There is also more consistent corroborating evidence of the existence of educational spillovers in microeconomic datasets. Moretti (2004a,b) showed that workers and firms gain productivity when they are in markets with greater concentrations of educated workers. Nor are the benefits confined to economic returns. Lochner and Moretti(2004) showed that education lowers incidence of crime. Currie and Moretti (2003) showed that higher maternal education increases infant health and lowers the probability the child will have only one parent or will be exposed to second-hand smoke. Grossman(2006) provides a comprehensive review of studies that demonstrate that higher levels of education lowers population growth, raises child health and education, and improves individual health as an adult. These benefits provide additional social returns beyond the estimated improvements in labor productivity above any private gain.

Two recent studies provide an historical context that further demonstrates why education still remains a compelling strategy for economic development. Becker and Woessmann (2009) show that the spread of the Protestant Reformation and its emphasis on reading scripture led to a more literate workforce. Counties closer to Wittenberg, the home of Martin Luther, experienced more rapid income growth and a more rapid path to industrialization. Given the improvements in employment opportunities for low-skilled labor and gains in life expectancy and nutritional status associated with the industrial revolution (Fogel, 2004), it seems apparent that the gains in average literacy benefited not only those who acquired literacy but the population as a whole.

Aaronson and Mazumder (2011) evaluated the impact of a philanthropic effort to add schooling options and improve school quality for black children in the American South. The

Rosenwald program added almost 5000 schools between 1913 and 1931. Because the program was not evenly distributed throughout the South, we can assess how exposure to the program affected years of schooling, cognitive attainment and geographic mobility of these children when they reached adulthood. Children exposed to the program had significantly improved human capital and mobility outcomes compared to those who did not grow up in close proximity to a Rosenwald school. The estimated rate of return in the form of enhanced earnings potential of recipients relative to the cost of the schooling investment was between 7-9%, well in excess of returns to bonds at the time. That the program served a social desire to equalize economic opportunity for a population that was inefficiently excluded from the opportunity to acquire human capital means that there was an additional social return beyond the private return going to the recipients.

My assessment of the most recent macroeconometric evidence supports the view that increased years of schooling can yield significant social returns. That still leaves open the issue of how one can increase schooling investments most efficiently.

### **B. School quality**

A second series of papers argues that it is school quality and not years of schooling that matters for economic growth. Empirical evidence advanced to support this conclusion involves findings that direct measures of human capital outperform years of schooling in explaining various measures of labor productivity. Microeconomic studies that have information on both years of schooling and measures of cognitive attainment typically find that it is the latter that raises earnings (Glewwe, 2002). A similar result holds in studies of economic growth. When both measures of average years of schooling and average cognitive attainment are included as variables explaining growth in output per capita, it is the cognitive attainment that more strongly affects growth (Hanushek and Kimko, 2000; Hanushek and Woessman, 2008).<sup>13</sup> Those studies equate higher cognitive attainment, given average years of schooling, as indicative of higher school quality.<sup>14</sup>

While countries that have higher test scores at the same years of schooling may have higher school quality, that is not the only possible interpretation. It is possible that greater cognitive attainment is due to factors separate from the school but that complement educational production. Countries with higher test scores at a given level of schooling may have higher parental inputs into their children's human capital production; greater endowments of child health; more favorable community support for education; or any number of other factors that could affect child learning. It is also possible that cognitive attainment and years of schooling are alternative measures of human capital attainment, but that the latter measure is subject to more random error. The greater weight placed on cognitive attainment could be a simple artifact of measurement error.

An additional concern is that there are relatively few developing countries that participated in the international tests used to measure relative cognitive attainment by country. Of 62 countries that participated in the PISA test, only 4 are lower middle income countries and none are poorer than that. As a result, the conclusion that it is cognitive scores and not years of

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<sup>13</sup> Breton(2011) argued that when correct empirical specifications and properly timed measures of school quality, both quality and quantity of schooling matter equally.

<sup>14</sup> Castelló-Climent and Hidalgo-Cabrillana (2012) provide a different argument: that school quality raises the return to schooling and is the cause for rising quantity of schooling.

schooling that is critical to economic growth is based disproportionately on the experience of developed countries.

The World Bank strategy to focus on school quality rather than expanding enrollment was heavily influenced by the finding that measured school output dominates measured time in school as a predictor of economic growth or individual earnings. Nevertheless, it is important to understand that the studies cited in this section only demonstrate that cognitive attainment matters for growth, but they do not necessarily show that it is improved school quality that generates the improvements in cognition. We will return to that point in the next section after defining the educational production process more rigorously.

## V. How is school quality produced?

### A. Educational Production

A tremendous amount of work has been expended trying to identify what inputs or strategies make schools more efficient at generating human capital. A recent review by Glewwe et al (2011) reported that there had been over 9,000 studies completed since 1990! And yet we have few concrete findings that would guide a strategy using school quality as a way to foster economic development. It is useful to review a simple model of the educational production process that explains why research on this topic has proven so frustrating.

The process of education involves a cooperative venture between teacher and student to produce educational outcomes,  $B$ .<sup>15</sup> The value of  $B$  can be viewed as the area under the marginal benefit curve in Figure 1: the present value of all skills produced in school over the years the child is in school. Both teachers and students get utility from higher levels of  $B$ , and so they have an incentive to cooperate to produce more skill. The key cooperative element is the willingness of the teacher and the child to allocate time to the school. The proportion of time that the teacher attends school is  $e_T$  and the proportion of time the child attends is  $e_C$ . Attendance varies between 0 and 1 with 0 meaning never attending and 1 meaning attending full-time. The teacher and child time interact with school and home inputs to produce  $B$  according to

$$B = \gamma(q_T e_T^\rho + q_C e_C^\rho)^{\frac{1}{\rho}} \quad (1)$$

where  $q_T$  and  $q_C$  are the quality of school inputs attached to the teacher and the child. The teacher's input quality will depend on the school attributes  $X$  and the teacher's own attributes  $\mu_T$ :  $q_T = q(X, \mu_T)$ . The child's input quality will also depend on the school attributes and the child's attributes  $\mu_C$ :  $q_C = q(X, \mu_C)$ . Relevant teacher attributes include ability, training, and socioeconomic background. Relevant child attributes include ability, child health, and the child's socioeconomic background. The parameter  $\gamma$  is a measure of school efficiency in converting inputs into cognitive skills and can be viewed as a measure of administrative skills available in the school. The parameter  $\rho$  increases in the substitutability of teacher and student inputs in the production of cognitive skills.

