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EXCLUSION FROM EDUCATION: The Economic Cost Out of School Children in 20 Countries

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Results for Development Institute
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RESULTS FOR
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Acronyms

DRC: the Democratic Republic of the Congo
EAC: Educate A Child
EFA: Education For All
GDP: Gross Domestic Product
GMR: Education For All Global Monitoring Report
HDI: Human Development Index
MDG: Millennium Development Goals
OOSC: Out of School Children
UIS: UNESCO Institute for Statistics
UN: United Nations

Foreword

This is an update of the second publication from Educate A Child (EA) that focuses on the costs of not providing universal primary education—to individuals and to nations. Like the original version of this paper, it was developed by and is published jointly with Results for Development (R4D).

This study, using more recent data reinforces in significant ways the findings of the first two EAC publications on the costs of not educating out of school children (OOSC). It relies on the estimation methodology used previously, which we believe is an important contribution to future knowledge generation in relation to the economic and related costs of not educating children at the primary level.

The key findings from this research are that the costs of not educating out of school children significantly outweigh the necessary investments for providing universal primary education, and that for some countries, these costs exceed the value of an average year of economic growth. Additionally, using the findings from this study, educating out of school children will also yield impressive savings in a range of other sectors including health, agriculture, and the environment, which can have a positive effect on growth and productivity.

Investing in basic education seems an obvious solution in a global community where economic disparities are increasing and becoming more visible, leading to dissatisfaction, and sometimes social unrest, among segments of society worldwide.

Why, then, are investments in primary education not on the increase across the board, and especially in those countries where the numbers of out of school children are highest? The evidence exists and it has been shown to be constant over decades. We can only surmise that it has not reached leaders and decisions-makers in a form that enables them to understand the importance to nations, as well as to individuals, of providing free, quality primary education to all.

We hope that this research can contribute to decisions that result in increased investment in primary education, particularly as we look to complete the unfinished agenda of Millennium Development Goal 2.

Mary Joy Pigozzi, PhD
Director, Educate A Child.

Executive Summary

In April 2013, Results for Development Institute (R4D) reviewed the benefits of primary education and estimated the economic cost associated with large populations of out of school children in a background study for Educate A Child's (EAC) High Level Strategic Meeting to Accelerate Efforts to Reach Out of School Children (Burnett, Guison-Dowdy and Thomas 2013). This report is an extension of that study. It updates economic cost estimates to reflect the UNESCO Institute for Statistics (UIS) database as of December 2014, further develops the estimation methodology, and expands the estimation exercise to a set of 20 low- and middle-income countries.

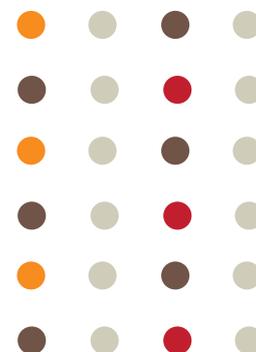
EAC's mission to support the Education for All initiative and the Millennium Development Goals for education is more pressing and relevant than ever. Although significant progress toward achieving universal primary education has been made over the past decade, out of school children (OOSC) remain a pervasive global problem. According to UIS (2014), there are nearly 58 million OOSC of primary-school age in the world.

To underscore the importance of reducing the global number of out of school children, this paper uses two methods to estimate the economic cost associated with OOSC. The first estimation approach uses labor market data compiled and analyzed by Montenegro and Patrinos (2014) to estimate the total earnings that will be forfeited in the near future due to undereducated workers if primary school enrollment patterns do not change. The second approach is based on cross-country regressions that estimate the relationship between national education attainment and per capita income (Psacharopoulos and Patrinos 2011, Barro and Lee 2010).

The estimated earnings cost of OOSC varies substantially with OOSC prevalence rates across the sample, from less than 1% of GDP in Vietnam to nearly 7% of GDP in Mali. Because these estimates do not account for the non-income benefits of primary education (such as improved health and citizenship), they are likely lower bounds for the total cost of OOSC in each country. We find that the economic benefit associated with achieving universal primary education exceeds one year of average economic growth for eight countries with high OOSC prevalence. A typical country in the sample is expected to forfeit earnings valued between 1% and 2% of GDP due to its OOSC population. Accounting for the indirect, non-earnings losses associated with OOSC, that average cost rises to between 5% and 6% of GDP.

In fact, the economic cost of OOSC tends to be highest in countries that are the least economically developed, suggesting that enrolling out of school children and providing them with quality education could contribute to global economic convergence, reducing economic inequality among and within countries. Furthermore, for all countries in the sample (even those with low OOSC prevalence, like Brazil and Indonesia), the estimated economic gain from achieving universal primary education exceeds the estimated increase in public spending required to enroll those OOSC in primary school. Thus there are strong equity and efficiency arguments in favor of endowing OOSC with quality primary education.

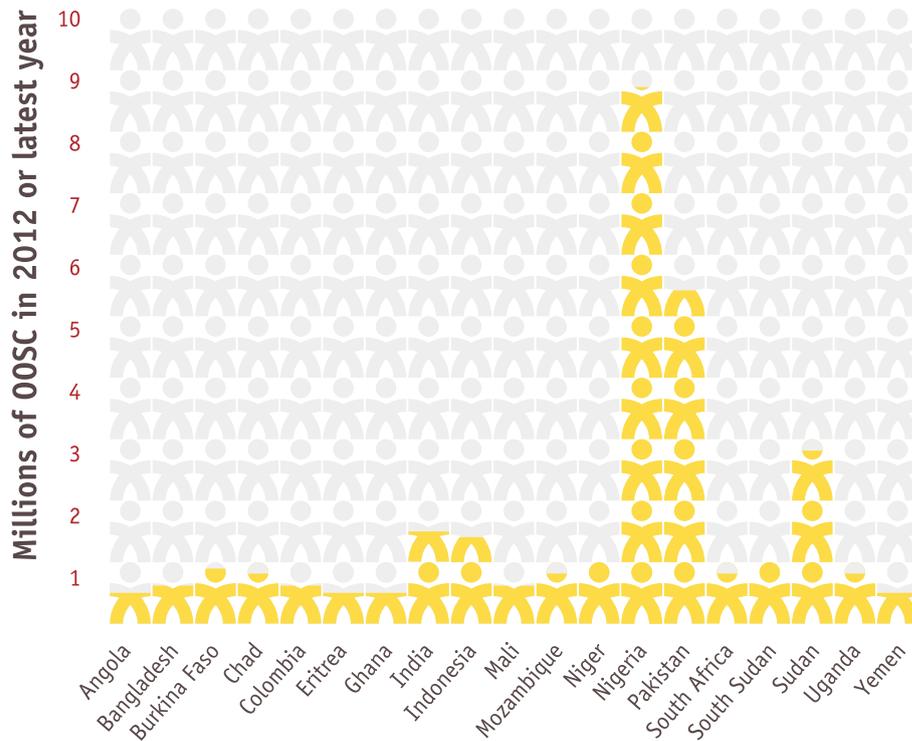
Taken together, the findings of this report should provide additional impetus for efforts to reach out of school children, and ensure that all citizens have access to primary education and the opportunity to achieve their full economic and social potential.



