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## Returns to Education in Low and Middle-Income Countries: Evidence from the Living Standards and Measurement Surveys

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# Returns to Education in Low and Middle-Income Countries: Evidence from the Living Standards and Measurement Surveys

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## Abstract

While a large literature has investigated the returns to education in high-income countries, evidence on returns in less developed countries is relatively scarce. We pool 61 nationally representative household surveys conducted between 1985 and 2012 in order to address this evidence gap and to estimate average national and regional returns to education. We find a return of 6.5% in the pooled data, with lower returns in rural areas, higher returns for females, higher returns in the years prior to 2000, and lower rates of return in Asian countries compared to Africa, Latin America, and Eastern Europe. With respect to schooling levels, we find lowest returns for primary education, and highest returns to tertiary education, consistent with recent evidence from developed countries. Overall, returns to education in developing countries seem to be similar or lower than those in high-income countries with remarkably large amounts of heterogeneity across countries, time, and regions.

## 1. Introduction

The return to education is one of the most common economic analyses with a rich history dating back to the late 1950s. While a few studies have tried to identify the returns to education in low- and middle-income countries (Psacharopoulos 1981, Psacharopoulos 1985, Psacharopoulos 1989, Psacharopoulos 1994, Psacharopoulos 1994, Psacharopoulos and Patrinos 2002), the large majority of more recent literature has focused on high-income settings (Card 2001). Returns to education in a developing country context may be different from those of high-income economies due to differing capital stock and capital investment, lower technological capacity, or more restricted schooling access (Psacharopoulos 1973, Kang 1993, Todaro 1989). In recent years, differences in capital stock and production technology have been declining due to an increasing rate of globalization and increasing rates of migration (Fischer 2003, Ghose 2004, UNCTAD 1999, World Bank 2001). At the same time, school enrollment, literacy, and other measures of human capital have increased dramatically (UNESCO 1999, World Bank 1982) following the incorporation of education in the Millenium Development Goals, but also based on the wide recognition of human capital investment as a critical strategy for promoting economic development (Schultz 1994, Romer 1989, (Nelson and Phelps 1966).

Relatively little recent systematic evidence is available on the returns to education in developing countries. While both Card (2001) and Duflo (2001) argue that returns to education are likely to be higher in developing than in industrialized countries, empirical evidence on the returns to education in developing countries is surprisingly scarce. Most existing evidence for developing countries is based on the work of George Psacharopolous and colleagues (Psacharopoulos 1981, Psacharopoulos 1985, Psacharopoulos 1989, Psacharopoulos 1994, Psacharopoulos 1994) and Psacharopolous and Patrinos (Psacharopoulos and Patrinos 2002, Patrinos and Psacharopoulos 2010), who summarize the literature on the returns to education from low- and middle-income countries up to the 1990s. A variety of different and not necessarily compatible empirical models and often non-representative data sources yield results which are difficult to compare to the estimated returns in developed countries (Bennell 1996, Psacharopoulos 1996, Psacharopoulos and Patrinos 2002). Other reviews assessing the estimated returns in developing countries assert either that the evidence is inconclusive or that the returns are overstated (Behrman and Birdsall 1987, Strauss and Thomas 1998)

One of the primary reasons why evidence on the returns to education is scare is the difficulty of collecting income data in low resource settings. Many household surveys in developing countries primarily rely on household asset ownership as proxy for socioeconomic status (Strauss and Thomas 1998). The most notable exception to this general strategy are the Living Standards and Measurement Study (LSMS) surveys run by the World Bank in collaboration with national governments and statistical offices.. LSMS are nationally representative household surveys with an explicit focus on income and household poverty (Grosh and Glewwe 1998). Even though specific surveys of the LSMS program have been used in previous studies (see e.g. Abbas and Foreman-Peck 2008, Angrist and Lavy 1997, Gertler and Glewwe 1992, Glewwe 1996, Hoddinott 1996,

Moll 1997, Schaffner 1997, Stelcner et al. 1989, Suarez-Berenguela 1988, van der Gaag and Vijverberg 1988, Vijverberg 1993), no study has tried to systematically evaluate the returns to education using these data sets which cover a wide range of low- and middle-income countries between 1985 and 2012.

In this paper, we use all 61 publicly available[1] and nationally representative LSMS surveys conducted between 1985 and 2012 containing individual income and education data in order to estimate the returns to education in 25 low to middle-income countries, as well as regional average estimates for Africa, Asia, Eastern Europe and Latin American.

Pooling of all countries and years of LSMS surveys, we find an estimated return to education of 6.5%, with highest returns of 8.0% per year of schooling in Latin America, returns of 6.7% in Africa, returns of 6.8% per year in Eastern Europe and returns of only 1.9% in Asia. We also find a gender gap in the returns to education in favor of females – on average, we find a return of 7.2% for females and a return of only 5.9% for males. Stratifying by urban/rural classification of household residence, the results show that the returns to education are higher in urban areas than rural areas.[2] When we divide years of schooling into grades 1-6 (primary), grades 7-12 (secondary) and grades 13+ (tertiary) we find the largest returns to tertiary schooling. Specifically, primary education yields an average return of 4.9% per year of schooling completed, secondary education yields returns of 5.4% per year completed, and tertiary education yields returns of 6.5% per year completed. When we stratify the data by time period, we find returns of 7.3% for all surveys prior to the year 2000 and 6.1% for all surveys during and after the year 2000. These trends mask a substantial degree of heterogeneity across regions, with returns relatively stable at high levels in Africa and Latin America, further declining in Asia, and increasing substantially in Eastern European countries.

The overall estimate for the pooled sample of developing countries as well as the regional specific estimates are significantly below the 10-11% cited in the developing country literature (Psacharopoulos and Patrinos 2002). While our preferred specifications include urban/rural fixed effects and yield returns of 6.5%, alternative specifications consistent with previous analyses which exclude urban/rural fixed effects yield returns comparable to 7-8% estimates from the developed world (Card 2001).[3] In the most comprehensive study to date, Psacharopoulos and Patrinos (2002) summarize returns to education from 83 high and low-income countries from data covering the period 1958 to 1999, reporting return between 2.7% (Italy, 1987) to 28.8% (Jamaica, 1989) per year. Regionally, the highest returns to education were found in Latin America and Sub-Saharan Africa (12% and 11.7% respectively), with the returns in Asia countries 9.9% and the returns in Europe, the Middle East, North Africa and OECD countries less than 7.5%. In contrast, our results for the years including and prior to 1999 (7.3%) are higher than later returns

[1] See Appendix Table 1 for details on the availability and inclusion/exclusion of LSMS surveys.
[2] Note that not every LSMS survey contains information on urban/rural classification of household residence. Therefore, the sample sizes differ for urban/rural stratifications and the overall estimates do not average to the full sample.
[3] The returns in developing countries are larger than 7-8% when an instrumental variable strategy is employed. IV estimates of the returns to education range from 8-15%.

(6.1%) but substantially less than Psacharopoulos and Patrinos (2002). The results presented in this paper suggests a similar geographical order (highest returns in Latin America and lowest in Asia), but lower returns overall.

With respect to the relative returns to schooling levels, our results look rather different from the ones presented in Psacharopoulos and Patrinos (2002), who find highest returns to primary education (18.9%), and lowest returns to tertiary education (10.8%), a result also found in Colclough, Kingdon and Patrinos (2009). Our results indicate that this gradient is the reverse, with highest returns to tertiary schooling. The patterns found in our analysis are however well aligned with more recent evidence highlighting the (non-monotonically) increasing returns to schooling across educational levels and years (Schultz 2004, Kingdon et. al. 2008)

The study builds on several previous papers analyzing individual LSMS surveys. Schaffner (1997) use the 1985 Peru LSMS survey to examine the employer size gap in the returns to education. For all employers, the returns to an additional year of school are 11%, and between 25-64% larger returns were observed for individuals working for larger employers.[4] Using 1985-87 LSMS surveys from Cote d'Ivoire, Vijverberg (1993) estimates the return to each year of school in primary, secondary and tertiary levels as well as years of apprenticeship and other work training and examines the male-female wage differential. Consistent with the results presented in this study, the authors find higher returns for females. Glewwe (1996) assesses schooling returns in Ghana and highlights ability and school quality as critical sources of bias in basic OLS regressions. Using the 1991 Moroccan LSMS survey, Angrist and Lavy (1997) exploit a national language instruction policy change to estimate the effect of French language skills on test scores and earnings in Morocco using the LSMS. Similar to the results found in this study, they find highest returns for tertiary schooling. Hoddinott (1996) finds that urban labor markets in Cote d'Ivoire between 1985-87 exhibit wage curves similar to developed countries. While returns to education are not estimated, the study finds that doubling urban unemployment causes wages to drop by 12%. Using LSMS data from South Africa, Moll (1997) demonstrates that despite segregation African educational systems create cognitive skills leading to improved labor market outcomes, a 3% increase from primary school, 9% increase from secondary, and a large 54% increase from tertiary education. The public-private wage differential is assessed using LSMS data from Peru (Stelcner et. al. 1989) and Cote d'Ivoire (van der Gaag and Vijverberg 1988). Juxtaposed, the studies demonstrate that context matters: while the results do not hold for all levels of education, higher levels of education are highly rewarded in the private sector labor market of Peru while the returns to education in the public sector generally exceed those in the private sector in Cote d'Ivoire.