This simple model of educational production makes it clear why the evidence that cognitive skills are more closely tied to growth in earnings or labor productivity does not imply that length of time in school is less valuable than school quality. Cognitive skills are a direct measure of school output  $B$  while time in school ( $e_C$ ) is just one of several inputs into the production of  $B$ . Children with identical school effort will nevertheless have very different

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<sup>15</sup> This model is based on Banerjee et al (2012) who present a more detailed version of the joint attendance decisions of teachers and students. Note that one could also couch this model as a bargain between schools and households, but the discussion is more straightforward when we focus on teacher and child.



values of  $B$  depending on the levels of  $e_T, \mu_T, \mu_C, X$ , and  $\gamma$ . In addition, one cannot take a high realization of  $B$  and presume to know which one of the inputs  $e_T, e_C, \mu_T, \mu_C, X$ , or  $\gamma$  is responsible. Presumably, the most productive schools have high values of all of these inputs.

Equation (1) also explains why despite the 9,000 studies of the educational production process reviewed by Glewwe et al (2011) and the thousands that were produced before 1990,<sup>16</sup> we have no confidence regarding which school inputs are the key ones to produce quality. The production process is driven by unobservable teacher and child attributes  $\mu_T$ , and  $\mu_C$ , that are offered to the process subject to the parents' and teachers' assessments of the production process. The time in school  $e_T$ , and  $e_C$  is observed on attendance registers, but the actual effort expended in learning and teaching is not. Furthermore, levels of  $e_T$ , and  $e_C$  are themselves chosen based on the expectations of both parties. Consequently, schools with the same attributes  $X$  can produce dramatically different levels of skill  $B$  depending on the effort expended by teachers and students ( $e_T$  and  $e_C$ ) and depending on the quality of complementary backgrounds that teachers and students bring to school ( $\mu_T$  and  $\mu_C$ ). Even the various school inputs  $X$  are subject to choice because their use depends on the children's capacity to learn and the teacher's ability to teach.<sup>17</sup>

The most important element of school quality is undoubtedly the teacher. An early project by Murnane (1975) showed that certain teachers in inner-city schools consistently produced classes of high achieving students while their colleagues consistently produced inferior results. Thirty years later, Rivkin et al (2005) found the same results in Texas. And yet the teachers were indistinguishable in terms of education, experience, pay, and in-service training. Good teachers had high levels of unobserved attributes  $\mu_T$  and effort  $e_T$ , and they inspired their students to apply high levels of their own unobserved attributes  $\mu_C$  and effort  $e_C$ , and yet the source of the persistent quality was not identifiable by either the econometricians conducting the analysis or the administrators setting compensation policy.

The most similar example from a developing country perspective is the study of middle school test performance in China by Lai, Sadoulet and de Janvry (2011). Again, there were large differences in student performance across schools that appear driven by teacher abilities. However, the key observable teacher attribute was the teacher's rank which is set by an evaluation process. Students taught by higher ranked teachers performed better, but there were no significant relationships between student performance and university-educated teachers, teachers who undertook informal pedagogical training, or teachers' years of experience. We are left with the circular result that higher ranked teachers teach better, and that teacher ranking is based on their ability to teach.

Any effort to raise school quality has to confront the decisions that set levels of the key inputs  $e_T, e_C, \mu_T, \mu_C, X$ , and  $\gamma$ . The challenge is that most of the relevant variation in these inputs across schools is not measured by administrative data. Schools and teachers with outstanding levels of cognitive attainment  $B$  will look identical on paper to schools and teachers with mediocre results.

### ***B. Incentives and effort***

A common problem in developing countries is that the teacher's shirk their responsibilities. Teacher absenteeism averages 19% in developing countries compared to 5% in developed countries (Chaudhury et al. 2006; Das et al. 2007). Moreover, substitute teachers

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<sup>16</sup> See reviews by Hanushek (1986, 1997) for earlier studies of the education production process.

<sup>17</sup> In Pakistan, I visited a school with classroom closets full of textbooks left in their original paper wrappers while the children were left without books. The teachers did not want the books to be damaged.

available in developed countries are largely absent in developing countries. Improving school quality in developing countries has to confront the problem of shirking teachers.

Teachers are paid  $w_T$  as long as they are not caught shirking. The probability of being caught shirking and then being fired is  $\alpha$ ,  $\alpha \in [0,1]$ . The teacher can also earn an alternative wage outside their teaching obligations,  $w_{0T}$ . Therefore the teacher faces a budget constraint composed of what they can earn in the school and out of school.

$$W_T = (1 - \alpha(1 - e_T))w_T + (1 - e_T)w_{0T} \quad (2)$$

If teachers get utility from the attainment of their students and they take the child's attendance as determined, their attendance decision is governed by

$$U'_T(B)(q_T e_T^\rho + q_C e_C^\rho)^{\frac{1}{\rho}-1} q_T e_T^{\rho-1} = U'_T(B) \frac{\partial B}{\partial e_T} = w_{0T} - \alpha w_T \quad (3)$$

The left-hand-side of (3) is the marginal utility the teacher gets from spending additional time in school and producing added cognitive attainment in the child and the right-hand side is the amount the teacher could earn if that same time were instead spent in an alternative activity net of any expected lost earnings from teaching if caught shirking. The condition encapsulates many of the issues surrounding the debate on school quality in both developing and developed countries. If teacher's are held responsible for shirking ( $\alpha$  is set at a high level so the expected penalty from poor performance is high), then teacher's will attend more regularly. On the other hand, teacher's will also attend more regularly if they are paid more ( $w_T$  is set at a high level). Teachers also attend more regularly if the school offers high quality inputs (high levels of  $X$ ), or if the teacher values child learning highly (high level of  $U'_T(B)$ ). But the other implication of (3) is that **anything that raises child attendance will cause teachers to attend more regularly as well.**

The child's decisions are symmetric. The child can earn a wage  $w_{0C}(B)$  if the child works rather than attending school, where the child labor wage is conditional on the child's cognitive attainment to date. The condition setting how much time the child will attend is

$$U'_C(B) \frac{\partial B}{\partial e_C} = w_{0C} - (1 - e_C) \frac{\partial w_{0C}}{\partial B} \frac{\partial B}{\partial e_C} \quad (4)$$

The left-hand-side is the marginal utility from additional cognitive attainment from spending more time in school, while the right-hand-side is the earnings from spending time in the child labor market net of the lost opportunity to raise the opportunity wage even more by spending additional time in school. The child attends more regularly if child labor is prohibited and if cognitive attainment is highly valued. High quality school and teacher inputs raise the marginal product of child time in school which both increases the utility from time in school and lowers the value of time in child labor which increases child attendance. In particular, **anything that raises teacher attendance will raise child attendance as well.**

We can now summarize the options available to policy-makers trying to improve school quality. Those include:

- Improve school inputs,  $X$ ;
- Improve school efficiency,  $\gamma$ ;
- Raise teacher attendance,  $e_T$  by raising wages  $w_T$  or by increasing monitoring for shirking  $\alpha$ ;
- Raise child attendance  $e_C$  by lowering child opportunity wage  $w_{0C}$  or by raising the anticipated return to schooling,  $\frac{\partial B}{\partial e_C}$
- Improve child health or other elements of socioeconomic background  $\mu_C$ ;

We will review the prospects for cost effective interventions for each of these in turn.