Background

Despite global initiatives dedicated to achieving universal primary education, nearly 58 million children of primary school age were not enrolled in school in 2012 (UIS 2014). These are the world's out of school children (OOSC). Nearly half of them were expected never to enroll in school, while the rest either had already dropped out or expected to enroll late. Significant progress in achieving universal primary education has been made over the past decade, as the global number of OOSC dropped by 42%, from 100 million in 2000. However, much of those gains were achieved between 2000 and 2004, and progress in reducing OOSC has stagnated in recent years (UNESCO 2014).

Figure 1: Half of the world's OOSC are Concentrated in 19 Countries



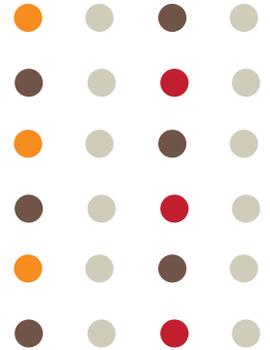
Considerable regional variation underlies the aggregate trend in OOSC. Although the global number of OOSC has fallen since 1999, the number of OOSC has increased in many countries. Nineteen countries, twelve of which are in Sub-Saharan Africa, account for half of the world's OOSC population (Figure 1). With significant progress

being made in South and West Asia, a growing concentration of OOSC is in Sub-Saharan Africa. In Sub-Saharan Africa, the number of OOSC rose from 29.0 million in 2008 to 29.6 million in 2012. More than one-seventh of all OOSC are in Nigeria, where the rate of OOSC has actually increased over the past decade. In some countries, the lack of progress in reducing OOSC can be attributed to disruption from armed conflict (e.g. the Democratic Republic of the Congo), ethnic discrimination (e.g. the Kurds in Iran) and natural disasters (e.g. floods in Pakistan).

There is also notable concentration of out of school children within demographic groups. Data show a sizable gender gap in global enrollment (53% of OOSC were female in 2012), and that gap is even more pronounced in certain countries (61% of OOSC in Mozambique are female). The income gap in primary education attendance is on average even wider than the gender gap. Children from the poorest families are overwhelmingly overrepresented in OOSC populations across countries, because the household costs of attending school are more likely to be prohibitive to the poor. In Mali, for example, 75 out of 100 children from the richest quintile of households enter school, compared with 26 out of 100 from the poorest households (Delprato 2012). Recent household surveys from eight countries show that school fees are a common deterrent to enrollment (UNESCO 2012). Many countries, including Kenya, Mozambique, and Ethiopia, have taken steps to address this by abolishing school fees, and have observed an increase in enrollment (World Bank 2009). However, other financial obstacles remain. On top of school fees, books, supplies, clothing, transportation costs, and private tutoring are all expenses that richer families are better equipped to defray.

Furthermore, attending school imposes an opportunity cost that is most burdensome to the poorest families. They are faced with a decision between putting their children to work and enrolling them in school. The direct and indirect costs of schooling are more likely to induce families at the lower end of the income distribution to substitute child work for child education, whether at home or in the labor market. Even in countries where access to education is equal, children from richer families are more likely to stay in the system and complete primary education (UNESCO 2012). Schemes that lower barriers to enrollment, reduce dropout, and promote attendance (such as conditional cash transfers) have high social rates of return, because they allow individuals and societies to access the benefits of primary education.

In summary, OOSC are a significant and persistent phenomenon, and they are concentrated geographically (Africa and South Asia) and demographically (females and children in poverty). Due to their exclusion from school, OOSC forego the benefits of primary education. In the following sections, we show that the sheer number and high prevalence of OOSC in certain countries represents a major economic failure – an underinvestment in human capital that results in significant income gaps, especially in the poorest countries.



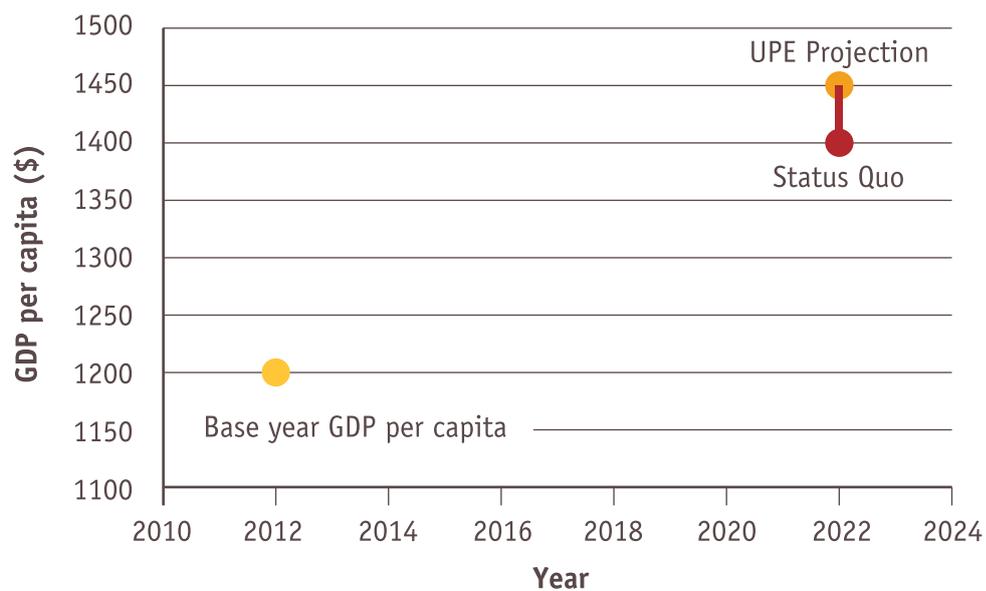
The Economic Cost of OOSC

Primary education is not only an inalienable human right - it is a powerful instrument for generating benefits for individuals and their families, the societies in which they live, and future generations. In our literature review of the social, economic, environmental, and political benefits of primary education (Burnett, Guison-Dowdy and Thomas 2013), we discuss the challenge of quantifying the wide-ranging, cross-sector impacts of enrolling out of school children in a single measure. Indeed, while non-economic returns have potentially the largest impacts on welfare due to externalities (such as democratization, women's empowerment, and improved public health) and play a central role in justifying national and international investments in primary education, they are also the most difficult to estimate.