This study contributes to the literature by providing a set of standardized estimates of the returns to education from comparable, representative household surveys across the developing world. While the literature has explored a large number of highly

[4] The estimated 11% returns is smaller than the estimate of 17.8% produced by the current study, a difference produced by the more select sample in Schaffner (1997) and different wage equation specifications including employer size and industry indicators.

heterogeneous models, we used a basic OLS specification across the entire sample. Conceptually, the main weakness of this OLS approach is the lacking ability to control for a potentially large number of omitted variables, with innate ability most likely being the single most important variable of concern. If it is true that ability is positively correlated with education and independently leads to higher wages, OLS will systematically overestimate the true causal impact of education. A large number of studies have investigated this concern empirically, exploring a range of instruments including changes in schooling laws (Harmon and Walker 1995), proximity to college (Card 1995) and birth quarters (Angrist and Krueger 1991). Rather remarkably, most IV estimates appear to be larger than the corresponding OLS estimates, suggesting that OLS may underestimate the true returns to education. One reason why this is the case would be measurement error in education, or, alternatively, returns to education are highly heterogeneous and the parameters identified by the IV strategy are local average treatment effects (LATE) describing the returns to education of only the subsample for whom the IV induces changes in years of education (Imbens and Angrist 1994). The idiosyncratic gains to education for this subsample are plausibly higher than those unaffected by the IV and the estimated returns exceed the average treatment effects (Heckman 1997). The results presented in this paper represent estimated associations between schooling and labor market incomes conditional on age, experience and rural or urban residence, which may not fully reflect the marginal returns to education for specific populations or subpopulations of interest. By using a highly standardized model, we can identify differences in the relationship between education and income across population strata, differences across countries and regions, and differences across time.

The remainder of the paper is structured as follows. The present data and methodology in Section 2 and show the main results in Section 3; we conclude with a short summary and discussion in Section 4.

## 2. Empirical Methodology

### 2.1 LSMS Data

The data used in this study stems from 61 Living Standard Measurement Study surveys covering 25 countries. Table 1 provides summary statistics for each survey, while appendix Table A1 provides an overview over the entire LSMS survey program coverage. The Living Standards Measurement Study (LSMS) program was established by the World Bank in the 1980s to improve the accuracy, timeliness and policy relevance of household survey data collected by government statistical offices in developing countries. Each survey is the result of collaboration between the World Bank and the statistical office of each nation, with data is made publicly available in most cases. The primary objective of LSMS is to collect data on various dimensions of household well-being to assess household welfare, to understand household behavior, and to potentially evaluate the effect of government policies (Grosh and Glewwe 1998). Typically, LSMS surveys are national surveys using multistage probability samples of households. The sample sizes typically range from 2,000-5,000 households (Scott et al. 2005). Table 1 lists the country and year of each of the 61 surveys included in the study and provides the number of individual level-observations with both education and earning data. Figure 1 displays

the geographic coverage of the LSMS surveys and the number of surveys per country included in the study. Extensive efforts were made to collect data from all LSMS surveys however the number of surveys included in this study is limited by four factors: first, some of the studies do not contain the relevant information, second, requests to local statistical offices housing the data did not receive any response, third, surveys included in the current study are limited to those available for free upon request, and fourth, the surveys are not nationally representative (see appendix Table A1 for details).

The standard LSMS survey consists of three questionnaires: a household questionnaire, a community questionnaire, and a price questionnaire. In addition to standard demographic information such as gender, age and educational attainment, household questionnaires in the surveys collect a wide range of income information (Grosh and Glewwe 1998). Commonly, surveys include income from primary and secondary occupations, number of hours worked, level of highest achieved education, and number of years within each level. The amount of information in each survey differs slightly with some collecting information on tertiary occupations, in-kind transfers, bonuses, benefits, and other information. For the purpose of this study, we define earnings as all income from the primary and secondary occupations, excluding benefits, in-kind transfers, and other potential compensations for labor not resulting from these occupations. Furthermore, we limit the analysis to workers with wage income and convert all earnings information into monthly measures. Limiting the analysis to wage and/or salary workers does not exclude agricultural workers or informal sector employees. However, this restriction does exclude farm or other business owners and the self-employed who do not report wages or salaries but report profits or revenues from their operations, which are not directly attributable to one single person reporting them.

Given that the definitions of primary, secondary and tertiary education differ widely across contexts we use the total number of years of education completed as primary measure of education.

The means and standard deviations of monthly earnings in US currency, years of education, gender, and age for each country and year represented in the LSMS surveys are shown in Table 1. Monthly earnings and average educational attainment were cross-checked against income and education data from the World Development Indicators; all surveys appear very close to the national averages of the respective time periods.[5]

## 2.2 Empirical Model

Following the standard in the literature, we model the effect of education on earnings with a standard Mincerian wage equation, where $Y$ denotes, $S$ denotes the years of schooling completed and $X$ denotes potential experience (Heckman, Lochner et al. 2005).

[5] Some of the World Bank estimates are likely based on the LSMS, making this comparison partially redundant.

$$Ln(Y) = \alpha + \rho S + \beta_1 X + \beta_2 X^2 + \varepsilon$$

As is common in the literature, we proxy potential experience $X$ by a quadratic age term. The coefficient of interest is $\rho$ which describes the percent change in earnings due to a one-year marginal change in attained schooling, $S$.

All models are estimated using OLS. As discussed in the introduction, the overall empirical literature on the bias of OLS estimates is ambiguous, most likely due to two competing sources of bias: positive ability and comparative advantage biases and attenuating measurement error bias. However, because measurement error in schooling is mean-regressive – individuals with the highest level of schooling cannot report positive errors and those with the lowest level of schooling cannot report negative errors – most of the literature concurs on the overall OLS bias being positive (Angrist and Krueger 1999, Card 2001, Griliches 1977). Unfortunately, methods to correct the bias in OLS are not easy to come by. The exclusion restrictions required for the validity of IV instrumental variable (IV) estimation are generally hard to satisfy (and even harder to prove); even if the instrument is valid, IV produces local average treatment effects (LATE), which may reflect non-representative effects with heterogeneous cost or return functions (Card 2001).

For multi-country studies like the ones presented here, identifying plausible instruments seem even more difficult. The only instrument which could potentially be applied across countries is birth quarter; however, data on birth dates is scarce and generally not very reliable in low-income countries.

Given these constraints, we use OLS in this paper to identify the associations the years of schooling and labor market incomes. The reported estimates should thus not be interpreted as the causal effect of (randomly) assigning one additional year of schooling to each individual, but rather as conditional association between educational attainment and income at the population level. As such, the reported coefficients do not directly provide information on returns to schooling per se, but simply describe the income differential observable across the schooling gradient, which reflects both the true causal effect of schooling and the effect of a range of personal and family traits predicting educational attainment as well as labor market outcomes.

The analysis begins by estimating the Mincerian wage equation separately by country and year. Subsequently, the data for each country and year are pooled in order to estimate overall returns to education for low- and middle-income countries. Additionally, we estimate the returns to education by subsample: male and female, urban and rural, and pre and post 2000. In order to compare the results of our study with a large subsample of the literature, we also estimate the returns to each level of schooling – primary, secondary and tertiary. Regional estimates provide a description of the geographic distribution of returns within the low- and middle-income countries of Africa, Asia, Eastern Europe and Latin America.

## 3. Results

Tables 2, 3, 4, and 5 display the results of the Mincerian wage equation estimation for each survey (country and year) by geographical region.[6] Table 2 displays the results for African countries, namely Cote d' Ivoire, Ethiopia, Ghana, Malawi, Niger, Nigeria, South Africa, Tanzania, and Uganda. For African nations represented by LSMS surveys between the years 1985 and 2011, the regional pooled estimates give a return of 6.7%. The minimum estimated return to an additional year of education occurred in Cote d' Ivoire during the year 1988: 3.3%. Previous years of the LSMS in Cote d' Ivoire demonstrated returns between 5.1%, 7.4, and 6%. Ethiopia in 2011 exhibits the largest return to an additional year of education (12.5%), with similarly high rates for Malawi, South Africa and Uganda. Pooling all surveys for each country shows lowest returns for Ghana (4.7%) and highest rates for Ethiopia (12.5%).

Table 3 displays the returns to education for the Asian countries between 1991 and 2009. Pooling all countries and years of LSMS surveys in Asia yields an estimated return to education of only 1.9%. The largest return to education amongst these countries is seen in the Kyrgyz Republic during the year 1998: 9.7%. The smallest return to education occurs in Iraq 2006, where an additional year of education yields only a 0.7% increase in earnings, likely related to the 2006-07 civil war (Fearon 2007), the continually deteriorating quality of education (Buckland 2005), and the over 31,000 attacks on educational institutions between 2003 and 2008 (UNESCO 2010). Much of regional estimated return of 1.9% is due to Iraq.[7] If Iraq is excluded from the regional pooled sample the estimated returns increase to 3.4% but remains the smallest of all regions.