## **VI. What are the prospects for getting a reasonable return from improving school quality?**

### ***A. Investing in improved school characteristics, $X$***

Perhaps because countries attempt to standardize the inputs they allocate to schools, there is not much evidence that variation in school characteristics alter learning outcomes to a significant degree. By and large, schools have the same textbooks and materials, classrooms buildings, and curricula, at least on paper. That lack of variation makes it difficult to evaluate whether changes in input mix would affect learning outcomes. Glewwe et al (2011) concluded that children perform better in schools with adequate desks and a permanent structure as compared to sitting on mats in the open air, but most children already have access to those minimal school attributes. Glewwe and Kremer (2006) did suggest that developing countries probably underinvest in schooling compared to developed countries, but they did not have strong suggestions for how additional monies might be spent.

In times past when there were many underserved children lacking access to a nearby school, the case for large public building efforts may have been more compelling. That was the case with the Rosenwald schools built to educate Southern black children in the U.S.. That also was the case in Indonesia in the 1970s, where Duflo (2001) showed that a major effort to expand primary school access in Indonesia had a large impact on enrollments and over time, a modest but significant impact on earnings as well. As we showed in section I, however, the vast majority of children in the world have access to a school and spend at least some time in the school. Even if we had better understanding of the productivity of various inputs, it is doubtful that we would get sufficient improvements in learning outcomes to pay back the costs of further investments in school infrastructure.

### ***B. Improving School Quality by improving school management, $\gamma$***

As early as 1962, international agencies such as the United Nations and the World Bank were advising that the decentralization of public service delivery could serve as a development strategy. The move toward more local control is motivated by the belief that decentralized control will result in better school outcomes, holding constant the level of resources devoted to the school. Local decision-makers should have more information on local needs and conditions and can adjust resource allocations accordingly. Central dictates that are aimed at maximizing welfare on average may oversupply the service in some areas and undersupply it in others. Local officials should better respond to local needs because they are more exposed to pressure from constituents and because they may use quality public services to attract or retain residents.

Tempting as it is to assume that we can spend the same amount on schooling and get better outcomes if we only managed schools better, evidence that we can raise  $\gamma$  by shifting responsibility from the Ministry of Education to local school managers is decidedly mixed. In the case of schooling outcomes, even the most supportive studies tend to argue that decentralization helps some schools but not others. There are numerous reasons why local control may yield poor outcomes. Bardhan (2005) and Bardhan and Mookherjee (2006) argue that autonomous decisions are particularly prone to fail in developing countries. First, populations may not be mobile, and so households may not move because of poor quality public services. Second, local officials may be subjected to undue influence by prominent local families seeking to divert public resources towards their private needs. A related problem is that there may be no tradition of monitoring of local officials by local residents, so presumptions of greater accountability with local control may not hold in fact. Finally, local officials may lack

the necessary experience or skills to manage resources in countries with few well-educated professionals. Any of these problems could create difficulties for decentralized school systems.

A more fundamental concern is that any effort to devolve authority to the local school level will require that local school principals, teachers, parents or community leaders choose to exert effort to manage the school. This point was driven home by Gunnarsson et al (2009) who found that most of the variation in school autonomy was within countries and not between countries. Even supposedly centrally managed school systems have some degree of local participation while supposedly locally managed systems often have decisions dictated by central authorities. As a result, localities only participate actively in decentralization initiatives if it is in their interest to do so. In Latin America, more local authority was exercised by schools in localities with more educated parents and more remote locations (Gunnarsson et al, 2009). In Argentina, the best outcomes from a decentralization initiative were in districts that responded quickest and were in wealthier areas (Galiani et al, 2008). In El Salvador, benefits of decentralization were found in the schools that took up an offer of greater autonomy but not all schools opted in (King and Ozler, 2001).

The key benefit of decentralization is supposed to be that resources will be used more efficiently. However, that requires both capable and ethical public servants at all levels of the government. Unethical local authorities may take advantage of their increased freedom to transfer resources away from their efficient uses. In Uganda, only 13% of block funding for decentralized schools ended up at the schools while the rest disappeared in the bureaucratic maze (Reinikka and Svensson, 2004).

Hanushek, Link and Woessman (2011) examined the role of decentralization on student outcomes across 42 countries that participated in the PISA international tests. They conclude that decentralization increases test scores in developed countries and countries with well-developed managerial capacity in education. However, decentralization lowers student outcomes in poorer countries and countries lack institutional capacity to manage schools. Their cross-country results are consistent with the findings within countries that decentralization works best in the best managed and most educated communities. Losers tend to be the districts with the weakest managerial capacity and the poorest and least educated parents.

These findings suggests that decentralization ought to be offered but not mandated. Only those communities or districts that expect to benefit will participate. The poorest and least educated communities will opt not to participate, the communities that would be harmed if the decentralization were mandated by the central authority. Because I cannot advocate a universal move toward increased local autonomy, I don't believe this option would pass muster on a global benefit-cost criteria.

### ***C. Raising Teacher attendance by improving compensation ( $w_T$ ) or increasing monitoring ( $\alpha$ )***

We know that teachers are important for school quality and that teacher absenteeism is a common problem in developing countries. A naïve view would be to contend that if teachers are paid to teach, then public expenditures are already in place and one need only compel the teachers to show up for work. But teacher absenteeism has been recognized as a problem for decades and yet it persists. Governments either lack the will to enforce contractual obligations; or they lack the resources to monitor teacher performance; or they view teacher postings more as investments in political patronage rather than human capital development. It seems clear that the solution to teacher absenteeism will not be found by asking governments to continue doing what they are currently doing but with more diligence.

Several recent efforts have attempted to improve the monitoring of teacher attendance. Duflo et al (2010) report on an experiment where teachers in a one-teacher school were asked to have a student take a picture with a date stamped on the photo. Teachers were paid a bonus depending on how many days they attended. Absenteeism was 44% before the program was instituted and fell to 21% afterward while remaining above 40% in a set of control schools. The improvement persisted over time, increasing the time students had access to a present teacher by 30%. Student performance was 0.17 standard deviations higher in the schools with the cameras than in the control schools.

Unfortunately this solution has only limited application. It works in cases in remote schools where monitoring teacher attendance is costly. It is also important to note that these teachers were not part of the government system where bureaucratic rules would undoubtedly conspire to restrict its use. Indeed the authors also followed a similar scheme used to monitor the absenteeism of government nurses. At first, nurses' absenteeism fell by half, similar to the finding for the teachers. But soon the government began allowing exceptions to monitoring program and lax enforcement caused a reversal of the initial improvements.