With an understanding that foregone income accounts for only a portion of the total cost associated with out of school children, the following sections estimate the economic cost of out of school populations in 20 countries. The purpose of these estimation exercises is to demonstrate that enrolling out of school children is not only a moral obligation but a productive investment, and that economies suffer a far greater loss from maintaining large out of school populations than they would from increasing public spending to enroll those children in primary school.

Cost estimation in this paper investigates the question: *If all of today's children expected not to complete primary school actually do complete basic education, how much higher will GDP be in the 20 countries when that cohort of children enters the labor market, relative to a counterfactual in which those OOSC never completed primary education? (Figure 2).*

Figure 2: OOSC Cost Estimation



The Economic Cost of OOSC

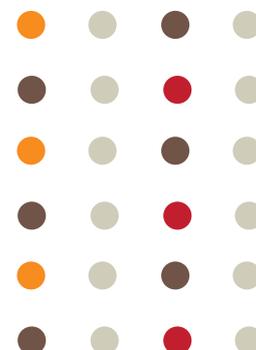
The cost of OOSC can be thought of as the difference in GDP between two hypothetical, forward-looking scenarios: one in which current OOSC trends persist (Status Quo) and one in which today's OOSC that are not currently expected to complete primary education do receive basic education before entering the labor market in the next decade (UPE Projection).

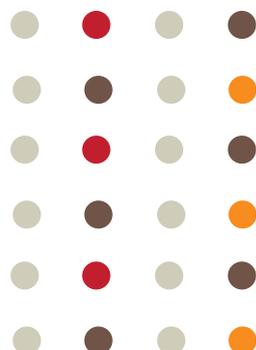
Two approaches are employed to give an indication of the magnitude of the cost (expressed as a percentage of GDP) that countries can expect to bear if current patterns of OOSC are not improved. The first approach uses a microeconomic method, aggregating the estimated productivity deficits of individuals who are not expected to complete primary education. Based on wage premium estimates in Montenegro and Patrinos (2014) and Colclough et al. (2009) and OOSC figures calculated by UIS, it provides an estimate of how much higher GDP will be in roughly a decade if all of today's OOSC are given primary education before they enter the workforce. This approach accounts for only the private economic gains of enrolling OOSC.

The second approach uses a macroeconomic method, based on cross-country regressions that estimate the relationship between schooling and income per capita, to address the same question. Unlike the microeconomic estimation, which captures only direct income returns to primary education (the expected increase in private income enjoyed by former OOSC given primary education), the macroeconomic cost estimation should capture some indirect economic impacts of primary education attainment on GDP, such as increases in national income due to lower crime rates, better public health, and other peer effects of schooling. Together, the two approaches show that there are significant economic incentives (equivalent to over a year of a country's average GDP growth in some cases) to enroll OOSC populations and provide them with quality primary education.

Microeconomic Cost Estimation

Evidence on the returns to education suggests that in recent decades, the income gains from primary school completion have fallen relative to the returns of higher education (Colclough et al. 2009). There are even some studies that show no apparent returns to primary education (Kingdon et al. 2008). Labor economists ascribe this trend to demand- and supply-side developments. These include skill-biased technological change, which has raised the demand for skilled workers at the expense of unskilled and semiskilled workers, and the rising proportion of the global working population that has completed primary education. There is also concern that progress toward universal primary education has strained educational infrastructure in less developed countries, to the detriment of quality of schooling and, as a result, the productivity gains associated with primary education.





There are three reasons why the downward trend in relative returns to primary education does not undermine the importance of investing in primary school and reducing the number of out of school children. First, basic education is recognized as a human right. Second, primary education is a prerequisite for higher levels of education, so the cost of OOSC is proportional to the returns to all levels of education. Finally, the majority of economic studies focus on the effect of primary education on the wages of workers employed in the formal sector, but this constitutes only one aspect of returns to education. Primary education has a wide range of non-market benefits that studies typically do not capture – informal sector productivity gains, as well as social, political, psychosocial, environmental, and health benefits.

With these arguments in mind, this section presents estimates of the aggregate earnings loss due to OOSC for a subset of developing countries. Given that OOSC is a phenomenon heavily concentrated in select countries (see Figure 1), returns to education vary widely by country, and data is missing for potentially key countries (e.g. China), estimating a global cost of OOSC is neither illustrative nor tractable. Instead, the country-level costs of OOSC are estimated for a sample of 20 countries, selected to provide geographic variety and on the basis of data availability.

The pure economic impact of primary education is the effect of schooling on labor productivity and wages. There is a vast literature, reviewed in Thomas and Burnett (2015b), that measures the returns to education in terms of wage premia – the wage differential between those who complete a given level of education and those who do not (Psacharopoulos and Patrinos 2004). Wage premia estimates provide a measure for the direct private benefit of education completion. As discussed in Colclough et al. (2009), labor market returns to education vary substantially by country and level of education.

Unfortunately, countries with significant OOSC populations are the ones for which wage premia are least likely to be available for recent years. They are also the countries that tend to have large informal sectors, so wage premium estimates have limited relevance. Many recent studies focus on the returns to higher education, taking primary education as a human right with established economic benefits that do not require further empirical validation.

Thus, even estimation of the direct productivity cost of OOSC is not straightforward. Due to these data limitations and methodological issues, restrictive assumptions must be made to quantify the direct economic cost of OOSC. To overcome the lack of information on the returns to education outside of the formal labor market, it is assumed that the wage premia estimated in studies on the returns to education are representative of the economic benefits that would accrue to all population groups. For example, the 13% wage premium found for Cote d'Ivoire (Montenegro and Patrinos 2014) was estimated using survey data of workers in wage labor. The analysis

underlying Table 2 assumes that the 13% wage premium will apply to all members of the population in Cote d'Ivoire if they complete primary education, even if they end up working in the informal sector or the household. This is not an unreasonable assumption, given the sparse but growing evidence on education returns in the informal sector (De Brauw and Rozelle 2006 for rural China, Nguetse Tegoum 2009 for Cameroon, Arbex et al. 2010 for Brazil, and Yamasaki 2012 for South Africa), and on the positive effect of maternal education on child health (Chen and Li 2009). We also abstract from labor market competition complications that could arise with an influx of basic educated workers.