The returns to education for Eastern European countries during the years 1995-2007 are displayed in Table 4. The returns to education for these countries and years varies between 0.2% and 10.9%, though the majority of the estimates lie between 5% and 8.5%. Pooling all countries and years of LSMS surveys in Eastern Europe yields an estimated return to education of 6.8%. The smallest return to education for these countries and years was experienced in Bulgaria during the crisis year 1997.[8] The returns to an additional year of education in Bulgaria during the years 1995, 2001 and 2007 were 4.8%, 5.3%, and 4.9%, making the 0.2% return of 1997 a significant outlier. The largest estimated return occurred in Serbia 2007. The years 2000, 2002, 2003 and 2007 in Serbia depict consistently growing returns to education from 2% in 2000 to 7% in 2002, 9.4% in 2003 and 10.9% in 2007. This growth in the returns to education from 2000 to 2007 coincides with the ousting of former Yugoslav President Slobodan Milosevic in October

[6] Note that the standard errors of each regression are clustered at the regional level within each survey.

[7] The Iraq survey is very influential in the pooled estimates because of the size of the survey. Of the 13 surveys of Asian countries included in the pooled regional analysis, the over 18,000 observations in the Iraq survey composed 35% of the regional pooled sample.

[8] The Bulgarian financial crisis of 1997 was characterized by hyperinflation exceeding 300%, a macroeconomic event potentially validating the temporary reduction in the estimated returns to education (Berlemann et al 2002).

2000 and the subsequent economic liberalization yielding dramatic growth in GDP per capita (IMF 2010).

Table 5 displays the returns to education for the following Latin American countries between 1985-2008: Brazil, Ecuador, Guatemala, Nicaragua, Panama and Peru. Generally, the returns to education for these countries and years are estimated between 6.5% and 11%, however the minimum is 0.2% and the maximum is 13.7% - both took place in Peru. Pooling all countries and years of LSMS surveys in Latin America yields an estimated return to education of 8%. The estimated returns to education in Peru consistently decrease from 13.7% in 1985 to 6.8% in 1991 and 0.2% in 1994.[9] Among Latin American countries, Panama exhibited the highest, consistent returns to education coinciding with GDP growth rates higher than those of all other Latin American countries (BTI 2012).

Figure 2 summarizes the survey-specific returns to education in a forest plot. The figure suggests that a high level of variation in returns to education in Africa, and also highlights the generally low returns in Asia. Returns to education in Eastern Europe are moderate and consistent across countries within the region. Latin America has relatively high returns in general and less variation than Africa. Despite geographic and temporal variation, the overall assertion that returns to education in low- and middle-income nations is not supported by the results.

Figure 3 graphs the average marginal effects for each year of school between 1 and 16 for the entire pooled sample.[10] Overall, there is an upward trend to the marginal returns by year of schooling. At times the marginal return drops close to zero and the confidence interval includes negative values but all estimated marginal returns are greater or equal to zero. The largest marginal returns are obtained by completion of tertiary education (16 years) and the completion of secondary education (12 years).

Table 6 displays the results for a pooled analysis of the returns to education. All 62 datasets are combined and the effect of education on earnings is estimated using over 260,000 observations. The first three columns show the results of the full, pooled sample regressions. The first column including quadratic age and gender covariates as well as survey fixed effects. The second adds an urban/rural fixed effect, and the third column adds province fixed effects. The specification of the first column is comparable to the majority of the literature while the subsequent columns control for endogenous

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[9] This temporal pattern may be related to the administrations of Presidents Alan Garcia and Alberto Fujimori. President Garcia, 1985-1990, vastly expanded public expenditures in previously neglected sectors and locations which decreased unemployment and increased GDP growth between 1985-1987. However, trade deficits lead to hyperinflation exceeding 7500% between 1988-1990 (Parodi 2000). The subsequent economic unrest led to the election of authoritarian President Alberto Fujimori, 1990-2000. Economic policy under President Fujimori began by drastically reduced inflation and relaxed price controls, each incurring significant short-term costs (as demonstrated in the reduced estimated returns of 1991 and 1994) (Sheahan 2001).

[10] The years of school assessed is top coded at 16 because of the limited number of observed years of schooling exceeding 16 and the subsequently high variance in estimated returns. Estimation of these effects is performed with survey (country and year) fixed effects.

urban/rural residential sorting. The results indicate that the average return to an additional year of education in a low to middle-income country between 1985 and 2012 is 6.5%. Whereas previous studies suggest that the returns to education of developing countries exceeds those of developed countries because of underinvestment in education or ill-allocated educational subsidies, our results demonstrate that the returns of developing nations are similar or less than those of developed nations. Card (2001), Psacharopoulos and Patrinos (2002) and others demonstrate that the returns to education in the developed world are approximately 7%-8%. The first specification which does not account for endogenous residential sorting produces estimates consistent with the established range for developed countries. When an urban/rural fixed effect is included the estimated return drops below the levels common for estimates in developed economies. The upwards bias produced by the highly selective samples (non-representative and firm surveys) common to previous studies of developing countries is the most likely reason for the difference between our results and the previously published reviews (Psacharopoulos 1996, Bennell 1996, Psacharopoulos and Patrinos 2002). Furthermore, in contrast to previous results demonstrating higher returns for primary education in developing countries (Psacharopoulos and Patrinos 2002), the estimated returns to each level of education in Table 6 demonstrate that returns grow from 4.9% (primary) to 5.4% (secondary) and 6.5% (tertiary).

Table 7 shows how the returns to education vary by gender, urban/rural status, and time periods for the pooled sample of LSMS surveys. Note that in examining the differences in returns by gender that the analysis does not make any correction for selection into employment which is more common with women. As a result, the estimated returns to education for females may exhibit larger upward bias than the estimates for males, though previous research suggests that selection bias has little or no impact on estimates (Dearden 1998). The results of the preferred specification includes survey fixed effects. The difference between male and female returns to education for the entire pooled sample is 1.3 percentage points – 5.9% for males and 7.2% for females. The difference between urban and rural returns to education is 1.4 percentage points – 6.7% for urban residents and 5.3% for rural residents. The estimated return for the pooled sample of surveys collected during and prior to 1999 is 7.3% while the pooled sample of surveys collected after 1999 yield a 6.1% return.

Finally, Table 8 shows how the returns to education vary by gender, urban/rural status, level of education, and time periods by region for the pooled sample of LSMS surveys. In Africa, the full sample returns are 6.7% with larger returns going to females (7.2% for females to 6.2% for males), urban residents (8.1% for urban to 5.1% for rural), tertiary education (4.8% for primary, 5.2% for secondary, and 7.3% for tertiary years of education), and the years prior to 2000 (8.5% for pre-1999 and 6.4% for post-2000). The full sample returns are lower in Asia (1.9%), females have higher returns (2.8% to 1.3%), urban residents have slightly higher returns (1.9% to 1.7%), tertiary education yields the highest returns (1.3% compared to 0.9% and 1.7% in secondary and primary), and the years prior to 2000 yield the highest return (3.6% to 1.3%). Latin America has the highest regional returns (8.0%), higher female returns than male (8.5% and 7.6%), higher returns in urban areas (8.2% and 7.1%), growing returns from primary to tertiary levels

(6.6% primary, 6.7% secondary, and 8% tertiary), and relatively no difference between pre-1999 and post-2000 returns (8.1% and 7.9%). Eastern Europe exhibits similar patterns to the other regions in terms of gender, urban/rural, and educational level (6.8% full, 5.9% male, 8.3% female, 6.5% urban, 6.1% rural, 5.7% primary, 5.3% secondary, 6.3% tertiary) but display a significant contrast in the returns by time period: larger returns are seen in the time period in and after the year 2000 (3% pre-1999, 7.2% post-2000). This contrast in trends likely reflects relatively the low rates of returns in the post-communist transition years as well as increased demand for human capital with accelerated economic growth post 2000.

## 4. Conclusion

In this paper, we utilizes 61 nationally representative Living Standard and Measurement Study surveys conducted between 1985 and 2012 to estimate standard Mincerian wage equations across 25 low to middle-income countries. While we find consistently positive estimates as expected, we do not find evidence for higher average returns to schooling in developing countries as suggested in previous literature (Psacharopoulos and Patrinos 2002). On average, the results presented in this paper suggest that each year of completed schooling is associated with a 6.5% increase in income in developing countries. This aggregate return estimate masks a remarkably high degree of heterogeneity in the returns to education. On average, we find that rates of returns in South America are about twice those in Asia, and generally higher in rural areas and among females. Even within countries, some of the observed variations are rather remarkable, with nations like Peru and Bulgaria experiencing both rates close to zero and rates over 10 percent in specific survey years. While some of the more extreme variations in returns to education can likely be explained by macro-economic instability, further research will be needed to better understand both the cross-country and inter-temporal variations in the returns to schooling.

Overall, the results presented in this paper suggest that the returns to education in developing countries continue to be positive, but are likely lower on average today than observed in developed economies like the US; in many settings, and in particular in the Asia region, returns to education seem to have fallen below 5%. Given that the demand for human capital is unlikely to have declined over the past decades, this suggests that either the quality of education has fallen or that that increases in the supply of human capital have been more rapid than the concurrent increases in the demand (or both). With most developing country governments aggressively pursuing educational attainment goals further decreases in the returns to education over the coming years seem likely.