This divergence of outcomes between similar interventions applied to teachers in government postings versus teachers hired outside the civil service bureaucracy is a recurring theme in the development literature. Teacher attendance in private schools is much more regular than in government schools despite higher pay in government schools. Duflo, Dupas and Kremer (2007) report on Kenya's Extra Teacher Program which provided funds to hire additional teachers on a contract basis to be used in grades 1 and 2. Despite the reduced class size, children assigned to civil servant teachers in the schools receiving extra teachers scored no better than did those in schools without the additional teachers. The apparent reason is that from an already abysmal attendance rate of 58%, civil service teachers reduced their attendance an additional 13 percentage points in schools that received extra teachers. Meanwhile, the contract teachers attended more frequently than civil service teachers despite being paid 25% of the civil service rate. Students taught by the contract teachers attended more frequently and scored 0.23 standard deviations higher on tests than did students taught by the civil service teachers in the same schools.

A similar program was instituted in Andhra Pradesh province in India (Muralidharan and Sundararaman, 2010). Teachers on fixed-term, renewable contracts lacking the professional training normally required for a civil service posting were hired and randomly posted to 100 government schools. Pay was on par with private school salaries, but only one-fifth the pay of the civil service teachers. Nevertheless, attendance by contract teachers was significantly higher than for civil service teachers (84% versus 73%). Students in schools receiving the extra teacher performed significantly better on tests of mathematics and language. An earlier study by Banerjee et al (2007) found that contract teachers who provided tutoring to weak students significantly raised the performance of those children in the current year and the effect remained significant but smaller once the tutoring ended. A third study in Uttar Pradesh and Bihar by Atherton and Kingdon (2012) also found that contract teachers attended more regularly, performed better and at a third of the civil service pay standard.

The India case demonstrates a significant challenge to school reformers. In private schools, teacher performance is closely tied to pay, but not in government schools (Kingdon and Teal, 2007). In private schools, teacher attributes such as tenure on the job, scores on tests, and pedagogical methods affect students' performance, but not so in government schools (Aslam and

Kingdon, 2011). Unionized teachers are paid more, but perform worse in the classroom (Kingdon and Teal, 2010). Why then wouldn't a move toward contract teachers be warranted?

There are two main concerns that suggest the use of contract teachers will only be a short-term solution. First, it is not sustainable to maintain two teaching cadres, one that is highly paid, enjoys job security, and has no expectation of performance and a second that is poorly paid, has no job security, and is expected to make up for the failings of the first group. At some point, one would have to ask why the government continues to employ the civil service teaching cadre. If the contract teachers become a threat, the civil service teachers will press to have the system disabled.<sup>18</sup> Replacing the civil service teachers with contract teachers is a political impossibility

The second concern is that if the contract system becomes regularized so that there are two teaching systems, the contract system will eventually adopt the rules that have made the civil service system nonfunctioning. Once contract teachers become regular teachers, why wouldn't their performance revert to the civil service standard? In fact, the superior performance of contract teachers may be a transitory phenomenon if the contract teachers ultimately expect to become civil service teachers. If contract teachers discover they will never gain a permanent posting, would their superior performance continue?

Nor does decentralized control of the schools appear to offer a solution to civil service teacher absenteeism. Banerjee et al (2010) review a series of efforts in India designed to improve community monitoring of schools and teachers in the village. Village Education Committees composed of parents, the village head and the head teacher are empowered to monitor teacher performance and to request school resources from the education district. The experiments attempted to improve the capacity of the VEC to manage the schools. One intervention was aimed at informing the village about the function and power of the VEC to manage the school. A second added training in administering and interpreting literacy tests that would give the village an independent assessment of children's progress in the school. The third added an additional component that trained volunteers to provide supplemental reading instruction after school. None of the interventions significantly affected teacher attendance. Children who attended the afterschool reading classes did improve their reading skills, but there were no apparent enhanced learning outcomes related to the teacher's actions. These disappointing outcomes mirror the findings from efforts to decentralize discussed in the previous section: local control is difficult to foster in areas that lack managerial capacity and educated parents.<sup>19</sup>

The most plausible solution is to tie teacher pay to performance, the subject of an experimental evaluation conducted by Muralidharan and Sundararaman (2011a) in Andhra Pradesh province, India. The program offered a bonus averaging 3% of annual pay to civil service teachers based on the average improvement of their students' test scores in an independently administered exam. Despite the modest cost increment, student performance was 0.27 standard deviations higher in mathematics and 0.17 standard deviations higher in languages compared to students in schools without the bonus. In addition, students performed better in sciences and social studies. The gains came despite the fact that teacher attendance was no

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<sup>18</sup> In both Kenya and Andhra Pradesh, the perceived need to add teachers led to proposals to expand the civil service ranks substantially, and so the policy was to expand the underperforming ranks while limiting the size of the contract teacher program.

<sup>19</sup> An expert on educational decentralization confided to me that in his experience, every successful effort to foster parental control over local schools involved support of the parents' activities by a nongovernmental organization (NGO) commissioned to carry out the project. Once the project ended and the NGO exited, the parental control would fall apart, suggesting that it was the NGO that effectively exerted authority over the local school.

higher in the bonus schools. On the other hand, teachers apparently used their in-class time more effectively and their students were given more out-of-class assignments to work at home or in teacher administered supplementary sessions. Furthermore, teachers appear to have been accepting of the bonus payment system, especially younger teachers who had lower pay to start. Interestingly, teachers who expressed the greatest support *ex ante* were the ones whose students performed the best *ex post*, suggesting that the most able teachers are the ones who are comfortable with performance pay.

This most favorable outcome serves as a counterpoint to a similar experiment attempted in Kenya (Glewwe, Ilias and Kremer, 2010). Teachers were offered a reward amounting to 2-4% of annual pay based on their students' test scores with penalties applied if students did not take the exam. Performance on the exam increased, but performance on other exams showed no improvement. Performance did not persist beyond the current school year. Neither teacher, nor student attendance was affected. The one significant behavioral change was that time spent preparing for the incentivized exam increased in 88% of the schools where bonuses were offered.

It is tempting to use the India case to support a move toward bonus pay. The cost was modest compared to the benefits of increased cognitive development. However the Kenya experience suggests that the case for broad based adoption of performance based pay is premature.

***D. Lowering child opportunity wage ( $w_{OC}$ ), raising the return to schooling,  $\frac{\partial B}{\partial e_c}$ , or improving the child's socioeconomic status ( $\mu_c$ )***

***1. Providing information on the true returns to schooling***

One of the barriers to schooling is that parents and children do not have a grasp of the true returns to education. This is particularly true in rural or remotely sited schools where it is more difficult to observe how education can raise lifetime earnings. As T.W. Schultz argued in his 1975 essay on the role of human capital in disequilibria, traditional farm households are efficient given what they know about their markets and technologies, but they are poor because those traditional markets and methods do not allow for much more than subsistence. Production analysis confirms that formal schooling does not have a return in traditional rural households (Fafchamps and Quisumbing, 1999; Godoy et al, 2005). As a result, any returns to rural schooling are tied to migration to an urban market where skills and specialization are rewarded.