To calculate the direct cost of OOSC due to foregone primary education (Equation 1), the per capita economic benefits (measured by wage premia) from primary education must be multiplied by the prevalence of primary school non-completion in the school-aged population. However, raw OOSC numbers alone do not reveal how many school-aged children in a cohort will eventually complete primary education under the status quo. Country-level estimates produced and provided for this study by UIS (2013) break down OOSC into the three categories for the most recent year with available data (e.g., based on 2010 Demographic and Health Survey for Cambodia). Those figures are used to derive the percentage of children projected to not complete primary school.

Equation 1: Direct GDP Loss from foregone primary education =

$$[\% \text{ non-completing OOSC}] \times [\text{wage premium to primary education}]$$

The analysis assumes that all late-starters eventually complete primary school, and that no drop-outs or those unlikely to start will ever complete primary school. Thus the final column of Table 1, percentage of non-completing OOSC, is the overall percentage of OOSC minus the percentage that is likely to start late. These simplifying assumptions belie the complex behavior of OOSC (many of whom enter and leave school multiple times due to idiosyncratic factors like family illness), but they make the analysis possible in the absence of more detailed data on OOSC.

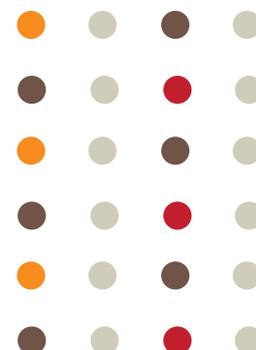


Table 1: Primary School Aged OOSC in 20 Countries

Country	% OOSC*	% left school**	% likely to enter**	% unlikely to enter**	% Non - Completing OOSC
Bangladesh	14%	18%	79%	3%	2.9%
Brazil	2%	24%	76%	0%	0.5%
Burkina Faso	33%	5%	19%	76%	26.9%
Cambodia	2%	23%	68%	9%	0.5%
Colombia ***	13%	20%	44%	36%	7.3%
Cote d'Ivoire	37%	11%	32%	57%	25.4%
DRC	22%	24%	54%	22%	10.1%
Ethiopia	13%	12%	79%	9%	2.7%
Gambia	26%	3%	19%	78%	21.4%
Ghana	12%	12%	76%	12%	3.0%
India	1%	14%	38%	48%	0.7%
Indonesia	5%	53%	45%	2%	2.6%
Lesotho	18%	46%	44%	10%	10.0%
Mali	27%	3%	4%	93%	25.6%
Nigeria	34%	5%	21%	74%	27.1%
Pakistan	28%	6%	62%	32%	10.5%
Senegal	21%	8%	9%	83%	18.7%
Thailand***	10%	43%	46%	11%	5.6%
Vietnam	2%	23%	67%	10%	0.6%
Yemen	13%	19%	48%	33%	6.7%

*Source: UIS Database, accessed November 2014.

**Source: UIS calculations based on Multiple Indicator Cluster Surveys and Demographic and Health Surveys, 2013.

***Regional typology data used because country-level estimates were unavailable.

The percentage of school-aged children that is predicted to not complete primary education (the last column of Table 1) is then multiplied by the wage premium to primary education (the second column of Table 2) to produce estimates in the third column of Table 2.

The next step of the analysis is designed to account for the value of primary education as a gateway to higher education (Equation 2). Table 3 estimates the additional increase in aggregate income that primary-enrolled OOSC would be expected to generate due to the access they gain to secondary education. This is calculated by

The Economic Cost of OOSC

multiplying the wage premium to secondary education by the rate of continuation from primary to secondary school (UNESCO 2014) and the rate of secondary school completion. Because data are unavailable for secondary school completion rates, it is conservatively assumed that 50% of students that transition from primary to secondary education complete secondary school. That assumption is based on the lowest rates of primary school completion observed in developing countries. The probability-weighted loss from foregone secondary education is then added to the GDP loss from foregone primary education to generate Table 4.

Equation 2: Probability-weighted GDP loss from foregone secondary education =

$$[\% \text{ non-completing OOSC}] \times [\text{wage premium to secondary education}] \times [\text{rate of continuation from primary to secondary school}] \times [\text{rate of secondary school completion}]$$

Table 2: GDP Loss from Foregone Primary Education

Country	% Non-Completing OOSC	Wage Premium to Primary Education *	GDP Loss from foregone primary education
Bangladesh	2.9%	8.1%	0.24%
Brazil	0.5%	7.9%	0.04%
Burkina Faso	26.9%	12.0%	3.23%
Cambodia	0.5%	0.9%	0.00%
Colombia	7.3%	6.0%	0.44%
Cote d'Ivoire	25.4%	12.6%	3.20%
DRC	10.1%	9.0%	0.91%
Ethiopia	2.7%	32.7%	0.89%
Gambia	21.4%	9.4%	2.01%
Ghana	3.0%	2.7%	0.08%
India	0.7%	5.8%	0.04%
Indonesia	2.6%	12.7%	0.33%
Lesotho	10.0%	15.5%	1.54%
Mali	25.6%	21.2%	5.43%
Nigeria	27.1%	16.6%	4.50%
Pakistan	10.5%	7.6%	0.79%
Senegal	18.7%	9.8%	1.83%
Thailand	5.6%	3.2%	0.18%
Vietnam	0.6%	10.8%	0.06%
Yemen	6.7%	10.0%	0.67%

*Source: Most recent study cited in Montenegro and Patrinos (2014) or Colclough et al. (2009).

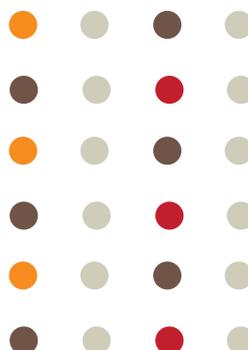


Table 3: Probability-weighted Loss from Foregone Secondary Education

Country	Rate of Continuation to Secondary School*	Wage Premium to Secondary Education **	Probability-weighted Loss from foregone secondary education
Bangladesh	90%	5.0%	0.07%
Brazil	94%	6.3%	0.01%
Burkina Faso	51%	17.8%	1.22%
Cambodia	80%	2.5%	0.01%
Colombia	96%	5.3%	0.19%
Cote d'Ivoire	46%	12.1%	0.71%
DRC	71%	1.7%	0.06%
Ethiopia	82%	16.2%	0.18%
Gambia	85%	8.6%	0.78%
Ghana	91%	8.8%	0.12%
India	93%	6.0%	0.02%
Indonesia	89%	10.0%	0.11%
Lesotho	74%	26.7%	0.98%
Mali	79%	12.4%	1.26%
Nigeria	71%	6.8%	0.65%
Pakistan	73%	5.5%	0.21%
Senegal	92%	6.5%	0.56%
Thailand	93%	5.4%	0.14%
Vietnam	100%	3.8%	0.01%
Yemen	84%	3.8%	0.11%

*Source: UNESCO 2014. Data was unavailable for Brazil, DRC, India, Nigeria, and Thailand. For these countries, regional transition rates were used.