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Table 1 (Summary Statistics)

**Summary Statistics**

| | Year | Obs. | Monthly Earnings in US Dollars | | Years of Education | | Male | Age | | Urban |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean | Std. Dev | Mean | Std. Dev | Mean | Mean | Std. Dev | Mean |
| **Africa** | | | | | | | | | | |
| Cote D'ivoire | 1985 | 2333 | 349.17 | 889.48 | 3.11 | 5.27 | 0.50 | 33.06 | 15.96 | 0.29 |
| Cote D'ivoire | 1986 | 2288 | 569.83 | 1568.89 | 3.32 | 5.41 | 0.49 | 33.10 | 16.80 | 0.28 |
| Cote D'ivoire | 1987 | 2196 | 671.85 | 1917.60 | 3.16 | 5.28 | 0.50 | 33.70 | 15.93 | 0.35 |
| Cote D'ivoire | 1988 | 2164 | 474.63 | 1465.99 | 3.16 | 5.22 | 0.50 | 34.49 | 16.28 | 0.33 |
| Ethiopia | 2011 | 667 | 2.78 | 32.34 | 2.16 | 3.23 | 0.50 | 24.87 | 17.82 | 0.10 |
| Ghana | 2005 | 10686 | 27.83 | 319.70 | 4.96 | 5.40 | 0.49 | 24.14 | 19.48 | 0.35 |
| Ghana | 2008 | 10267 | 14.05 | 55.47 | 4.46 | 5.03 | 0.49 | 24.91 | 20.85 | 0.28 |
| Malawi | 2010 | 3432 | 10.02 | 135.11 | 4.75 | 3.98 | 0.49 | 21.19 | 18.31 | 0.18 |
| Niger | 2011 | 5120 | 32.35 | 208.09 | 1.99 | 3.67 | 0.49 | 20.09 | 18.25 | 0.38 |
| Nigeria | 2010 | 4637 | 59.43 | 1204.51 | 5.99 | 5.67 | 0.49 | 26.92 | 19.01 | 0.29 |
| Nigeria | 2012 | 4024 | 53.54 | 1033.65 | 6.12 | 5.76 | 0.50 | 12.57 | 18.27 | 0.27 |
| South Africa | 1993 | 6556 | 350.04 | 451.08 | 6.33 | 4.77 | 0.48 | 25.68 | 18.73 | 0.43 |
| Tanzania | 2004 | 926 | 5.08 | 177.23 | 5.38 | 3.65 | 0.49 | 21.30 | 18.36 | 0.36 |
| Tanzania | 2008 | 1821 | 24.26 | 604.42 | 5.40 | 4.23 | 0.48 | 22.82 | 19.17 | 0.48 |
| Tanzania | 2010 | 2739 | 39.93 | 646.24 | 5.56 | 4.23 | 0.48 | 22.83 | 19.09 | 0.29 |
| Uganda | 2005 | 1845 | 67.63 | 197.97 | 4.93 | 4.27 | 0.49 | 23.64 | 16.67 | 0.26 |
| Uganda | 2009 | 1540 | 13.48 | 251.24 | 4.77 | 4.39 | 0.49 | 23.95 | 17.51 | 0.24 |
| Uganda | 2010 | 1260 | 12.39 | 126.49 | 5.05 | 4.46 | 0.49 | 24.07 | 17.99 | 0.22 |
| **Asia** | | | | | | | | | | |
| Azerbaijan | 1995 | 2156 | 287.34 | 936.17 | 8.92 | 4.19 | 0.47 | 32.54 | 19.03 | 0.50 |
| Iraq | 2006 | 18937 | 5.06 | 42.21 | 5.92 | 4.85 | 0.50 | 22.81 | 18.39 | 0.65 |
| Kyrgyz | 1993 | 2855 | 12.85 | 31.12 | 9.65 | 3.18 | 0.46 | 36.95 | 17.56 | 0.63 |
| Kyrgyz | 1996 | 1639 | 35.58 | 39.66 | 8.96 | 4.90 | 0.49 | 26.79 | 20.48 | 0.32 |
| Kyrgyz | 1997 | 6818 | 26.66 | 28.40 | 8.30 | 5.52 | 0.49 | 25.84 | 19.92 | 0.30 |
| Kyrgyz | 1998 | 920 | 30.86 | 28.46 | 9.31 | 5.03 | 0.19 | 25.41 | 19.32 | 0.26 |
| Pakistan | 1991 | 1412 | 36.92 | 99.74 | 3.68 | 4.59 | 0.67 | 21.33 | 14.73 | 0.62 |
| Tajikistan | 1999 | 2425 | 66.53 | 221.38 | 8.54 | 3.84 | 0.49 | 30.27 | 17.20 | 0.23 |
| Tajikistan | 2003 | 5683 | 22.40 | 60.23 | 9.92 | 3.08 | 0.48 | 33.90 | 16.77 | 0.30 |
| Tajikistan | 2007 | 6307 | 29.11 | 173.09 | 8.32 | 4.66 | 0.48 | 29.02 | 18.16 | 0.30 |
| Tajikistan | 2009 | 2125 | 24.62 | 88.47 | 8.53 | 4.55 | 0.49 | 25.98 | 19.05 | 0.29 |
| Timor Leste | 2001 | 1111 | 174.51 | 913.14 | 4.17 | 4.70 | 0.51 | 26.19 | 17.40 | 0.44 |
| Timor Leste | 2007 | 1182 | 176.56 | 686.37 | 3.92 | 5.22 | 0.51 | 22.86 | 18.55 | 0.50 |
| **Eastern Europe** | | | | | | | | | | |
| Albania | 2002 | 2087 | 57.46 | 101.85 | 9.65 | 3.53 | 0.56 | 38.57 | 13.37 | 0.38 |
| Albania | 2003 | 1058 | 36.19 | 124.20 | 7.75 | 4.25 | 0.51 | 31.49 | 21.10 | 0.47 |
| Albania | 2005 | 3948 | 178.10 | 220.52 | 10.00 | 3.24 | 0.59 | 39.62 | 12.57 | 0.45 |
| Bosnia | 2001 | 4185 | 168.43 | 196.45 | 8.65 | 4.40 | 0.48 | 37.78 | 21.58 | 0.46 |
| Bosnia | 2002 | 2238 | 170.47 | 201.76 | 8.28 | 4.37 | 0.48 | 37.54 | 21.67 | 0.68 |
| Bulgaria | 1995 | 2188 | 75.04 | 55.19 | 9.21 | 4.39 | 0.48 | 40.33 | 22.35 | 0.67 |
| Bulgaria | 1997 | 1791 | 11.74 | 8.18 | 9.17 | 4.43 | 0.48 | 40.57 | 22.16 | 0.54 |
| Bulgaria | 2001 | 2083 | 171.38 | 96.04 | 9.28 | 4.50 | 0.48 | 39.29 | 22.38 | 0.66 |
| Bulgaria | 2007 | 4793 | 208.99 | 364.10 | 10.43 | 5.83 | 0.48 | 43.30 | 22.19 | 0.71 |
| Serbia | 2000 | 2259 | 66.90 | 433.36 | 8.57 | 3.88 | 0.49 | 34.00 | 18.48 | 0.66 |
| Serbia | 2002 | 6514 | 141.78 | 122.73 | 8.88 | 4.80 | 0.49 | 40.94 | 22.04 | 0.53 |
| Serbia | 2003 | 2542 | 189.51 | 154.12 | 9.25 | 4.00 | 0.48 | 47.70 | 18.88 | 0.52 |
| Serbia | 2007 | 5172 | 378.29 | 280.16 | 8.45 | 4.78 | 0.48 | 42.11 | 22.15 | 0.52 |
| **Latin America** | | | | | | | | | | |
| Brazil | 1997 | 6818 | 652.92 | 1553.14 | 6.03 | 5.08 | 0.48 | 27.91 | 19.91 | 0.75 |
| Ecuador | 1994 | 4959 | 52.39 | 790.79 | 7.57 | 4.73 | 0.50 | 24.62 | 19.01 | 0.65 |
| Ecuador | 1995 | 5164 | 52.33 | 1093.91 | 7.20 | 4.60 | 0.50 | 25.03 | 19.63 | 0.53 |
| Ecuador | 1998 | 5499 | 31.45 | 174.12 | 7.60 | 4.62 | 0.50 | 25.91 | 19.99 | 0.53 |
| Ecuador | 1999 | 6217 | 27.87 | 676.77 | 7.50 | 4.68 | 0.50 | 25.99 | 20.15 | 0.54 |
| Ecuador | 2006 | 13976 | 21.18 | 98.77 | 7.50 | 4.80 | 0.49 | 27.29 | 20.90 | 0.53 |
| Ecuador | 2009 | 1295 | 69.57 | 906.27 | 8.22 | 5.34 | 0.51 | 27.42 | 18.83 | 0.74 |
| Guatemala | 2000 | 4901 | 41.90 | 2068.94 | 4.49 | 4.44 | 0.49 | 26.79 | 18.60 | 0.44 |
| Nicaragua | 1993 | 5176 | 25.67 | 113.31 | 5.27 | 4.25 | 0.49 | 21.88 | 18.52 | 0.56 |
| Nicaragua | 1998 | 6027 | 34.30 | 133.81 | 6.00 | 4.73 | 0.49 | 70.66 | 18.24 | 0.52 |
| Nicaragua | 2001 | 6655 | 34.77 | 136.75 | 6.58 | 4.83 | 0.49 | 23.62 | 19.17 | 0.53 |
| Panama | 1997 | 7179 | 124.55 | 486.16 | 7.56 | 5.44 | 0.51 | 27.45 | 20.70 | 0.46 |
| Panama | 2003 | 8760 | 115.06 | 371.80 | 7.92 | 5.43 | 0.50 | 27.60 | 20.78 | 0.50 |
| Panama | 2008 | 10342 | 181.73 | 582.63 | 8.44 | 5.52 | 0.51 | 29.31 | 21.36 | 0.50 |
| Peru | 1985 | 1599 | 58.46 | 132.19 | 6.21 | 4.75 | 0.47 | 37.06 | 15.58 | 0.42 |
| Peru | 1991 | 3642 | 58.39 | 135.30 | 6.77 | 4.26 | 0.49 | 29.78 | 18.57 | 0.47 |
| Peru | 1994 | 5603 | 47.83 | 83.51 | 7.01 | 4.55 | 0.49 | 25.62 | 20.28 | 0.29 |