Supportive evidence is found in the fact that rural enrollments react positively to the possibility of migrating to nearby urban markets (Tansel, 2002) or to higher observed returns in those markets (Kochar, 2004). Boucher et al. (2005) found that rising returns to education in Mexico following the installation of the PROGRESA rural conditional cash transfer program (discussed below) is largely attributed to the migration of the more educated rural workers to urban markets. It seems that knowledge of returns to schooling in other markets and the ability and willingness to commute to those markets is critical to school enrollments and attendance in more remote locations.

Orazem and Tesfatsion (1997) demonstrated that when children base their expectations of returns to schooling on their parents experiences rather than global information on returns to schooling, inefficient human capital investments result. In developed countries, the empirical research on impacts of neighborhoods on schooling decisions of disadvantaged youth is mixed at best (Lang, 2007; Oreopoulos, 2003). However, information on returns to schooling are easily observed in developed countries, but less so in developing countries. An inexpensive way to

increase child attendance may be to provide them and their parents with accurate information about the value of education.

Jensen(2010) found that 8th grade boys had a very low subjective estimate of the returns to schooling in the Dominican Republic. A random sample of these boys were given correct information on returns. The result was a significant increase in persistence to graduation from high school of 9 percentage points for those whose subjective returns were increased to the true rate of return. Nguyen (2008) conducted a similar experiment on primary students in Madagascar. Grade 4 students in schools where they and their parents were given information on the returns to schooling increased their attendance by 3.5 percentage points and increased their test scores by 0.2 standard deviations.

With only limited experience with these interventions, it is premature to propose a global program of informing parents and children about the true returns to schooling. And yet it would be difficult to devise a less expensive intervention and one with virtually no chance of unintended consequences. If children increase their intensity of effort in school as a result of being told the best estimates of the true returns in the local and more remote labor markets, it would have to meet a benefit-cost criteria.

## ***2. Conditional Cash Transfers for school attendance***

The most widely studied development intervention over the past fifteen years has been to tie desired household behaviors to the receipt of cash or in-kind transfers from the government. Fiszbein, Schady et al (2009) listed 28 countries that had initiated at least a pilot program since 1997 including virtually all Latin American countries, 4 in Africa, 6 in Asia and 2 in the Middle East. The programs are targeted to households in the lowest socioeconomic strata. In most cases, coverage includes 20% or less of the country's population. The targeting is pragmatic as the countries cannot afford to extend the benefits to all, the poorest are the group that is most likely to underinvest in their children's schooling because of liquidity constraints, and the amount of the transfer necessary to induce the desired behavior will be smallest in households with the lowest opportunity costs of time. Perhaps because the programs focus so intensively on the poorest social strata, benefits have shown little evidence of leakage to the nonpoor.

The transfer programs typically require that child attendance in school meets a threshold level of 80% per month or more. They may also require that the children receive periodic health assessments at a local clinic and receive timely vaccinations, that the mothers receive training in nutrition and health, and that the mothers participate in perinatal care and receive training in early childhood development. As a result, the conditional transfers become an umbrella program aimed at incentivizing a broad array of desired behaviors believed to improve private and social outcomes. The transfers themselves are aimed at lowering the incidence of poverty and inequality in the society.

Few interventions have been subjected to so many rigorous evaluations that allow us to evaluate outcomes relative to a baseline collected before the conditional transfers were implemented and that include randomized participants and controls. As such, the evidence of the outcomes of these programs should be particularly reliable for assessing whether further expansion of such programs is warranted.

First, the program has been applied to some of the poorest countries (Bangladesh, Burkina Faso) as well as countries that are relatively well off (Chile, Argentina). The transfers are typically modest, representing 10% of pretransfer household consumption levels or less.<sup>20</sup>

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<sup>20</sup> The highest transfers were in Mexico and Nicaragua averaging about one-third of pretransfer consumption.



Median administrative costs including management, monitoring and evaluation across 10 programs evaluated by Grosh et al (2008) came to 8% of the total costs which was lower than the administrative costs for other social assistance programs. The programs Transfer mechanisms have been adaptable to the level of financial sophistication in the country—from the use of debit cards readable at ATMs in Brazil to payments distributed through the post office or through village leadership. In short, conditional transfers have been quite flexibly applied to countries at all stages of development.

The Fiszbein, Schady et al (2009) review summarizes how households have responded to these incentives. First, the transfers raised per capita consumption in all countries evaluated, the primary aim of the poverty alleviation aspect of the program. In 4 of 5 countries with necessary data, expenditure shares on food rose significantly, suggesting that the transfers help households meet their basic needs. In most countries, the incidence of health care visits and vaccinations for children in recipient households increased significantly. These results are important because they suggest that even before we consider child time in school, conditional transfers improve child health, nutrition, and socioeconomic status. In section II, we learned that these are factors that increase returns to schooling at least in theory.

As for time in school, the evidence consistently supports the view that conditional transfers increase time in school. The short term effects of the program are summarized for 11 countries in Table 3. In almost all cases, households increase their children's time in school in response to the conditional transfer. Within countries, the largest impacts are found among the poorest households that are the most likely to face liquidity constraints that would inefficiently limit the time their children spend in school. Larger effects are found in rural areas where children face the highest opportunity cost of time in school. Consistently where evaluated, we find that the increased child time in school is accompanied by a reduced incidence of child labor. In one case in Brazil, the biggest decline was in the most hazardous forms of child labor (Yap et al, 2009).

The Brazil case is useful because it is the largest conditional transfer program. It also began as a municipality-led innovation and so it was implemented only gradually over time until it became a national plan. While it was not subject to an experimental design, Glewwe and Kassouf (2012) were able to evaluate its impacts on student outcomes by exploiting variation across municipalities in the timing of its implementation and program expansion. The program significantly reduced dropout, raised the promotion rate, and increased primary enrollment by 6%.

Less certain is whether more time in school results in better cognitive development. Few studies have examined the effect of receiving a conditional transfer on test scores. Ponce and Bedi (2008) found no difference in 2<sup>nd</sup> grade test scores between recipient and nonrecipient children in Ecuador, but it is not clear that differences would show up that early in the primary cycle. More importantly, the test score is administered to children in school which means that time in school is held constant for recipient and nonrecipient children. If cash transfers increase cognitive attainment by increasing time in school, this study would fail to capture any effect. A study of adolescent girls who were exposed to a conditional cash transfer program in Malawi (Baird et al, 2011) found significantly higher performance on test of English, mathematics and cognitive attainment. It is plausible that the more positive evidence of cognitive improvements in Malawi are due to their inclusion of girls out of school as well as those still in school into the study. The girls receiving conditional transfers had more time in school relative to the control girls, and that additional time may be responsible for their higher test scores. Furthermore, by

middle school, differences in academic attainment are easier to measure than they are in the second grade.