**Source: Most recent study cited in either Montenegro and Patrinos (2014) or Colclough et al. 2009.

The Economic Cost of OOSC

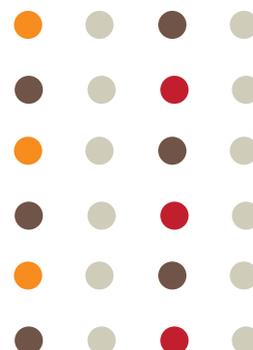
Table 4: Economic Cost of OOSC by Microeconomic Estimation

Country	Economic Cost of OOSC as % of GDP	Country	Economic Cost of OOSC as % of GDP
Bangladesh	0.30%	India	0.06%
Brazil	0.05%	Indonesia	0.44%
Burkina Faso	4.45%	Lesotho	2.53%
Cambodia	0.01%	Mali	6.69%
Colombia	0.62%	Nigeria	5.16%
Cote d'Ivoire	3.90%	Pakistan	1.00%
DRC	0.97%	Senegal	2.39%
Ethiopia	1.07%	Thailand	0.32%
Gambia	2.79%	Vietnam	0.08%
Ghana	0.20%	Yemen	0.78%

Table 4, which adds the last columns of Tables 2 and 3, can be interpreted as the direct economic cost (lost productivity as measured by wages) incurred by today's OOSC that will not have completed primary education in each of the countries when those OOSC reach working age. It can also be visualized as the vertical red gap between the two points in Figure 2.

To generate an estimate of the total cost (economic and non-economic costs combined) of OOSC requires calculation of the foregone non-market benefits of primary education. There are also significant behavioral impacts of education that might take years or decades to manifest. For example, education has been shown to accelerate demographic transition in developing countries. By lowering dependency rates, increasing investment and raising female labor force participation rates, educating OOSC can have large economic impacts aside from direct productivity gains. Since OOSC forego all of these benefits, the economic cost estimated in Table 4 likely provides a lower bound for the total cost of OOSC. Moreover, there are additional significant benefits associated with female primary education. Since females are overrepresented in OOSC populations, the calculations above further understate the total costs of OOSC populations.

This section has provided an indication of the magnitude of the economic cost of today's OOSC in terms of lost private earnings. In the next section, macroeconomic analysis is employed to provide an alternatively specified set of estimates.

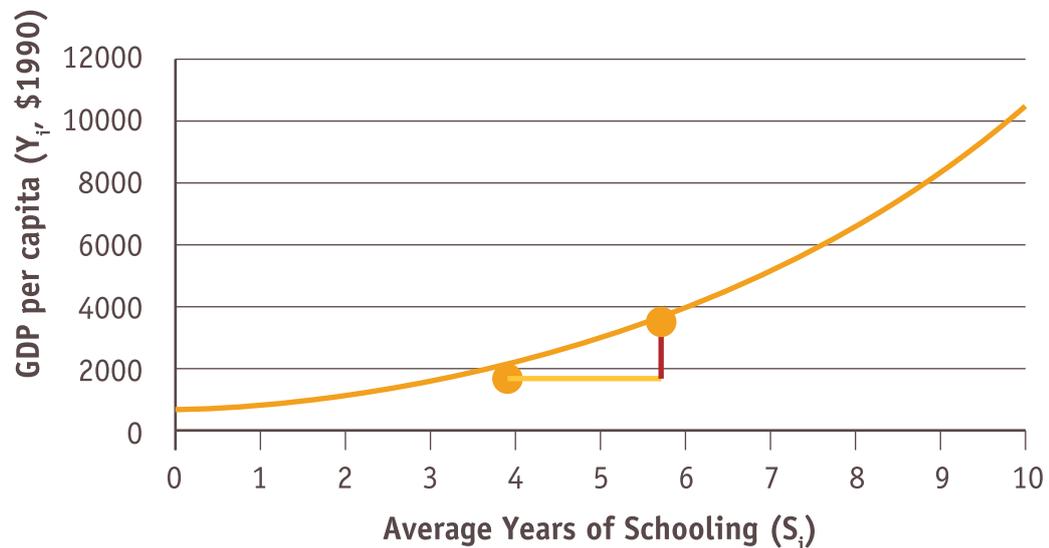


Macroeconomic Cost Estimation

The microeconomic approach to cost estimation requires precise quantification of the various individual-level effects of education, many of which are difficult to express in terms of income. For that reason, the previous estimation exercise focused on labor productivity gains. While a macroeconomic cost estimation approach is less specific on from where income gains are derived, it has the potential to provide a more comprehensive estimate of the cost of OOSC and provides a second set of estimates against which the estimates from the previous section can be compared.

The technique for macroeconomic modeling of the relationship between education levels and income levels is derived from labor economics literature, in which an individual worker's wage is dependent on his or her education attainment and other individual characteristics (Mincer 1974). Extending Mincerian equations to the aggregate level, macroeconomic modeling uses cross-country or time-series data (regional, national, or international) to estimate the income gains associated with the accumulation of human capital. Those gains can alternatively be considered the cost of underinvesting in human capital (i.e. having a large OOSC population). Psacharopoulos and Patrinos' (2011) estimation of a global Mincerian equation is presented graphically in Figure 3. For more details on this type of regression, refer to Annex 2.

Figure 3: The Education-income Relationship, as Estimated by Psacharopoulos and Patrinos (2011)



Using data from over 100 countries from 1950-2010, Psacharopoulos and Patrinos fit the curve displayed above. In the graph above, the red line segment represents the increase in per capita GDP associated with an increase in the population's average years of schooling from 4 to 6 years.

The Economic Cost of OOSC

Using the type of Mincerian equation graphed in Figure 3, the cost of OOSC can be estimated as the difference between two hypothetical, forward-looking scenarios. In the first scenario, education policy follows the status quo so that the expected number of years of schooling in each country (estimated in UNDP 2013) is unchanged. In the second scenario, a stronger push is made to achieve universal primary education, so that the expected lifetime schooling of the population (S in Figure 3) rises in proportion to the current percentage of children expected not to complete primary education.

While Psacharopoulos and Patrinos' specification provides a useful starting point for conceptualizing the cost of OOSC in the macroeconomic context, their estimation technique has shortcomings (discussed in full detail in Annex 2). A more rigorous estimation of the education-income relationship is provided by Barro and Lee (2010). Barro and Lee specify a more sophisticated model of the education-income relationship, using multivariate regression, panel effects, and instrumental variable estimation to resolve issues of omitted variable bias and endogeneity. By controlling for other possible influences on GDP, these additional econometric techniques bring the estimation closer to isolating a causal effect of education attainment on national income. Table 5 shows the macro-estimated costs of OOSC (based on Barro and Lee's estimation of the education-income relationship) for the same 20 countries analyzed in the microeconomic estimation exercise. The equation used to generate these estimates can be found in Annex 2.

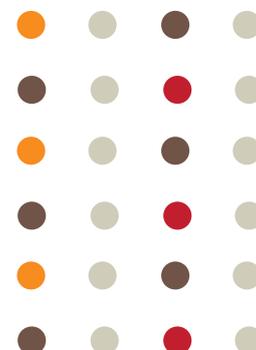


Table 5: Economic Cost of OOSC by Macroeconomic Estimation

Country	Expected Years of Schooling (status quo)	% Non-completing OOSC	Expected Years of Schooling (No OOSC scenario)	Economic cost of OOSC as a % of GDP *
Bangladesh	8.1	2.9%	8.2	1.45%
Brazil	14.2	0.5%	14.2	0.23%
Burkina Faso	6.9	26.9%	8.0	15.02%
Cambodia	10.5	0.5%	10.5	0.25%
Colombia	13.6	7.3%	13.9	3.66%
Cote d'Ivoire	6.5	25.4%	7.5	14.06%
DRC	8.5	10.1%	8.9	5.17%
Ethiopia	8.7	2.7%	8.8	1.34%
Gambia	8.7	21.4%	9.6	11.61%
Ghana	11.4	3.0%	11.5	1.48%
India	10.7	0.7%	10.7	0.33%
Indonesia	12.9	2.6%	13.0	1.26%
Lesotho	9.6	10.0%	10.0	5.08%
Mali	7.5	25.6%	8.6	14.22%
Nigeria	9.0	27.1%	9.4	15.17%
Pakistan	7.3	10.5%	8.0	5.35%
Senegal	8.2	18.7%	8.4	9.97%
Thailand	12.3	5.6%	12.3	2.80%
Vietnam	11.9	0.6%	12.2	0.29%
Yemen	8.7	6.7%	9.2	3.37%

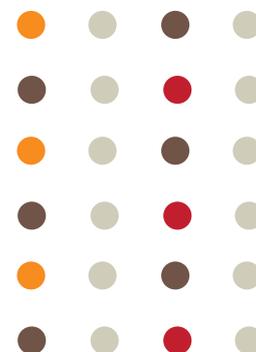
*Estimated using the Barro and Lee (2010) specification of the education-income relationship.

Bearing in mind that cost calculations are based on the cross-country average relationship between income and education, Table 5 suggests that countries with high OOSC prevalence face large costs in terms of foregone GDP. These estimates are generally much higher than the microeconomic estimates (on average, by a factor of 3.3), likely because this second method captures some of the indirect positive externalities (better health, safety, intergenerational effects) associated with primary education, rather than solely direct private income gains.

Discussion: The Urgency of Enrolling OOSC

We have constructed two sets of estimates of the cost of out of school children, but what do these figures mean? The microeconomic estimate pinpoints a specific source of OOSC cost (foregone labor earnings), while the macroeconomic estimates use a more comprehensive but black-box approach. Thus the two approaches yield numbers of differing scale, but they are in agreement across the sample that the economic cost of OOSC is significantly large for many countries.

The costs appear even more striking when compared to back-of-the-envelope estimates of incremental public spending (as a percentage of GDP) required to achieve universal primary education in the countries, and compared to average annual economic growth in those countries in recent years (Table 6). Calculations for the last column assume constant average costs for enrolling OOSC - i.e., the average cost of enrolling an out of school child is identical to the average public spending per primary school student. This may overestimate the cost of enrolling OOSC, since fixed costs, such as school buildings, need not necessarily be replicated to provide for OOSC. On the other hand, scaling-up primary education to reach OOSC in rural areas or from marginalized groups likely requires spending on education infrastructure, involving some new fixed costs in addition to higher variable costs for targeted interventions. See Thomas and Burnett (2015a) for a discussion of the non-linearity of enrollment costs for primary education.



Discussion: The Urgency of Enrolling OOSC

Table 6: Benchmarking the Economic Cost of Out of School Children

Country	Economic Cost of OOSC as % of GDP (Micro method)	Economic Cost of OOSC as a % of GDP (Macro method)	Average annual economic growth, 2009 - 2013*	Required incremental spending on primary education as a % of GDP**
Bangladesh	0.30%	1.45%	6.16%	0.14%
Brazil	0.05%	0.23%	2.69%	0.04%
Burkina Faso	4.45%	15.02%	6.24%	0.91%
Cambodia	0.01%	0.25%	5.58%	No data
Colombia	0.62%	3.66%	4.10%	0.17%
Cote d'Ivoire	3.90%	14.06%	3.90%	No data
DRC	0.97%	5.17%	6.49%	0.22%
Ethiopia	1.07%	1.34%	10.32%	0.26%
Gambia	2.79%	11.61%	4.08%	0.50%
Ghana	0.20%	1.48%	8.59%	0.21%
India	0.06%	0.33%	7.03%	0.01%
Indonesia	0.44%	1.26%	5.88%	0.05%
Lesotho	2.53%	5.08%	5.14%	1.10%
Ma li	6.69%	14.22%	2.95%	0.59%
Nigeria	5.16%	15.17%	5.87%	No data
Pakistan	1.00%	5.35%	3.46%	No data
Senegal	2.39%	9.97%	3.25%	0.56%
Thailand	0.32%	2.80%	3.00%	0.16%
Vietnam	0.08%	0.29%	5.75%	0.03%
Yemen	0.78%	3.37%	-0.20%	0.33%

*Average GDP growth from World Bank data.

**UNESCO 2014 data on public spending on primary education as a percentage of GNP was converted to GDP using GDP to GNP ratios based on World Bank data. Incremental required spending is calculated based on the assumption of constant average costs of enrolling students in primary education to (e.g. if current public spending on primary education is 1% of GDP and 50% of primary-aged children are in school, spending 2% of GDP on primary education will cover 100% of primary-aged children.)