Tables 2 (Africa) – 3 (Asia)

**Returns to Education for Countries, Years: Africa**

| | Cote d'Ivoire | | | | Ethiopia | Ghana | | Malawi | Niger | Nigeria | | South Africa | Tanzania | | | Uganda | | | Africa |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1985 | 1986 | 1987 | 1988 | 2011 | 2005 | 2006 | 2010 | 2011 | 2010 | 2012 | 1993 | 2004 | 2008 | 2010 | 2005 | 2009 | 2010 | Pooled |
| Achieved years of Education | 0.051*** | 0.074*** | 0.080*** | 0.033 | 0.125*** | 0.057*** | 0.037*** | 0.122*** | 0.085*** | 0.048*** | 0.085*** | 0.107*** | 0.059** | 0.089*** | 0.088*** | 0.118*** | 0.122*** | 0.120*** | 0.087*** |
| | (0.018) | (0.019) | (0.021) | (0.023) | (0.021) | (0.008) | (0.005) | (0.008) | (0.007) | (0.012) | (0.009) | (0.008) | (0.027) | (0.015) | (0.009) | (0.009) | (0.007) | (0.008) | (0.010) |
| Age | 0.131*** | 0.120*** | 0.104*** | 0.108*** | 0.159*** | 0.088*** | 0.051*** | 0.084*** | 0.082*** | 0.080*** | -0.004 | 0.070*** | 0.058*** | 0.085*** | 0.088*** | 0.084*** | 0.088*** | 0.077*** | 0.078*** |
| | (0.012) | (0.018) | (0.022) | (0.009) | (0.053) | (0.005) | (0.005) | (0.002) | (0.010) | (0.007) | (0.007) | (0.007) | (0.034) | (0.018) | (0.010) | (0.009) | (0.024) | (0.007) | (0.005) |
| Age^2 | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.002*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.000 | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Male | 1.859*** | 1.987*** | 1.848*** | 1.825*** | -0.223* | 0.353*** | 0.258*** | 0.051*** | 1.289*** | 0.839*** | 0.828*** | 0.419*** | 0.775*** | 0.479*** | 0.478*** | 0.345** | 0.423*** | 0.443** | 0.844*** |
| | (0.103) | (0.201) | (0.188) | (0.187) | (0.133) | (0.018) | (0.049) | (0.030) | (0.210) | (0.088) | (0.092) | (0.086) | (0.068) | (0.158) | (0.038) | (0.142) | (0.105) | (0.178) | (0.142) |
| Urban | -0.847*** | -0.598*** | -0.780*** | -0.808*** | 0.238** | 0.371*** | 0.408*** | 0.309*** | 0.815*** | 0.245*** | 0.197 | 0.573*** | 0.759*** | 0.285** | 0.251*** | 0.418*** | 0.375*** | 0.308*** | 0.287** |
| | (0.131) | (0.090) | (0.104) | (0.123) | (0.128) | (0.083) | (0.068) | (0.032) | (0.102) | (0.088) | (0.124) | (0.152) | (0.120) | (0.110) | (0.087) | (0.018) | (0.148) | (0.107) | (0.108) |
| Constant | 8.338*** | 8.413*** | 7.255*** | 7.268*** | 2.549** | 10.824*** | 10.833*** | 8.453*** | 8.784*** | 8.821*** | 8.887*** | 9.501*** | 7.090*** | 8.313*** | 8.910*** | 8.487*** | 8.134*** | 8.592*** | 9.815*** |
| | (0.245) | (0.338) | (0.404) | (0.350) | (1.100) | (0.145) | (0.131) | (0.110) | (0.248) | (0.145) | (0.214) | (0.215) | (0.480) | (0.410) | (0.185) | (0.180) | (0.311) | (0.160) | (0.218) |
| Number of obs (N): | 2,318 | 2,282 | 2,184 | 2,153 | 804 | 10,585 | 10,117 | 3,330 | 5,120 | 4,414 | 3,880 | 8,517 | 164 | 1,821 | 2,739 | 1,645 | 1,539 | 1,260 | 83,782 |
| R-squared | 0.348 | 0.393 | 0.342 | 0.349 | 0.233 | 0.194 | 0.084 | 0.393 | 0.423 | 0.187 | 0.205 | 0.434 | 0.287 | 0.058 | 0.231 | 0.403 | 0.327 | 0.359 | 0.895 |

Notes: Standard errors are clustered at the regional level within each survey. All estimates include regional fixed effects. Pooled estimates include survey (country and year) fixed effects. Significance values: *** p<0.01, ** p<0.05, * p<0.1

**Returns to Education for Countries, Years: Asia**

| | Azerbaijan | Iraq | Kyrgyz | | | | Pakistan | | Tajikistan | | | Timor Leste | | Asia |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1995 | 2006 | 1993 | 1996 | 1997 | 1998 | 1991 | 1999 | 2003 | 2007 | 2009 | 2001 | 2007 | Pooled |
| Achieved years of Education | 0.039*** | 0.007*** | 0.035*** | 0.091*** | 0.024*** | 0.097*** | 0.070*** | 0.066*** | 0.010 | 0.016* | 0.049*** | 0.046* | 0.047 | 0.019** |
| | (0.003) | (0.002) | (0.007) | (0.019) | (0.004) | (0.020) | (0.009) | (0.022) | (0.016) | (0.008) | (0.014) | (0.027) | (0.029) | (0.007) |
| Age | 0.029** | 0.030*** | 0.056*** | 0.049*** | 0.010** | 0.004** | 0.093*** | 0.039*** | 0.036*** | 0.043*** | 0.056*** | 0.049*** | 0.009 | 0.029*** |
| | (0.011) | (0.005) | (0.006) | (0.010) | (0.005) | (0.002) | (0.009) | (0.009) | (0.005) | (0.012) | (0.008) | (0.002) | (0.091) | (0.010) |
| Age^2 | -0.000** | -0.000*** | -0.001*** | -0.001*** | -0.000 | -0.000* | -0.001*** | -0.000*** | -0.000*** | -0.001*** | -0.001*** | -0.001*** | 0.000 | -0.000** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) |
| Male | 0.812*** | 0.266*** | 0.401*** | 0.231*** | 0.064*** | 0.099*** | 0.360** | 0.569*** | 0.336*** | 0.907*** | 0.815*** | 0.316*** | 0.505 | 0.427*** |
| | (0.045) | (0.021) | (0.063) | (0.031) | (0.024) | (0.031) | (0.163) | (0.046) | (0.070) | (0.112) | (0.206) | (0.046) | (0.314) | (0.104) |
| Urban | 0.472*** | -0.016 | -0.259** | 0.830*** | 0.669*** | 0.606*** | 0.129*** | 0.655*** | 0.204 | 0.436** | 0.425*** | 0.710* | -0.638* | 0.271** |
| | (0.133) | (0.025) | (0.131) | (0.190) | (0.172) | (0.134) | (0.029) | (0.206) | (0.126) | (0.195) | (0.130) | (0.407) | (0.376) | (0.126) |
| Constant | 4.459*** | 9.369*** | 2.649*** | 3.415*** | 5.004*** | 4.591*** | 5.101*** | 1.936*** | 3.579*** | 3.400*** | 3.266*** | 2.797*** | 4.767*** | 8.969*** |
| | (0.202) | (0.104) | (0.116) | (0.406) | (0.172) | (0.363) | (0.185) | (0.269) | (0.242) | (0.472) | (0.106) | (0.146) | (1.517) | (0.237) |
| Number of obs (N): | 2,156 | 16,446 | 2,855 | 1,612 | 5,205 | 962 | 1,397 | 2,364 | 5,665 | 6,092 | 2,062 | 1,067 | 476 | 52,853 |
| R-squared | 0.194 | 0.039 | 0.166 | 0.379 | 0.212 | 0.263 | 0.379 | 0.224 | 0.053 | 0.199 | 0.247 | 0.140 | 0.030 | 0.669 |

Notes: Standard errors are clustered at the regional level within each survey. All estimates include regional fixed effects. Pooled estimates include survey (country and year) fixed effects. Significance values: *** p<0.01, ** p<0.05, * p<0.1

Tables 4 (Eastern Europe) – 5 (Latin America)

**Returns to Education for Countries, Years: Eastern Europe**

| | Albania | | | Bosnia | | Bulgaria | | | | Serbia | | | | Eastern Europe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2002 | 2003 | 2005 | 2001 | 2002 | 1995 | 1997 | 2001 | 2007 | 2000 | 2002 | 2003 | 2007 | Pooled |
| Achieved years of Education | 0.051*** | 0.053*** | 0.070*** | 0.085*** | 0.077*** | 0.048*** | 0.002 | 0.053*** | 0.049*** | 0.020*** | 0.070*** | 0.094*** | 0.109*** | 0.066*** |
| | (0.019) | (0.015) | (0.006) | (0.020) | (0.020) | (0.004) | (0.003) | (0.005) | (0.004) | (0.007) | (0.006) | (0.008) | (0.009) | (0.007) |
| Age | 0.015*** | 0.036*** | 0.051*** | 0.023*** | 0.025*** | 0.047*** | -0.001 | 0.046*** | 0.065*** | -0.015 | 0.045*** | 0.053*** | 0.050*** | 0.043*** |
| | (0.005) | (0.010) | (0.017) | (0.006) | (0.002) | (0.006) | (0.006) | (0.005) | (0.010) | (0.021) | (0.006) | (0.004) | (0.006) | (0.007) |
| Age^2 | -0.000*** | -0.000*** | -0.001*** | -0.000** | -0.000*** | -0.001*** | 0.000 | -0.001*** | -0.001*** | 0.000 | -0.001*** | -0.001*** | -0.001*** | -0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Male | 0.370*** | 0.354*** | 0.560*** | 0.186*** | 0.171*** | 0.370*** | 0.349*** | 0.305*** | 0.346*** | 0.462*** | 0.251*** | 0.276*** | 0.211*** | 0.301*** |
| | (0.032) | (0.035) | (0.050) | (0.036) | (0.036) | (0.028) | (0.025) | (0.030) | (0.018) | (0.083) | (0.028) | (0.019) | (0.021) | (0.035) |
| Urban | 0.149* | 0.147** | 0.395*** | -0.111 | -0.066*** | 0.131*** | -0.100* | 0.122*** | 0.206*** | -0.058 | 0.140*** | 0.087*** | 0.161*** | 0.105** |
| | (0.077) | (0.057) | (0.140) | (0.092) | (0.014) | (0.035) | (0.054) | (0.047) | (0.039) | (0.090) | (0.024) | (0.032) | (0.027) | (0.048) |
| Constant | 8.494*** | 8.031*** | 7.467*** | 4.227*** | 4.227*** | 6.629*** | 9.567*** | 3.958*** | 4.309*** | 5.709*** | 7.023*** | 6.739*** | 7.235*** | 7.932*** |
| | (0.191) | (0.243) | (0.476) | (0.001) | (0.118) | (0.156) | (0.127) | (0.162) | (0.157) | (0.322) | (0.145) | (0.126) | (0.210) | (0.194) |
| Number of obs (N): | 2,064 | 1,044 | 3,661 | 4,109 | 2,198 | 2,188 | 1,790 | 2,083 | 4,793 | 2,192 | 6,514 | 2,542 | 4,975 | 40,858 |
| R-squared | 0.190 | 0.209 | 0.291 | 0.150 | 0.126 | 0.185 | 0.069 | 0.178 | 0.279 | 0.058 | 0.211 | 0.250 | 0.284 | 0.878 |

Notes: Standard errors are clustered at the regional level within each survey. All estimates include regional fixed effects. Pooled estimates include survey (country and year) fixed effects. Significance values: *** p<0.01, ** p<0.05, * p<0.1

**Returns to Education for Countries, Years: Latin America**

| | Brazil | | | Ecuador | | | | Guatemala | Nicaragua | | | Panama | | | Peru | | | Latin America |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1997 | 1994 | 1995 | 1998 | 1999 | 2006 | 2009 | 2000 | 1993 | 1996 | 2001 | 1997 | 2003 | 2008 | 1985 | 1991 | 1994 | Pooled |
| Achieved years of Education | 0.111*** | 0.093*** | 0.066** | 0.078*** | 0.086*** | 0.062*** | 0.010 | 0.093*** | 0.069*** | 0.073*** | 0.072*** | 0.112*** | 0.107*** | 0.106*** | 0.137*** | 0.068*** | 0.002 | 0.080*** |
| | (0.004) | (0.006) | (0.028) | (0.003) | (0.004) | (0.003) | (0.015) | (0.012) | (0.006) | (0.007) | (0.004) | (0.003) | (0.008) | (0.006) | (0.012) | (0.003) | (0.005) | (0.006) |
| Age | 0.130*** | 0.032*** | 0.160*** | 0.050*** | 0.060*** | 0.059*** | 0.071*** | 0.068*** | 0.064*** | 0.055*** | 0.050*** | 0.102*** | 0.129*** | 0.103*** | 0.096*** | 0.061*** | 0.000 | 0.059*** |
| | (0.005) | (0.007) | (0.051) | (0.008) | (0.004) | (0.003) | (0.010) | (0.008) | (0.006) | (0.006) | (0.005) | (0.003) | (0.009) | (0.012) | (0.014) | (0.005) | (0.002) | (0.014) |
| Age^2 | -0.001*** | -0.000*** | -0.003*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.000*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.000 | -0.001*** |
| | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Male | 0.634*** | 0.689*** | 0.533** | 0.776*** | 0.876*** | 0.873*** | 0.364*** | 0.517*** | 0.233*** | 0.349*** | 0.319*** | 0.483*** | 0.401*** | 0.456*** | 0.461*** | 0.341*** | -0.043*** | 0.530*** |
| | (0.030) | (0.047) | (0.231) | (0.113) | (0.139) | (0.041) | (0.097) | (0.068) | (0.025) | (0.052) | (0.035) | (0.027) | (0.063) | (0.056) | (0.102) | (0.027) | (0.011) | (0.073) |
| Urban | 0.434*** | 0.321*** | 0.396* | 0.640*** | 0.337 | 0.469*** | 0.220** | 0.558*** | 0.549*** | 0.329*** | 0.298*** | 0.576*** | 0.470*** | 0.585*** | 0.777*** | 0.360*** | -0.225*** | 0.439*** |
| | (0.119) | (0.110) | (0.204) | (0.135) | (0.227) | (0.037) | (0.106) | (0.093) | (0.061) | (0.069) | (0.050) | (0.096) | (0.056) | (0.119) | (0.193) | (0.026) | (0.040) | (0.027) |
| Constant | 1.347*** | 9.955*** | 6.557*** | 10.412*** | 10.599*** | 11.506*** | 12.174*** | 3.503*** | 3.965*** | 4.417*** | 4.851*** | 1.250*** | 0.774*** | 1.324*** | 2.291*** | 2.052*** | 4.360*** | 11.566*** |
| | (0.152) | (0.090) | (0.336) | (0.170) | (0.036) | (0.146) | (0.287) | (0.195) | (0.105) | (0.095) | (0.130) | (0.061) | (0.227) | (0.223) | (0.151) | (0.109) | (0.040) | (0.398) |
| Number of obs (N): | 6,616 | 4,488 | 226 | 5,221 | 5,846 | 13,296 | 1,173 | 4,737 | 4,869 | 5,603 | 6,075 | 7,179 | 2,672 | 1,776 | 1,464 | 3,404 | 5,603 | 103,842 |
| R-squared | 0.403 | 0.233 | 0.322 | 0.295 | 0.212 | 0.252 | 0.050 | 0.198 | 0.299 | 0.249 | 0.234 | 0.378 | 0.361 | 0.338 | 0.445 | 0.241 | 0.013 | 0.924 |

Notes: Standard errors are clustered at the regional level within each survey. All estimates include regional fixed effects. Pooled estimates include survey (country and year) fixed effects. Significance values: *** p<0.01, ** p<0.05, * p<0.1

Table 6 (Pooled: Years of Education and Levels of Education)

**Returns to Education, All Countries and Years Pooled**

| | All Levels | | | By Educational Level | | |
|---|---|---|---|---|---|---|
| | Survey FE | Survey FE | Survey and Province FE | Survey FE | Survey FE | Survey and Province FE |
| Achieved years of Education | 0.075*** | 0.065*** | 0.065*** | | | |
| | (0.008) | (0.007) | (0.007) | | | |
| Years of Primary School | | | | 0.057*** | 0.049*** | 0.050*** |
| | | | | (0.008) | (0.008) | (0.007) |
| Years of Secondary School | | | | 0.064*** | 0.054*** | 0.055*** |
| | | | | (0.007) | (0.006) | (0.006) |
| Years of Tertiary School | | | | 0.075*** | 0.065*** | 0.065*** |
| | | | | (0.008) | (0.007) | (0.007) |
| Age | 0.052*** | 0.050*** | 0.050*** | 0.052*** | 0.050*** | 0.050*** |
| | (0.009) | (0.008) | (0.008) | (0.009) | (0.008) | (0.008) |
| Age^2 | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Male | 0.477*** | 0.501*** | 0.501*** | 0.484*** | 0.507*** | 0.507*** |
| | (0.051) | (0.051) | (0.051) | (0.050) | (0.050) | (0.051) |
| Urban | | 0.324*** | 0.314*** | | 0.322*** | 0.313*** |
| | | (0.042) | (0.040) | | (0.041) | (0.039) |
| Constant | 8.696*** | 8.607*** | 8.634*** | 8.723*** | 8.633*** | 8.656*** |
| | (0.212) | (0.205) | (0.228) | (0.208) | (0.202) | (0.224) |
| Number of obs (N): | 264,000 | 261,285 | 257,044 | 264,000 | 261,285 | 257,044 |
| R-squared | 0.894 | 0.897 | 0.896 | 0.894 | 0.897 | 0.896 |

Notes: Standard errors are clustered at regional level within each survey. Significance values: *** p<0.01, ** p<0.05, * p<0.1

Table 7 (Pooled: Gender, Urban/Rural, Pre 1999 and Post 2000)

**Returns to Education, All Countries and Years Pooled**

| | Full | Male | Female | Urban | Rural | Pre-1999 | Post-2000 |
|---|---|---|---|---|---|---|---|
| Achieved years of Education | 0.065*** | 0.059*** | 0.072*** | 0.067*** | 0.053*** | 0.073*** | 0.061*** |
| | (0.007) | (0.008) | (0.007) | (0.008) | (0.007) | (0.010) | (0.009) |
| Age | 0.050*** | 0.057*** | 0.040*** | 0.063*** | 0.040*** | 0.042*** | 0.060*** |
| | (0.008) | (0.007) | (0.010) | (0.009) | (0.007) | (0.015) | (0.004) |
| Age^2 | -0.001*** | -0.001*** | -0.000*** | -0.001*** | -0.000*** | -0.000*** | -0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Male | 0.501*** | | | 0.494*** | 0.539*** | 0.548*** | 0.474*** |
| | (0.051) | | | (0.039) | (0.069) | (0.091) | (0.061) |
| Urban | 0.324*** | 0.322*** | 0.330*** | | | 0.324*** | 0.324*** |
| | (0.042) | (0.041) | (0.048) | | | (0.085) | (0.044) |
| Constant | 8.607*** | 9.610*** | 7.934*** | 8.024*** | 9.318*** | 5.691*** | 7.941*** |
| | (0.205) | (0.180) | (0.216) | (0.217) | (0.190) | (0.407) | (0.202) |
| Number of obs (N): | 261,285 | 164,113 | 97,172 | 135,515 | 125,770 | 95,613 | 165,672 |
| R-squared | 0.897 | 0.902 | 0.895 | 0.904 | 0.896 | 0.891 | 0.895 |

Notes: Included (not displayed) in each regression are survey (country-year) fixed effects. Standard errors are clustered at the regional level within each survey. Significance values: *** p<0.01, ** p<0.05, * p<0.1

Table 8 (Pooled: Regional Returns for full sample, by gender, by urban/rural, by educational level and by time period)

**Returns to Education, Pooled, By Region and Gender, Urban/Rural Residence, Educational Level and Time Period**

| | Full | Male | Female | Urban | Rural | Years of Primary Education | Years of Secondary Education | Years of Tertiary Education | Pre-1999 | Post-2000 |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Region:*** | | | | | | | | | | |
| Africa | 0.067*** | 0.062*** | 0.072*** | 0.081*** | 0.051*** | 0.048*** | 0.052*** | 0.073*** | 0.085*** | 0.064*** |
| | (0.010) | (0.008) | (0.010) | (0.011) | (0.008) | (0.011) | (0.010) | (0.009) | (0.018) | (0.010) |
| Asia | 0.019** | 0.013* | 0.028*** | 0.018*** | 0.017** | 0.013* | 0.009 | 0.017*** | 0.036** | 0.013*** |
| | (0.007) | (0.007) | (0.008) | (0.007) | (0.008) | (0.007) | (0.005) | (0.006) | (0.016) | (0.004) |
| Eastern Europe | 0.068*** | 0.059*** | 0.083*** | 0.065*** | 0.061*** | 0.057*** | 0.053*** | 0.063*** | 0.030 | 0.072*** |
| | (0.007) | (0.006) | (0.011) | (0.008) | (0.009) | (0.016) | (0.006) | (0.007) | (0.022) | (0.008) |
| Latin America | 0.080*** | 0.076*** | 0.085*** | 0.082*** | 0.071*** | 0.066*** | 0.067*** | 0.080*** | 0.081*** | 0.079*** |
| | (0.006) | (0.004) | (0.010) | (0.004) | (0.011) | (0.008) | (0.005) | (0.006) | (0.009) | (0.007) |

Notes: Included (not displayed) in each regression are gender, quadratic age, and urban indicator covariates as well as survey (country-year) fixed effects. Standard errors are clustered at the survey and province level. Significance values: *** p<0.01, ** p<0.05, * p<0.1

Figure 1 (Geographic Coverage of LSMS surveys included in the study)

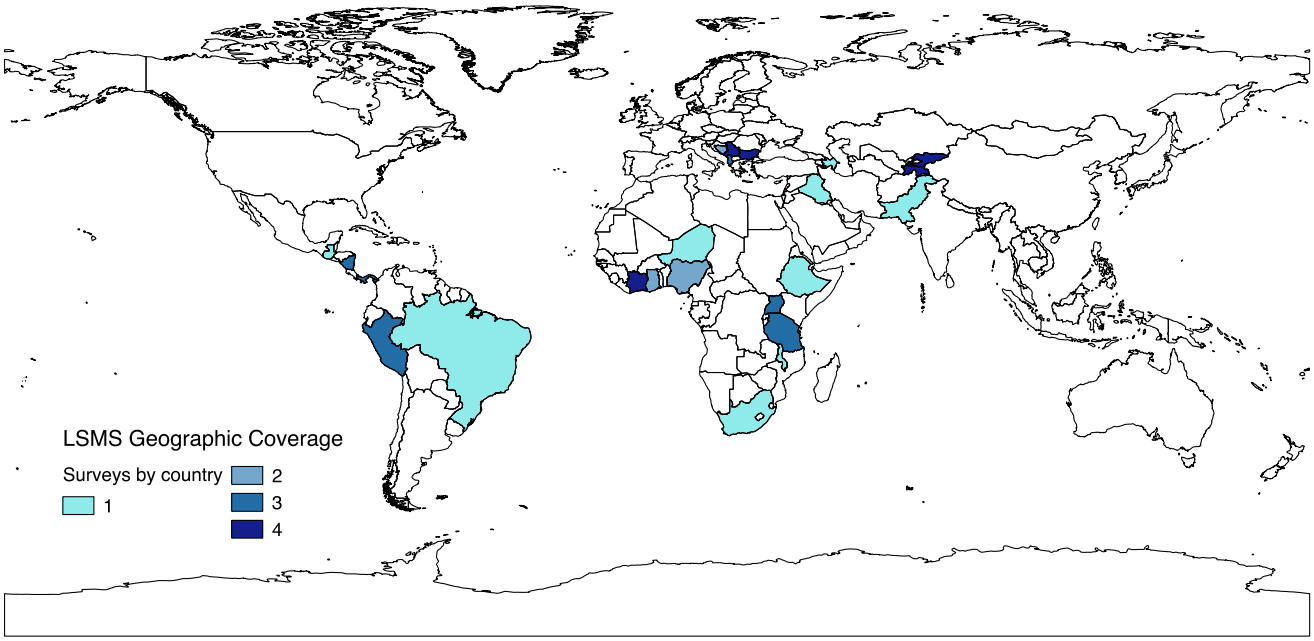



Figure 2 (Returns by Country with Year FE)

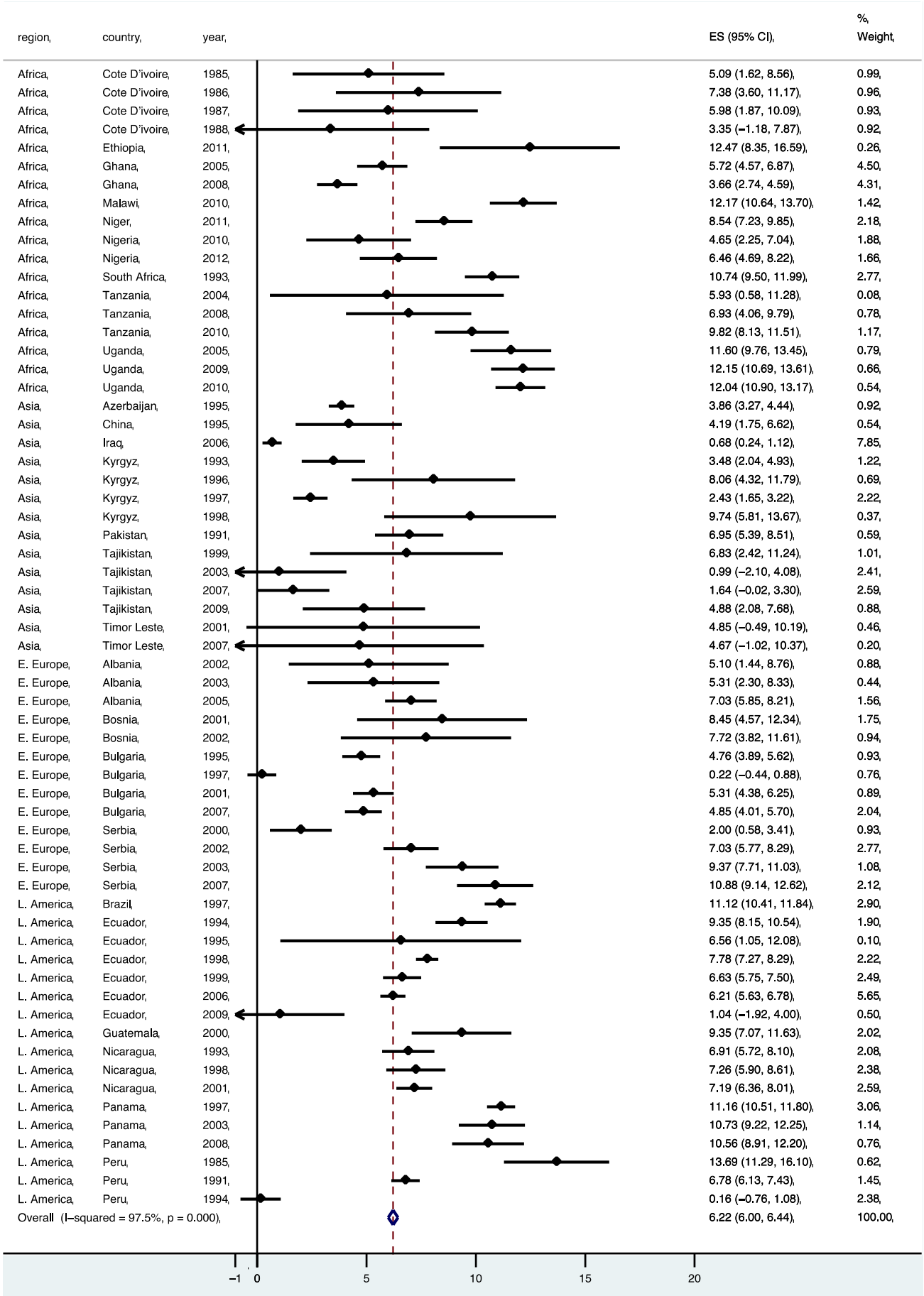
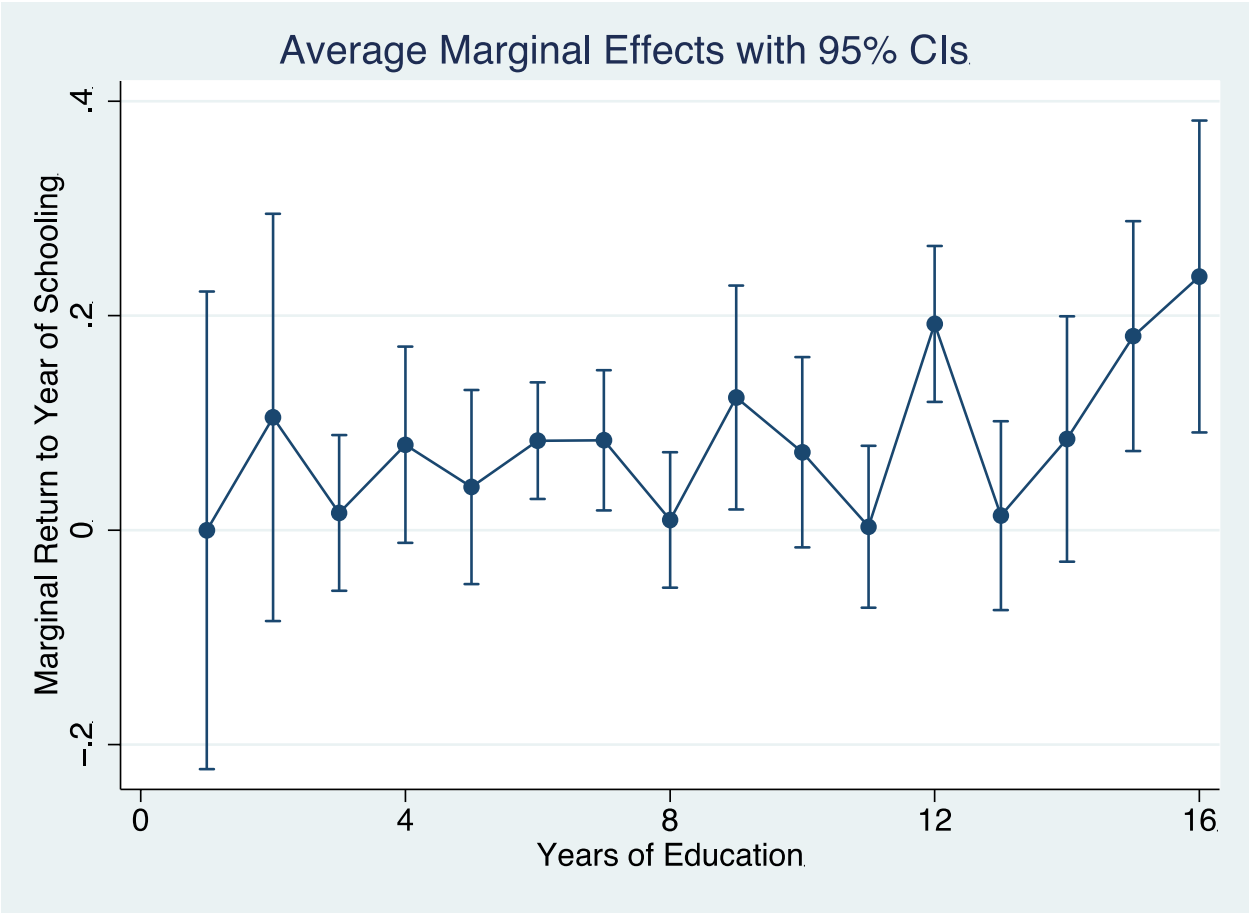



Figure 3 (Marginal Year Increases in Returns to Education)


Average Marginal Effects with 95% CIs
Marginal Return to Year of Schooling
.4
.2
0
−.2
0
4
8
12
16
Years of Education

Appendix: Table 1

**Data Sets in the LSMS Archive by Region and Country**

| | Start Year | End Year | Inclusion | Exclusion and Reason |
|---|---|---|---|---|
| **Africa** | | | | |
| Cote D'ivoire | 1985 | 1988 | 1985, 86, 87, 88 | |
| Ethiopia | 2011 | 2011 | 2011 | |
| Ghana | 1987 | 2008 | 2005, 08 | Not freely distributed (1987, 88, 91, 98) |
| Malawi | 2004 | 2010 | 2010 | Local organization distributing data could not be contacted (2004) |
| Morocco | 1991 | 1991 | None | Not available from local distributing organization (1991) |
| Niger | 2011 | 2011 | 2011 | |
| Nigeria | 2010 | 2012 | 2010, 12 | |
| South Africa | 1993 | 1993 | 1993 | |
| Tanzania | 1991 | 2010 | 2004, 08, 10 | Not nationally representative (1991) |
| Uganda | 2005 | 2010 | 2005, 09, 10 | |
| **Asia** | | | | |
| Azerbaijan | 1995 | 1995 | 1995 | |
| China | 1995 | 1995 | None | Not nationally representative (1995) |
| India | 1997 | 1997 | None | Not nationally representative (1997) |
| Iraq | 2006 | 2006 | 2006 | |
| Kazakhstan | 1996 | 1996 | None | Local organization distributing data could not be contacted (1996) |
| Kyrgyz | 1993 | 1998 | 1993, 96, 97, 98 | |
| Nepal | 1996 | 2010 | None | Local organization distributing data could not be contacted (1996, 2003, 10) |
| Pakistan | 1991 | 1991 | 1991 | |
| Tajikistan | 1999 | 2009 | 1999, 2003, 07, 09 | |
| Timor Leste | 2001 | 2007 | 2001, 07 | |
| **Eastern Europe** | | | | |
| Albania | 1996 | 2012 | 2002, 03, 05 | Local organization distributing data could not be contacted (1996, 2008, 12) |
| Armenia | 1996 | 1996 | None | Local organization distributing data could not be contacted (1996) |
| Bosnia | 2001 | 2004 | 2001, 02 | Missing income/education data (2003, 04) |
| Bulgaria | 1995 | 2007 | 1995, 97, 2001, 07 | Untranslated (2003) |
| Romania | 1994 | 1994 | None | Local organization distributing data could not be contacted (1994) |
| Serbia | 2000 | 2007 | 2000, 02, 03, 07 | |
| **Latin America** | | | | |
| Brazil | 1997 | 1997 | 1997 | |
| Ecuador | 1994 | 2009 | 1994, 95, 98, 99, 2006, 09 | |
| Guatemala | 2000 | 2000 | 2000 | |
| Guyana | 1992 | 1992 | None | Local organization distributing data could not be contacted (1992) |
| Jamaica | 1988 | 2000 | None | Not freely distributed (1988, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 2000) |
| Nicaragua | 1993 | 2005 | 1993, 98, 2001 | Missing income/education data (2005) |
| Panama | 1997 | 2008 | 1997, 2003, 08 | |
| Peru | 1985 | 1994 | 1985, 91, 94 | Not nationally representative (1990) |