The only long-term experimental measure of the effects of conditional transfers was reported by Behrman et al (2011) for the PROGRESA/Oportunidades program in Mexico. Youth aged 9-15 when first exposed to the conditional transfer program were aged 15-21 when an evaluation was made of their labor market and educational outcomes. Boys who were exposed to the program at age 9 ended up completing a year more of schooling than did boys without the program. The magnitude of the effect decreases as length of exposure decreases. Girls exposed to the program earliest received 0.7 more years of schooling while girls exposed at older ages experienced no difference in schooling. Child labor decreased significantly for boys but not girls after exposure to the program. Exposure to the program significantly lowers the probability of working in agriculture, meaning that the additional schooling encourages migration out of traditional employment. This is consistent with the role Schultz (1975) proposed for education of rural peoples—to allow them to adapt to changing economic opportunities and is consistent with the Boucher et al (2005) finding that the most educated rural youth are moving to urban markets.

What does the conditional transfer have to do with school quality? Child attendance complements other school inputs, and so child cognitive attainment should be enhanced by more regular attendance. In addition, as shown in (3), teacher attendance will also increase with child attendance to the extent that teachers view cognitive attainment as a shared good with their students. Unfortunately, we do not have any studies that have examined what happens to teacher attendance in the presence of a conditional transfer program aimed at their students, and so that link between child and teacher attendance must remain conjectural.<sup>21</sup>

It is important to note that the substantial increases in attendance related to the elimination of school fees reported in Table 1 did not erode learning outcomes in Africa, even when class sizes rose substantially. One would have expected that the addition of more children to existing schools would disadvantage those already in school, but that does not appear to have happened. One would also expect that the added children disproportionately come from more disadvantaged backgrounds and so they should underperform those who would have attended without an intervention, but that does not appear to be the case. Government schools were apparently able to adapt to the rising demand, even if resources were not added proportional to the increased enrollments. Similarly, rising demand for schooling induced by conditional transfer programs or by improved information on returns to schooling do not appear to have lessened school quality. These results are consistent with a model where teachers respond positively to an increased demand for their services, but actual proof will require further study.

## **VII. Benefit-Cost Comparisons of the Most Promising Strategies**

We can now return to the initial challenge posed in Section II: Do any of these interventions dominate a competing strategy aimed at improving child health? The answer is almost certainly no. Health interventions undertaken before schooling age, whether nutritional supplements, antiparasitics, antimicrobials or vaccinations, can insure proper brain development necessary to optimize time in school. The cost of such programs is often quite modest and the gains last a lifetime. One could pair these interventions with schooling as the child ages by tying their distribution to the school. I would hesitate to suggest withholding the treatments only to regular attendees of the school, however, as the benefits of the health improvement alone is adequate justification for the treatment, independent of the complementary effects on schooling.

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<sup>21</sup> An exception is Banerjee et al (2012) who find that the single most important factor explaining primary teacher attendance in Northwest Frontier Province of Pakistan is the attendance of their pupils.

Nevertheless, a program that combines conditional transfers for student attendance with improved information on the returns to schooling and school-based health programs represents a compelling package of complementary interventions that simultaneously address current poverty, health, nutrition, and human capital development. If the resulting boost to attendance results in a complementary increase in the quality of schooling provided by teachers who attend more regularly, the benefit-cost ratio becomes that much more attractive.

In Table 4, I present the benefits and costs of the three strategies that I believe offer the best evidence of success to date, nutrition supplements, offering information on returns to schooling, and conditional cash transfers. All have been shown to succeed with benefits that dominate costs. As I have discussed these in detail before, I now focus more generally on the relative strength of these strategies in different regions of the world.

Interested readers can request my detailed computations. My strategy was to first compute the cost of inducing an added year of schooling. These were discounted back to the first period of the intervention. I then imputed the present value of an added year of schooling over a 40 year work career. For very early interventions such as those in preschool or primary grades, I assumed that the work career began at age 15. For the others, I assumed it began at the end of the intervention. Returns to induced schooling were computed using returns to schooling for each country that were estimated for the King et al (2012) study. Average wages in the country were computed using those same data sets. Therefore, the stream of returns from the intervention reflect the imputed gain from a worker having one more year of schooling compared to the average worker in the country.

There are several caveats to this procedure. First, not all papers reported increases in years of schooling as a result of the intervention, and so I had to generate an implied gain in years of schooling from reported increases in enrollment or attendance rates. Second, this method assumes all returns come from increased years of schooling, but we know from the theory section that the larger gains may come from increased human capital produced per year of schooling. As a result these estimated returns are likely to be overly conservative as they ignore gains in the pace of cognitive development of the children while in school. Also, I do not add in likely external benefits from increased schooling in the form of reduced incidence of early pregnancy, lower incidence of criminal activity, improved health, or improved mobility of labor.

Several general findings are apparent. First, the climate for these interventions are better in economies with strong returns to schooling than in those where returns to schooling are depressed by poor government institutions. Therefore, the best places to try these interventions are countries that protect individual economic and political freedoms. Of course those countries would also have the better capacity to implement an intervention, whether distributing medication, transfer payments, or information on the returns to schooling. Therefore my earlier comments regarding failed states apply to these interventions as well. Perhaps there are a menu of interventions one could apply to failed states, but they are unlikely to involve a coordinated government effort to improve schooling outcomes.

Second, nutrition or health interventions are much less expensive than are cash transfers programs. Perhaps that is why the cash transfer programs are concentrated in wealthier countries while the nutrition programs typically focus on the poorest countries. In fact, conditional transfer programs require at least some minimum level of development to be feasible because they require a large enough population of the relatively well-off to subsidize those at the bottom of the income distribution. If the entire population is poor, redistribution is impossible.

Related to that is the requirement that benefits outweigh costs requires that the more expensive interventions be applied in relative more developed economies. Returns come from induced returns to additional years of schooling. As thousands of Mincerian earnings function studies have found, log wages are linear in years of schooling, and so wage levels rise at an increasing rate as years of schooling increase. That means that increasing schooling by one year in a country where average schooling is at the primary level or less will generate a relatively small stream of benefits compared to an added year of

schooling in a country where average schooling is at the secondary level. Only relatively inexpensive interventions can be tried in the poorest and least developed countries.

Finally, the appropriateness of one type of intervention versus another also reflects the proximate cause for poor educational outcomes in the area. Not surprisingly, micro-nutrient interventions and deworming strategies will be most effective where those problems are most severe. As shown in Table 4, that would be in the poorest countries and in South Asia and Sub-Saharan Africa. Those interventions also tend to have the largest benefits relative to costs. That is to be expected. Provision of nutrient supplements and antiparasitic medicines are very inexpensive and they can be delivered to children very early in life where they can make a lifetime of difference. Insuring proper nutrition at the time when brain development is occurring, whether before birth by insuring maternal nutritional health, in infancy, or in preschool can both shift up and out the marginal return to schooling in Figure 1. It would be very difficult to design an intervention in these poorest countries that would dominate the benefit-cost ratios of these nutritional interventions.