Discussion: The Urgency of Enrolling OOSC

Bearing in mind that cost calculations are based on the cross-country average relationship between income and education, Table 5 suggests that countries with high OOSC prevalence face large costs in terms of foregone GDP. These estimates are generally much higher than the microeconomic estimates (on average, by a factor of 3.3), likely because this second method captures some of the indirect positive externalities (better health, safety, intergenerational effects) associated with primary education, rather than solely direct private income gains.

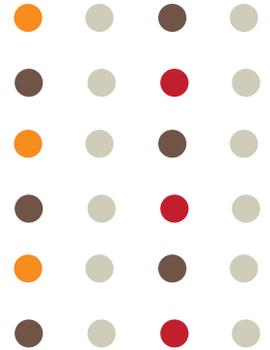
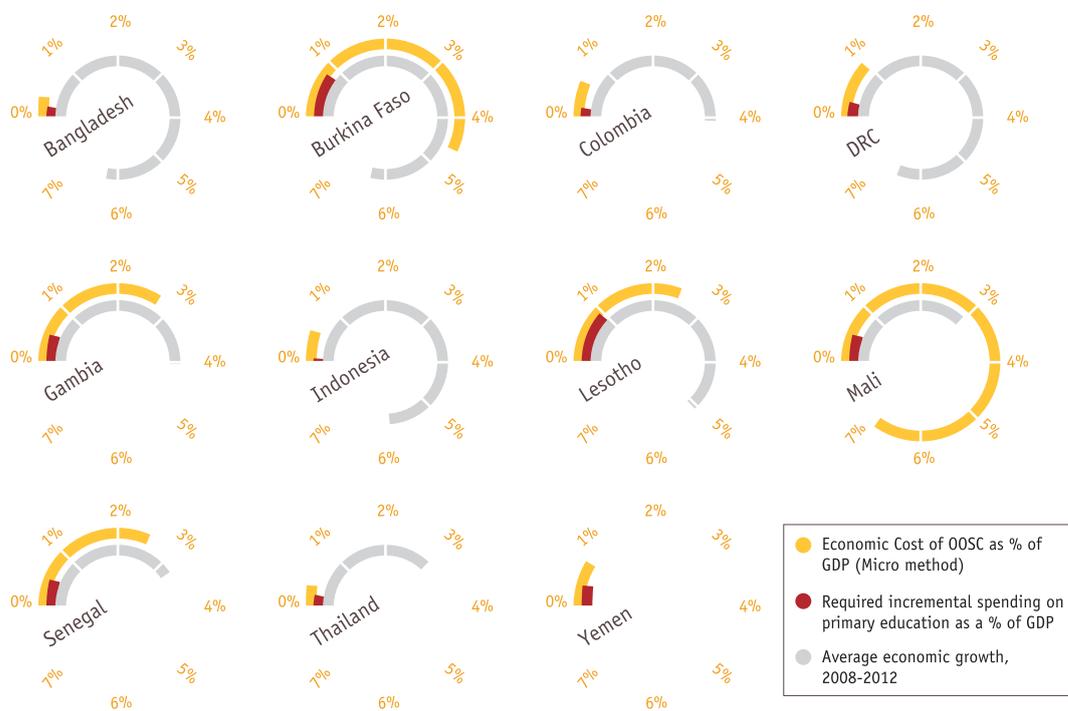


Figure 4: Benchmarking the Economic Cost of Out of School Children



A notable issue is that we have not addressed the possibility of quality of education suffering as enrollment increases, reducing the benefits of primary education, lowering the economic cost of OOSC, and invalidating these benchmarking exercises. This is a critical concern, given Hanushek and Woessman's (2007) finding that the quality of education is more important for economic growth than years spent in school. The possible quality-coverage tradeoff in primary education and its implications for optimal OOSC strategy is an important area of future study.

Conclusion

This study analyzes the economic cost of out of school children using two approaches. The first approach aggregates the forecasted foregone private income of OOSC populations in 20 countries, predicting how much will be lost as a percentage of GDP in the future due to their lack of primary education. The second method computes the income gap due to out of school children based on a cross-country model of the relationship between education attainment and aggregate income. We benchmarked those estimates against incremental public spending required to enroll OOSC and average economic growth rates to highlight the magnitude of the cost of OOSC, which is highest in the smallest, least developed countries.

Together, the two approaches show that there are significant economic incentives to educate OOSC in all countries. On top of the economic benefits, there is a range of non-market benefits that are not explicitly accounted for in the quantitative analysis. Given the large and numerous benefits associated with primary education, programs that increase access to education for OOSC are critical interventions to promote economic and social development. Until universal primary education is achieved in countries where progress has stalled, out of school children will continue to represent an unconscionable underinvestment in human capital and a costly barrier that prevents nations from reaching their full economic and social potential.

Annex 1: EPDC Data

There are a number of methodological challenges in estimating the global population of out of school children, which are discussed in Omoeva et al. (2013). Estimates of OOSC rates produced by FHI 360's Education Policy Data Centre (EPDC) are based on household surveys and population censuses, whereas official UIS estimates are based on administrative data collected by national Ministries of Education and population censuses. This leads to very different OOSC estimates for some countries, and also different availability. EPDC collects data for a number of countries with large OOSC populations that are currently not published by UIS due to data issues or lack of reported data. The graph below shows all South Asian and Sub-Saharan African countries with over one million OOSC according to EPDC data (year of survey varies by country).

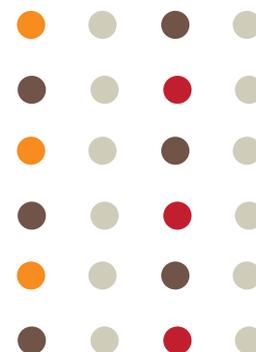
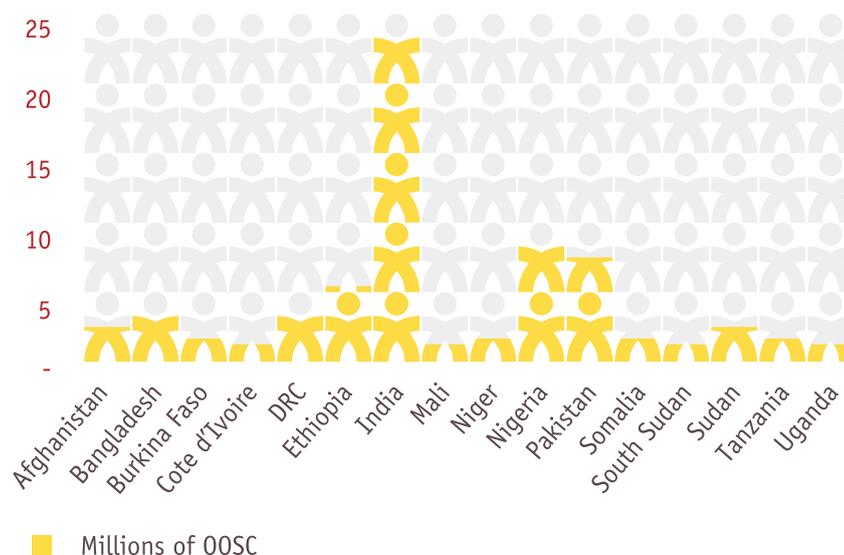


Figure 5: OOSC in Millions, According to Household Surveys Analyzed by EPDC

Countries with over 1 million OOSC according to EPDC



EPDC data is for the 2006 school year for Cote d'Ivoire, India, Mali, Niger, Pakistan, Somalia; 2008 for Nigeria, Sudan, South Sudan; 2010 for Burkina Faso, DRC, Tanzania; 2011 for Afghanistan, Bangladesh, Ethiopia, Uganda.

Although this study relies on UIS data, it is important to note that the EPDC's alternative OOSC data diverge from UIS estimates for a number of countries. Since they draw from different sources, EPDC and UIS data can be taken together to provide a more complete picture of the global OOSC problem.

Annex 2: Econometrics

This annex goes into greater detail about the econometric specifications underlying the macroeconomic estimation method.

A generic Mincerian equation is shown below (Equation 3):

Equation 3: A Mincerian Equation

$$\ln(Y_i) = f(S_i, Z_i)$$

The natural logarithm of income of country i (in macroeconomic studies) or individual i (in microeconomic studies) is a function f of average years of schooling (S_i) and a vector of other explanatory variables, Z_i . In a microeconomic study, this could include the individual's experience or gender. In a macroeconomic study, Z could include policy or demographic variables.

Using average years of schooling data for the working age population (age fifteen and older) from the Barro-Lee dataset, Psacharopoulos and Patrinos estimate the following Mincerian equation to describe the relationship between income and education from 1950-2010:

Equation 4: Psacharopoulos and Patrinos' Model

$$\ln Y_i = 6.645 + 0.258S_i$$

S_i is mean years of schooling in country i and $\ln Y_i$ is the natural logarithm of per capita income (GDP) in country i .

Psacharopoulos and Patrinos use a single variable regression – they do not condition their results on other characteristics of the countries in their sample. This is equivalent to excluding the vector Z in Equation 1. According to their estimates, each additional year of schooling is associated with a 26% increase in per capita income. This is consistent with a number of studies, such as Kruger and Lindahl (2001), who estimate a rate of return to schooling between 18% and 30%, and Heckman and Klenow (1997), who find that an additional year of schooling in a country is associated with a 30% higher per capita GDP.

Due to the exclusion of the vast number of non-educational factors that could potentially impact GDP, Equation 4 should not be interpreted as a causal relationship between education attainment and income. In addition to omitted variable bias, Equation 4 has other methodological issues. As shown in the microeconomic analysis section, the empirical evidence is that the returns to education differ substantially among countries and time periods. In estimating an average relationship across countries and over time, Equation 4 masks considerable variation in the economic cost of OOSC.

Unfortunately, the Barro-Lee dataset only provides education attainment figures at five-year intervals, so there is not enough data to generate meaningful country-level

Mincerian equations (only thirteen observations are available per country). There is also the possibility that Equation 4 is a product of spurious regression: except in Africa (where income and education attainment stagnated between 1980 and 2000), both income and mean years of schooling have been trending strongly upward worldwide since 1950, and regressing income on schooling could thus estimate an artificially strong relationship.

In Barro and Lee (2010) the relationship between years of schooling and income is estimated using the natural log of GDP per worker (individuals age 15-64) as the independent variable (Equation 5). This is manipulated algebraically below so that the independent variable is the natural log of GDP per capita instead.

Equation 5: Fixed-effects estimation with instrumental variable for schooling (parental education).

$$\ln(Y_i/w_i) = 0.121S_i + 0.544\ln(K_i/w_i),$$

$$\ln(Y_i/n_i) = \ln(w_i/n_i) + 0.121S_i + 0.544\ln(K_i/w_i)$$

\ln represents the natural logarithm operator.

Y_i is the total income in country i .

S_i is instrumented average years of schooling in country i .

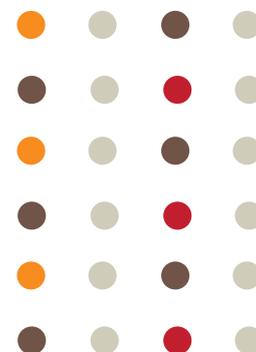
K_i is the per capita physical capital stock in country i .

w_i is the working age population (15-64) in country i .

n_i is the total population in country i .

Barro and Lee's specification has a number of advantages over that of Psacharopoulos and Patrinos. Barro and Lee add physical capital stock (a function of national investment and depreciation) as an explanatory variable. They also use the instrument variable estimation technique to resolve the potentially biasing effects of the endogeneity of human capital accumulation (causality between income and schooling is likely to go in both directions). They use parental income (proxied by national average years of schooling lagged by ten years) as an instrument for S , and use fixed-effects estimation, which allows for country-specific tendencies in income trajectories. They also estimate region-specific effects, but these are found to be insignificant for regions with large out of school populations. By controlling for other possible influences on GDP, all of these additional econometric techniques bring the estimation closer to isolating a causal effect of education attainment on national income.

The coefficient on mean years of schooling (S_i) is 47% of Psacharopoulos and Patrinos' estimate of 0.26. This suggests that, by not controlling for the effect of physical capital on income, Psacharopoulos and Patrinos overestimate the effect of education on income by a factor of over 2. Due to the advantages of Barro and Lee's specification, estimates in this paper are based on their model.



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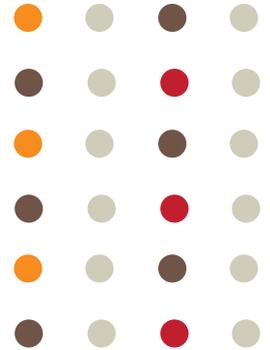
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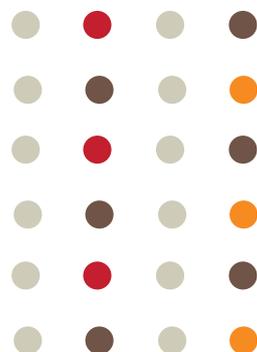
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