That said, the two studies that have explored the benefits of providing accurate information on the returns to schooling suggest that for older children, a very inexpensive intervention with very large returns is just to provide children and their parents accurate information on the value of schooling. Such an intervention could be easily built into the standard curriculum at low cost and has the potential of increasing academic effort while in school as well as increasing years of schooling.

Finally we have the conditional transfer programs that have been popular in Latin America. Most but not all have been cost-effective. They are most effective when targeted at child ages where dropout begins, and so transfer programs aimed at younger children tend to fail the benefit-cost criteria.

These programs are most cost-effective when there is already a preexisting transfer program aimed at helping the poor. These tend to be the more developed countries among the ones we have examined. In such circumstances, the marginal cost of taking an existing transfer program and adding conditions for their receipt is relatively low. It is unlikely that a country that has an insufficient upper-class that could afford a transfer program or that does not have a preexisting tax/transfer program would find such a program feasible on a national scale.

To that end, Behrman et al (2011) present estimates of the benefits and costs of Mexico's PROGRESA/Oportunidades program which I reproduce in Table 4. Including possible costs of distortionary taxes and the opportunity cost of child time out of school as well as the costs of administering the program, the benefits of induced increased earnings easily outpace the costs of the program. However, they do not also add in the costs of the transfer itself, arguing that the transfer comes at no real cost to the country. While I appreciate the public finance argument underlying this stance, I do not believe it applies as well when one is first implementing a transfer program where the opportunity cost of scarce government funds may be very high. It is not obvious that if the transfer comes at the expense of government programs to provide security, rule of law, infrastructure or other fundamental government services that the transfers come at zero cost to the country. In Mexico, where such transfers have been in place for many years, the opportunity cost of such funds can be more plausibly argued to be negligible.

## **VII. Summary and Recommendations**

Now that most children in developing countries enroll in school, economic development strategies have shifted to enhancing their learning while in school. This has led to a focus on improvements in school quality. While such improvements should increase lifetime returns to schooling in like fashion to improvements in child health, investments in school quality have some important disadvantages to health interventions in a benefit-cost sense. On the cost side, these interventions are typically more expensive per recipient than are nutrition supplements or preventive health. On the benefit side, the link between investment and resulting human capital acquisition is weaker than that between treatment and desired health outcome. Our knowledge of which inputs generate quality schooling outcomes is very weak, and additional investments in school inputs are unlikely to generate the desired learning response. There is widespread acknowledgement that resources are used inefficiently, but efforts

to improve resource management by devolving authority to local jurisdictions are as likely to fail as succeed. There is ample evidence of shirking by government teachers but efforts to increase monitoring have been disappointing. Use of alternative teachers, whether contract teachers or tutors, are often successful, but their use begs the question of why they must be hired when civil service teachers appear to be underperforming. In addition, if these teachers will be converted into permanent government employees eventually, we must presume that the benefits of using contract teachers or tutors will be fleeting. Tying teacher bonus payments to student performance on exams shows some promise, but there are too few studies to justify firm support for that option. Increasing years of schooling simply by providing accurate information on the returns to schooling is also quite promising and an inexpensive intervention, but again there are too few studies upon which to base a world strategy.

The most consistent evidence of success from schooling interventions in recent years comes from transfer payments targeted to the poorest segments of society conditional on the children attending school. These programs have consistently increased child attendance, even when the transfer is of modest size. Program administration costs have been lower than those of other social interventions. In addition to the positive schooling outcomes, these transfers have lowered the poverty rate, improved the nutritional status of poor households, and have increased the fraction of children receiving vaccinations and other health services. Even the most expensive and comprehensive of these programs, the Mexican PROGRESA/Oportunidades program, have met the benefit-cost criteria. Because the programs increase the intensity of child investment in school as well as increasing child time in school, they help to break the cycle of poverty whereby poor parents underinvest in their children's schooling and doom their children to poverty as well. And by increasing child attendance, we should see a concomitant increase in teacher attendance which will increase the quality of schooling offered to the poorest children in the country.

Nevertheless, these programs can only succeed in relatively developed countries where government institutions necessary to identify the poorest households, manage a large transfer program, and monitor child attendance are well developed. In the poorer countries, programs aimed at improving nutrient health of children are less expensive and can meet benefit-cost criteria despite the lower potential returns to human capital in such countries. Such programs can target very young children, taking advantage of potential increasing returns from interventions that bump up the marginal benefit from schooling.

All countries could benefit from improved information on the true returns from schooling. Although only two studies have buttressed that recommendation, the costs are very low and the potential benefits are quite promising.

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Table 1: Change in the Percent of Primary Aged Children in School After Fee Elimination in Sub-Saharan Africa

Country	Year Fees Eliminated	% Enrolled Before Elimination (Year)	% Enrolled 2009	% Change in enrollment rate
Cameroon	2000	69.5 (1991)	91.6	31.8%
Ethiopia	1994	20.3 (1994)	82.7	307.4%
Ghana	2005	59.5 (1999)	75.9	27.6%
Kenya	2003	62.4 (1999)	82.1	31.6%
Lesotho	2000	57.3 (1999)	73.1	27.6%
Mozambique	2004-2006	52.4 (1999)	90.6	72.9%
Tanzania	2001	49.3 (1999)	96.4	95.5%
Zambia	2002	69.3 (1999)	90.7	30.9%
Malawi	1994		90.8	49% <sup>a</sup>
Uganda	1997		92.2	68% <sup>a</sup>
Other Sub-Sahara	Reference	62 (1999)	77	24%

<sup>a</sup> Estimated by Kattan (2006) from changes in gross primary enrollment rates

Sources: Kattan (2006), World Bank (2009), Author's computation of World Development Indicators.



Table 2A: Random Effects Estimation of the Effect of Changes in Level and Average Schooling on Ten-year Labor Productivity Growth

Exogenous Variable	1	2	3
$S_{it}$	0.023** (2.35)	-0.134** (2.41)	-0.132** (2.37)
$S_{it} * Heritage$		0.0025** (2.48)	0.0024** (2.41)
$S_{it} * Polity$		0.0027 (0.79)	0.0028 (0.81)
$K_{it}$	-0.032** (2.46)	0.183**	0.24** (2.34)
$K_{it} * Heritage$		-0.0029* (1.75)	-0.004** (2.11)
$K_{it} * Polity$		-0.0136** (2.24)	-0.014** (2.32)
$(S_{it} - S_{it-10})$			-0.263 (1.37)
$(S_{it} - S_{it-10}) * Heritage$			0.004 (1.15)
$(S_{it} - S_{it-10}) * Polity$			0.008 (0.69)
<i>Trend</i>	-0.0025** (2.3)	-0.0027 (1.30)	-0.0024** (2.14)
Constant	5.22** (2.47)	4.23* (1.86)	3.42 (1.42)
R-squared	0.022	0.056	0.064
N	309	309	309

Table 2B: Implied impact of schooling level and Economic and Political Freedom on Ten-year Growth in Labor Productivity

Freedom Quartile	Schooling Quartile (Average Years of Schooling in Year $t$ )		
	25%ile (1.9 years)	Median (3.6 years)	75%ile (6.1 years)
25%ile	0.004	0.007	0.012
Median	0.03	0.058	0.098
75%ile	0.068	0.130	0.220

t-statistics in parentheses

Dependent Variable:  $[\ln(y_{it}) - \ln(y_{it-10})]$  where  $y_{it}$  is GDP per worker in country  $i$  in year  $t$

$S_{it}$ : Average years of schooling for the population aged 25 and over in country  $i$  in year  $t$

$K_{it}$ : Capital per worker in constant 2005 dollars in country  $i$  and year  $t$

Heritage: Heritage Foundation Index of Economic Freedom with higher values being freer in the base year  $t$

Polity: Freedom House Imputed Polity Index with higher values being more Democratic in the base year  $t$

Regressions also included uninteracted *Heritage* and *Polity* effects which were significant and positive in all regressions.

Table 3: Estimated short-run effect of conditional transfers on child time in school, by country

Country	Age/Grade	Impact (%) <sup>a</sup>	Transfer(%)
Bangladesh	11-18 (girls)	<b>27</b>	0.6
Cambodia	Grade 7-9	<b>33</b>	2.5
Chile	Age 6-15	<b>12</b>	7
Colombia	Age 8-13	<b>2</b>	17
	Age 14-17	<b>9</b>	17
Ecuador	Age 6-17	<b>14</b>	10
Honduras	Age 6-13	<b>5</b>	9
Jamaica	Age 7-17	<b>3</b>	10
Mexico	Grade 0-5	2	20
	Grade 6	<b>19</b>	20
	Grade 7-9	1	20
Nicaragua	Age 7-13	<b>18</b>	27
Pakistan	Primary girls	<b>38</b>	3
Turkey	Primary	-3	6
	Secondary	13	6

Source: Authors compilation of results reported in Table 5.1 of Fiszbein, Ariel and Norbert Schady with Francisco H.G. Ferreira, Margaret Grosh, Nial Kelleher, Pedro Olinto and Emmanuel Skoufias. 2009. Conditional Cash Transfers: Reducing Current and Future Poverty. Washington DC: The World Bank.

<sup>a</sup> Bolded values are significant at the 10% level or more

Table 4: Benefit-Cost ratios from various interventions affecting schooling

	Low Discount (3%)			High Discount (5%)		
	Benefit	Cost	BCR	Benefit	Cost	BCR
<b>Health and Nutrition Programs</b>						
Bolivia preschool (Behrman et al, 2004)	\$5,107	\$1,394	3.7	\$3,230	\$1,301	2.5
Kenya worms (Miguel and Kremer, 2004)	\$1,560	\$3.5	445.7	\$646	\$3.5	184.6
Kenya preschool (Vermeersch and Kremer, 2005)	\$1,560	\$29.1	53.6	\$646	\$28.6	22.6
Iron supplements (Knowles and Behrman, 2005)	\$474	\$10.5	45.1	\$330	\$10.3	32.0
India worms (Bobonis et al, 2006)	\$2,201	\$112.0	19.7	\$868	\$112.0	7.8
Guatemala (Damon and Glewwe, 2009)	\$622	\$52	12.0	\$301	\$51	5.9
<b>Information on Returns</b>						
Madagascar (Nguyen, 2008)	\$3,349	\$2.30	1456	\$1,455	\$2.30	632.6
Dominican Republic (Jensen, 2010)	\$7734	\$417	18.6	\$3356	\$417	8.1
<b>Conditional Cash Transfers</b>						
Mexico (Behrman et al, 2011)	\$2,679	\$500	5.4	\$1,082	\$390	2.8
Nicaragua (Maluccio, 2009)	\$6,003	\$1,574	3.8	\$4,412	\$1574	2.8
Honduras (Glewe et al, 2004)	\$9,178	\$266	34.5	\$4,064	\$219	18.6
Colombia (Attanasio et al, 2005)						
Urban ages 8-13	\$9395	\$1,916	4.9	\$3168	\$1898	1.7
Urban ages14-17	\$9395	\$767	12.2	\$5,957	\$759	7.8
Rural ages 8-13	\$9395	\$767	12.2	\$3168	\$759	4.2
Rural ages14-17	\$9395	\$479	19.6	\$5,957	\$474	12.6
Ecuador (Schady et al, 2008)	\$9100	\$572	15.9	\$4665	\$572	8.2
Chile (Galasso, 2011)						
Urban ages6-15	0-21504 <sup>a</sup>	\$542	0-39.7 <sup>a</sup>	0-9903 <sup>a</sup>	\$446	0-22.2 <sup>a</sup>
Rural ages6-15	0 <sup>a</sup>	\$542	0.0	0 <sup>a</sup>	\$446	0.0
Cambodia (Filmer and Schady, 2009)	\$1,849	\$709	2.6	\$939	\$709	1.3

Notes: Costs are the present value of inducing one additional year of schooling. Benefits are the present value from an additional year of schooling evaluated over a 40 year work career, evaluated at the average annual wage in the country

<sup>a</sup>Estimated impact of schooling was not significantly different from zero in some specifications. Estimates in rural areas were insignificant or negative.

Table 5: Incidence of Malnutrition by Region and Income Level, Most Recent Measure Available

<b>Region</b>	<b>% of infants born with low birthweight</b>	<b>% of children under 5 who are Malnourished <sup>a</sup></b>	<b>% of Population Undernourished</b>	<b>% of households that use iodized salt</b>
East Asia/Pacific	6.0	19.3	10.6	86.8
Latin America/Caribbean	8.4	2.0	8.9	
South Asia	27.3	47.5	20.3	
Sub-Saharan Africa	13.7	41.8	22.2	52.3
Middle East/North Africa	10.4	23.2		68.9
<b>Income Level</b>				
Low income	15.4	44.5	29.5	62.8
Lower middle income	21.0	41.8	16.5	54.2
Middle income	15.2	30.4	12.5	72.3
Upper middle income	5.4	12.6	8.5	91.4
World	15.2	31.8	12.9	70.7

Source: The World Bank *World Development Indicators & Global Development Finance*  
<http://data.worldbank.org/data-catalog/world-development-indicators>

<sup>a</sup> Measured by height for age.

Figure 1:

