Returns to Schooling around the World

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Abstract – Rates of return to investments in schooling have been estimated since the late 1950s. In the 60-plus year history of such estimates there have been several attempts to synthesize the empirical results in order to ascertain patterns. This paper presents unified estimates of the latest available surveys and patterns using the same specification and estimation procedure and data from 131 economies and 545 harmonized household surveys. This effort to compile comparable estimates addresses issues in the literature, such as: (i) the definition of the dependent variable; (ii) the variables used as controls; (iii) sample definitions; and (iv) the estimation method. The study holds constant the definition of the dependent variable, the set of control variables, the sample definition, and the estimation method for all the surveys in the sample. The results show: (i) private rates of return to schooling across a range of countries are more concentrated around the mean than previously thought; (ii) the basic model used is more stable than one may have expected; and (iii) private returns are higher/lower in the higher/lower schooling levels.

JEL codes: C13, J31

Keywords: Returns to schooling; Investments in education

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I. INTRODUCTION

Education is critical for economic growth and poverty reduction. Education systems produce the global economy’s workers and expand knowledge. Schooling produces the skills that propel individual labor productivity. A host of social and non-market benefits are also produced by schooling, including but not limited to child well-being, health status, efficiency of consumer choices, fertility and social capital. The individual contribution of schooling has often been measured by labor market earnings.

The study of earnings by schooling has led to a number of empirical works testing hypotheses on a great variety of social issues. These include, for example, racial and ethnic discrimination (McNabb and Psacharopoulos (1981); Chiswick (1988)); gender discrimination (Goldin and Polachek (1987)); income distribution (Mincer (1958)); the determinants of the demand for education (Freeman (1976)); and the impact of technology on wage differentials (Krueger (1993)). Under certain assumptions, earnings differentials by level of education have been used to identify the sources of economic growth (for example, Denison (1976)). But perhaps the quintessential application that has used earnings is the estimation of the rate of return to investment in schooling. Earnings of workers classified by some dimension have been at the core of empirical economics and other social sciences for many decades, starting with the human capital revolution in economic thought (Schultz (1961); Becker (1964)); Mincer (1974).

For 40 years, George Psacharopoulos alone or with colleagues (Psacharopoulos (1972), Psacharopoulos (1973), Psacharopoulos (1985), Psacharopoulos (1989), Psacharopoulos (1994), Psacharopoulos and Patrinos (2004), Psacharopoulos and Patrinos (2012)) has reported on the patterns of estimated returns to schooling across developing economies (see also Banerjee and Duflo (2005)). The returns are typically in the form of the estimated proportional increase in an individual’s labor market earnings from an additional year of schooling completed. Among the consistent findings across the various surveys are:

1. Private returns to schooling are generally positive and the cross-economy average is 10 percent per year of schooling

2. Returns seem to be higher in low or middle income economies than in industrialized economies

3. Returns are highest at the primary schooling level and become smaller (although still large) at the secondary and tertiary levels of schooling

4. Estimated returns to schooling are higher for women than for men

5. Returns to schooling have declined very modestly over time despite rising average levels of schooling attainment, suggesting that the world demand for skills has been increasing as world skill supply has also increased
As discussed by Psacharopoulos and Patrinos (2004), these conclusions are based on compilations of studies that may not be strictly comparable. There are two main sources of non-comparability: data sample coverage and methodology. One problem is that survey samples may not accurately reflect population means. For cost or convenience, surveys may concentrate on subpopulations that are easier or less expensive to reach, focusing on firms rather than households or on urban populations while excluding rural residents. Second, studies rarely use the same model to estimate returns. Variation in control variables used can affect estimated returns, as can variation in the estimation strategy used. Both of these problems leave open the possibility that the observed variation in estimated returns is due to these differences in sample design or estimation method and not to the true variation in returns.

Another methodological limitation, despite Becker’s warning (Becker (1964)), is that many researchers feel obliged to include in the regression model many independent variables. In effect, this procedure reduces part of the effect of education on earnings. Of course, researchers who include other variables, such as occupation dummies, in earnings functions do so because they are interested in modeling earnings, not necessarily in estimating the rate of return to schooling. Obviously, such practices create a problem when others interpret the schooling coefficient as a rate of return.

This paper presents new and comparable estimates of the private returns to schooling using harmonized household surveys from 131 economies and a total of 545 harmonized household surveys. The sample includes several countries for which there is more than one survey available. Private rates of return are used to explain the behavior of individuals in seeking different levels and types of schooling. Estimates of the returns to schooling are a useful indicator of the productivity of education and incentive for individuals to invest in their own human capital. This evidence can be used to guide public policy in the design of programs and crafting of incentives that both promote investment and ensure that low-income families make those investments.

The paper sets out to describe the patterns and trends using the same specification and estimation procedure, by making use of the International Income Distribution Database (I2D2), compiled by the World Bank’s World Development Report Unit over the period 2005-2012. The surveys have been harmonized to the extent possible to ensure that conceptual variables are measured in the same way. While not all are random samples of the economies’ populations, all samples can be made representative of the economies’ population using sample weights. The use of comparable data and methods should allay the concerns that the cross-economy pattern of returns to schooling may be driven by spurious factors. This effort to compile comparable estimates addresses the issues in the literature, such as (i) the definition of the dependent variable; (ii) specification; (iii) the variables used as controls; (iv) sample definitions; and (v) estimation method. The estimates provided here are for wage workers, which means that in many countries, for the majority of workers, we cannot estimate returns to schooling. One limitation of our approach is that it does not address the issue of the endogeneity of schooling. Recent work, however, shows that the traditional estimates presented here are very close to the
estimates provided in studies that attempt to control for endogeneity (see, for example, Card 1995; Duflo 2001; Patrinos and Sakellariou 2012).

The present study holds constant the definition of the dependent variable, the set of control variables, the sample definition, and the estimation method for all the surveys in the sample. The results show: (i) returns to schooling are more concentrated around the mean than previously thought; (ii) the basic model used is more stable than one may have expected; and (iii) the returns are higher/lower in the higher/lower schooling levels.

II. METHODS

The private rate of return compares the costs and benefits of schooling as incurred and realized by the individual student who undertakes the investment. Mincer (1974) has provided a great service and convenience in estimating returns to schooling by means of the semi-log earnings function (see also Becker and Chiswick (1966)). The now standard method to estimate private returns per year of schooling is to estimate log earnings equations of the form:

$$\Ln(w_i) = \alpha + \beta_1S_i + \beta_2X_i + \beta_3X_i^2 + \mu_i$$

Where $\Ln(w_i)$ is the natural log (of hourly or annual, depending on data) earnings for the $i_{th}$ individual; $S_i$ is years of schooling (as a continuous variable); $X_i$ is labor market potential experience (estimated as $age_i - S_i - 6$); $X_i^2$ is potential experience-squared; and $\mu_i$ is a random disturbance term reflecting unobserved abilities. Therefore, $\beta_1$ can be viewed as the average private rate of return to years of schooling to wage employment.

The earnings function method can be used to estimate returns at different schooling levels by converting the continuous years of schooling variable ($S$) into a series of dummy variables, say $D_p$, $D_s$ and $D_t$ (where $p$ is primary schooling, $s$ is secondary schooling and $t$ is tertiary) to denote the fact that a person has achieved that level of schooling. The omitted level is people with no schooling and that dummy is not in the equation to avoid matrix singularity. The estimation equation in this case is of the form:

$$\Ln(w_i) = \alpha + \beta_pD_p + \beta_sD_s + \beta_tD_t + \beta_1X_i + \beta_2X_i^2 + \mu_i$$

After fitting this “extended earnings function” (using the above dummies instead of years of schooling in the earnings function), the private rate of return to different levels of schooling can be derived from the following formulas:

$$r_p = (\beta_p)/(S_p)$$

$$r_s = (\beta_s - \beta_p)/(S_s - S_p)$$

$$r_t = (\beta_t - \beta_s)/(S_t - S_s)$$
where \( S_p, S_s \) and \( S_t \) stand for the total number of years of schooling for each successive level. In the empirical analysis that follows we have assigned only three years of foregone earnings to this group, following tradition (Psacharopoulos 1995).

III. DATA

We report our results based on the study of a large database constructed from existing national household surveys. The data was prepared for the World Bank’s World Development Report Unit over the period 2005-2011 and has been used in almost every World Development Report during this period and also in several Human Development Reports (see, for example, UNDP 2011; see also Montenegro and Hirn 2009). It covers economies from developed and developing regions. There is no censoring of any kind in the sample selection. If the survey was available and has all the needed variables, then it was included. For most of the economies it covers at least one point in time and in many cases several points in time. An enormous effort was undertaken in standardizing the variable definitions across economies and time periods. The original data set includes 750 economies/years points that represent 158 economies. Not all of the economy/year points available in the database are included in our analysis because some surveys lack the necessary key variables. The basic specification (the one that requires the minimum set of variables, and hence the one that has the most estimates) was calculated for 545 economy/years points, and covers 131 economies. The period under study is 1970 to 2011. However, only 4 percent of observations are from before 1990, and only 27 percent before 2000.

Looking at the distribution of the sample by region, it is immediately obvious that Latin America and the Caribbean region is the most represented in the sample, at 46 percent, or 249 data points, of all estimates. This is exclusively because of data availability. High Income Economies follow at 17 percent, then Sub-Saharan Africa at 11 percent, with Easter and Central Europe at 9 percent, East Asia and the Pacific at 8 percent, and finally Middle East and North Africa and South Asia at 4 percent each.

The sample definition used in this study includes only waged employees. The same variables and sample definitions are used for all surveys, which gives us comparable economy/year results. As in many other such studies, school attainment is defined here by the highest grade attended and completed; experience is defined as potential years of experience, where this is defined as age minus years of schooling minus six (as the typical school starting age). Both variables are measured in years.

IV. RESULTS

Overall, the average rate of return to another year of schooling is 10.4 percent, based on 545 observations from 131 economies between 1970 and 2011. In terms of latest year available, the average rate of return is 9.9 percent. This is similar to many other reviews of the literature. The fact that it was obtained after estimating the returns in a comparable fashion shows just how stable this estimate is. The rate of return is also well-behaved and
has a normal distribution, as shown in Figure 1a for the 545 estimates and in Figure 1b for the latest year available for each one of the 131 estimates included in the sample.¹

**Figure 1a: Returns to Schooling (total sample)**

![Graph of Returns to Schooling (total sample)](image)

**Figure 1b: Returns to Schooling (latest period for each country)**

![Graph of Returns to Schooling (latest period for each country)](image)

The returns to schooling by world region are highest in Sub-Saharan Africa, significantly above the global average (Table 1). Returns are lowest in the Middle East/North Africa region by a considerable margin. Healthy returns are also experienced in East Asia and Latin America. Below average returns are found in the relatively “schooled” Eastern European economies and the much less schooled economies of South Asia.

¹ We present the distribution of the latest year available for each country in order to avoid overrepresentation of those countries/regions with several data points.
### Table 1: Returns to schooling by region
(latest available year between 2000-2011)

<table>
<thead>
<tr>
<th>Region</th>
<th>Returns to Schooling (%)</th>
<th>Years of Schooling</th>
<th>GDP/pc (PPP 2005)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle East and North Africa</td>
<td>5.6</td>
<td>9.6</td>
<td>4,813</td>
<td>9</td>
</tr>
<tr>
<td>South Asia</td>
<td>7.0</td>
<td>6.5</td>
<td>2,661</td>
<td>7</td>
</tr>
<tr>
<td>Eastern and Central Europe</td>
<td>8.2</td>
<td>12.8</td>
<td>8,704</td>
<td>16</td>
</tr>
<tr>
<td>High Income Economies</td>
<td>10.0</td>
<td>12.7</td>
<td>29,538</td>
<td>25</td>
</tr>
<tr>
<td>East Asia and Pacific</td>
<td>10.3</td>
<td>10.5</td>
<td>4,996</td>
<td>13</td>
</tr>
<tr>
<td>Latin America and Caribbean</td>
<td>10.3</td>
<td>9.8</td>
<td>8,098</td>
<td>20</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>12.8</td>
<td>8.8</td>
<td>2,684</td>
<td>28</td>
</tr>
</tbody>
</table>

The returns to schooling by national income grouping overall are healthy, with lower than average returns for lower middle income countries (Table 2). There are particularly high returns for low income and upper middle income countries.

### Table 2: Returns to schooling by income group
(latest available year between 2000-2011)

<table>
<thead>
<tr>
<th>Income group</th>
<th>Returns to Schooling (%)</th>
<th>Years of Schooling</th>
<th>GDP/pc (PPP 2005)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>10.0</td>
<td>10.4</td>
<td>10,540</td>
<td>118</td>
</tr>
<tr>
<td>Low income</td>
<td>10.5</td>
<td>8.0</td>
<td>971</td>
<td>23</td>
</tr>
<tr>
<td>Lower middle income</td>
<td>8.9</td>
<td>9.6</td>
<td>3,166</td>
<td>34</td>
</tr>
<tr>
<td>Upper middle income</td>
<td>10.7</td>
<td>11.3</td>
<td>10,332</td>
<td>36</td>
</tr>
<tr>
<td>High income</td>
<td>10.0</td>
<td>12.7</td>
<td>29,538</td>
<td>25</td>
</tr>
</tbody>
</table>

By level of schooling, the returns are highest at the tertiary level, on average at 16.8 percent, followed by primary at 10.3 percent and secondary at 6.9 percent (Table 3). Returns to schooling are highest for all levels in Sub-Saharan Africa, reflecting the scarcity of human capital in this region. High returns to tertiary show that high skills are also in scarce supply, presenting considerable challenges for many countries in the region. Low returns throughout in the Middle East/North Africa are puzzling, yet relatively high returns to primary schooling signal this as a priority. There are very high returns to tertiary schooling in South Asia. In East Asia and the Pacific there are high returns at the primary and tertiary levels.
Table 3: Returns to schooling by educational level and region  
(latest available year between 2000-2011)

<table>
<thead>
<tr>
<th>Region</th>
<th>Primary</th>
<th>Secondary</th>
<th>Tertiary</th>
<th>GDP/pc (PPP 2005)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>10.3</td>
<td>6.9</td>
<td>16.8</td>
<td>6,719</td>
<td>74</td>
</tr>
<tr>
<td>Middle East and North Africa</td>
<td>9.4</td>
<td>3.5</td>
<td>8.9</td>
<td>3,645</td>
<td>7</td>
</tr>
<tr>
<td>South Asia</td>
<td>9.6</td>
<td>6.3</td>
<td>18.4</td>
<td>2,626</td>
<td>4</td>
</tr>
<tr>
<td>Eastern and Central Europe</td>
<td>8.3</td>
<td>4.0</td>
<td>10.1</td>
<td>6,630</td>
<td>7</td>
</tr>
<tr>
<td>High Income Economies</td>
<td>4.8</td>
<td>5.3</td>
<td>11.0</td>
<td>31,748</td>
<td>6</td>
</tr>
<tr>
<td>East Asia and Pacific</td>
<td>11.0</td>
<td>6.3</td>
<td>15.4</td>
<td>5,980</td>
<td>6</td>
</tr>
<tr>
<td>Latin America and Caribbean</td>
<td>9.3</td>
<td>6.6</td>
<td>17.6</td>
<td>7,269</td>
<td>20</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>13.4</td>
<td>10.8</td>
<td>21.9</td>
<td>2,531</td>
<td>24</td>
</tr>
</tbody>
</table>

By country income group, the returns to primary schooling are highest in low income countries (Figure 2). In fact, returns are highest at each level in low income countries, reflecting the relative scarcity of human capital. Globally, except for high income economies, the returns are healthy at the primary and tertiary levels. The returns to secondary schooling are uniformly low at the secondary level.

Figure 2: Returns by schooling level and income group  
(latest available year between 2000-2011)
Higher point estimates of the returns to schooling are associated with lower levels of schooling in a country. This suggests that schooling increases respond to price signals. In other words, it could be that as demand goes up and the supply follows, the price tends to fall (see Figure 3).

**Figure 3: Returns to schooling and mean years of schooling**

Examining the trends by region, one can see that Africa has a low level of schooling and high returns (Figure 4). Yet, schooling levels are even lower in South Asia, but returns are low. Returns are very low in the Middle East/North Africa region, but schooling levels are relatively high.
In summary, this section shows that the returns to schooling continue to be healthy, at about 10 percent a year globally. By level of schooling, the returns to schooling are highest at the tertiary level, showing that the demand for higher levels of skills is increasing and that the demand for skills is global. At the same time the returns to schooling are high at the primary level, signaling continued need for basic skills. Overall the returns to schooling are low at the secondary school level as a result of the increased demand for skills, prompting the best secondary school students to continue their education at the tertiary level. The returns to schooling are relatively higher in poorer economies overall. They are uniformly high for primary schooling in low income economies. But they are also high for tertiary in low income economies. In general, the returns to schooling are low for secondary school graduates.

Trends

Over time, the returns to schooling tend to decrease, as shown in Figure 5. Our new estimates, in black, show a sharp decline in returns during the past few decades. We combine our data set with Psacharopoulos and Patrinos (2004) to reach further back. This confirms the declining trend in returns to schooling.
There has been a tremendous increase in educational attainment in recent decades. In 2010, the world population aged 15 and above is estimated to have an average of 8 years of schooling, having increasing steadily from 5.3 years in 1980 (Barro and Lee (2010)). The returns to schooling have declined significantly since the 1980s, when they were above 14 percent, to 10 percent in recent years (Table 4). This could be due at least partly to the unprecedented expansion in schooling since the 1980s and especially since the late 1990s. Schooling has expanded by almost 50 percent since 1980, and the returns have declined by one-third. Over a 30 year period the returns to schooling have declined by 4.5 percentage points, or 1 percent a year. At the same time, schooling increased by more than 3 years, or 2 percent a year. On average, another year of schooling seems to coincide with a reduction of the returns to schooling by one percentage point.

Table 4: Relation between change and years of schooling expansion

<table>
<thead>
<tr>
<th>Period</th>
<th>Returns to Schooling</th>
<th>Average Years of Schooling</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980-1985</td>
<td>14.4</td>
<td>7.3</td>
<td>9</td>
</tr>
<tr>
<td>1986-1990</td>
<td>12.8</td>
<td>7.9</td>
<td>21</td>
</tr>
<tr>
<td>1991-1995</td>
<td>10.6</td>
<td>8.2</td>
<td>47</td>
</tr>
<tr>
<td>1996-2000</td>
<td>10.7</td>
<td>8.8</td>
<td>98</td>
</tr>
<tr>
<td>2001-2005</td>
<td>10.3</td>
<td>10.2</td>
<td>192</td>
</tr>
<tr>
<td>2006-2010</td>
<td>9.9</td>
<td>10.7</td>
<td>177</td>
</tr>
</tbody>
</table>
V. EXTENSIONS

The World Development Report 2013 stresses the transformational role of jobs. It also emphasizes that different types of countries have different needs. To support the analysis of the WDR we extend our analysis by including estimates of the returns to schooling by country type. We then add control variables to the basic equation. This information is available for 138 surveys. Four additional variables are included: firm size, urban-rural location, occupation, gender and industry. In this case, we estimated our basic specification (that includes schooling and years of potential experience), and we added four dummies. We follow with a brief example of how the estimates of returns to schooling can be used at the individual country level.

Country Type

We present estimates of the returns to schooling in several different types of countries (Table 5). These include agrarian economies—where most people are still engaged in agriculture, often in very small family farms, and cities are not yet a source of economic dynamism; conflict-affected countries—undergoing or emerging from conflict, where peace-keeping forces may still be needed or where deaths from conflict may still be high; resource-rich countries—minerals account for a large share of exports, exploitation of resources brings dramatic economic growth but undermines competitiveness and encourages jobs based on transfers; small island nations; urbanizing countries—where the share of the urban population is growing rapidly; countries with large youth populations; formalizing countries—where the coverage of social protection systems is large enough to envision extending it to the entire workforce; and aging societies—where the share of the working-age population is declining and the costs of providing and caring for the growing number of elderly is increasing, putting a double burden on living standards.

In agrarian economies, such as Kenya, Myanmar and Senegal, for example, the returns to schooling are high at all levels, probably as these are low income economies with a scarcity of human capital. In conflict-affected states, such as Afghanistan, Liberia and Sri Lanka, the premium to investing in primary schooling is high. In resource-rich economies, such as Botswana, Papua New Guinea and Peru, returns to schooling are high at all levels, suggesting that human capital skills are a complement to resources. Small-island states, such as Fiji, Tonga and Tuvalu, the returns are relatively higher at the primary level, emphasizing need for basic skills in such states. In urbanizing economies, such as Bangladesh, China and Morocco, premiums are high at all levels; in youth bulge economies, such as Egypt, South Africa and Tunisia, the returns to schooling are relatively lower; in formalizing economies, such as Brazil, Mexico and Turkey, the returns to schooling are relatively lower; and in aging economies, such as Argentina and Bulgaria, the returns are relatively lower.
Table 5: Returns to schooling by country type (latest available year between 2000-2011)

<table>
<thead>
<tr>
<th>Economy type</th>
<th>Total</th>
<th>Primary</th>
<th>Secondary</th>
<th>Tertiary</th>
<th>GDP/pc</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aging</td>
<td>8.5</td>
<td>6.3</td>
<td>5.2</td>
<td>12.6</td>
<td>8,485</td>
<td>8</td>
</tr>
<tr>
<td>Formalizing</td>
<td>9.2</td>
<td>8.2</td>
<td>5.5</td>
<td>14.0</td>
<td>8,043</td>
<td>23</td>
</tr>
<tr>
<td>Urbanizing</td>
<td>11.5</td>
<td>10.6</td>
<td>8.1</td>
<td>20.1</td>
<td>5,078</td>
<td>29</td>
</tr>
<tr>
<td>Agrarian</td>
<td>13.8</td>
<td>13.7</td>
<td>10.3</td>
<td>22.1</td>
<td>1,577</td>
<td>16</td>
</tr>
<tr>
<td>Resource rich</td>
<td>11.0</td>
<td>12.2</td>
<td>7.8</td>
<td>19.0</td>
<td>5,146</td>
<td>12</td>
</tr>
<tr>
<td>Conflict-affected</td>
<td>9.3</td>
<td>14.6</td>
<td>6.7</td>
<td>14.8</td>
<td>1,734</td>
<td>7</td>
</tr>
<tr>
<td>Youth bulge</td>
<td>9.3</td>
<td>8.3</td>
<td>5.1</td>
<td>14.7</td>
<td>6,112</td>
<td>14</td>
</tr>
<tr>
<td>Small island</td>
<td>9.4</td>
<td>10.4</td>
<td>5.0</td>
<td>12.7</td>
<td>5,645</td>
<td>6</td>
</tr>
<tr>
<td>Rich economy</td>
<td>8.9</td>
<td>4.3</td>
<td>4.4</td>
<td>10.9</td>
<td>31,258</td>
<td>5</td>
</tr>
</tbody>
</table>

Notes: Agrarian: a rural share of population of 60% or above in 2010 (WDI); Conflict-affected: (i) countries in Uppsala Conflict Data Program database with at least 1,000 battle deaths in an internal or internationalized internal conflict in 2010 or (ii) with UN peace keeping and peace building missions (2012 World Bank fragility list); Resource: with mineral exports accounting for at least 20% of total exports over 2005-10 (World Integrated Trade Solution); Small island: population less than 2 million (UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States and WDI); Urbanizing: with 65% or less of population living in urbanized areas in 2000, and with an increase of 4.5 percentage points by 2010 (WDI); Youth bulge: index score of 0.90 or above, based on total youth employment (2010) times youth unemployment rate (mean, 2001-10) divided by total population (WDI 2010); Formalizing: First Active Coverage (total number of contributors/Labor Force) ratio 25-75% (World Bank Pension Database 2012); Aging: old age (65 years and over) dependency ratio greater than 8 (WDI 2010); Rich economy: those that are classified as High Income Economies by the World Bank; country typologies are not mutually exclusive hence a country could be counted more than once.

Firm Size

For each one of these surveys two dummy variables were created. The first one indicating if the firm is small (defined as having between 10 to 50 workers). The other if the firm size is large (50 or more). The default is microenterprises (that is, firms with less than 10 employees). After adding the dummy variables to the data set, we estimated 138 Mincerian equations where we control for the variables in our basic specification and we added the two dummies that control for firm size. The firm size variable is only available for 138 of the 545 surveys that are available for the estimation of the Mincerian equation. We then extract the dummies’ coefficients and we analyzed their distribution. The results are clear: firm size matters; that is, for identical schooling and experience, workers in bigger firms tend to earn more than workers in small firms (Figure 6).

In this specification the estimated equation is:

\[
\ln(w_i) = \alpha + \beta_{\text{small}}D_{\text{small}} + \beta_{\text{large}}D_{\text{large}} + \beta_1 X_i + \beta_2 X_i^2 + \mu_i
\]
Other control variables

We also estimate a regression where we control for the basic Mincerian equation variables and simultaneously include the following variables:

- Urban/rural where the dummy variable is 1 if the sector is urban, and zero otherwise
- Occupation where the dummy variable is 1 if the occupation is elementary occupation, and zero otherwise
- Gender, where the dummy variable is one if the gender of the person is female, and zero otherwise
- Agriculture, where the dummy variable is one if the person is employed in the agricultural sector, and zero otherwise

The specification is as follows:

\[
\ln(w_i) = \alpha + \beta_{urban}D_{urban_i} + \beta_{occupation}D_{occupation_i} + \beta_{gender}D_{gender_i} + \beta_{agriculture}D_{agriculture_i} + \beta_1S_i + \beta_2X_i + \beta_3X_i^2 + \mu_i
\]

These dummy coefficients are plotted separately against GDP per capita and here we used the latest available year estimate for each country.

The estimated coefficients of the dummy variables are plotted against the log of GDP per capita in PPP constant dollars of 2005. The results show that in relatively low income
countries, the negative impact of living in a rural area decrease significantly as countries grow richer (Figure 7).

**Figure 7: Rural-Urban Gap**

If a person works in an elementary occupation – defined as a job where the knowledge and experience necessary to perform it is mostly simple and routine, involving the use of hand-held tools and in some cases considerable physical effort, and, with few exceptions, only limited personal initiative or judgment. The main tasks consist of selling goods in streets, door keeping and property watching, as well as cleaning, washing, pressing and working as laborers in the fields of mining, agriculture and fishing, construction and manufacturing. Most occupations in this major group require skills at the first ISCO (International Standard Classification of Occupations, ISC0-88), skill level. Our results show that working in an elementary occupation entails a large negative effect on worker earnings as an economy grows richer (Figure 8).
Figure 8: Elementary Occupations Gap
Many studies find that the effect of schooling on earnings is greater for females than for males, despite the fact that females tend to earn less, both absolutely and controlling for personal characteristics (Dougherty (2005)). In other words, the returns to schooling tend to be higher for women than for men in most countries. Figure 9 implies that this is true in lower income countries, but that in higher income countries the effect is negative, meaning that being a woman has a negative effect on earnings.

**Figure 9: Gender Gap**
The effect of working in agriculture on earnings is negative at lower national income levels (Figure 10). As a country becomes richer the effect tends to fade.

**Figure 10: Sectoral Gap**

Country-specific patterns

We now turn back to equation (1) and we analyze the trend pattern for some specific countries where we have several points in time. Country level estimates provide rich information. A selection of countries for which we have at least 9 data points over time are presented in Figure 11. Brazil is an interesting case. The returns were stable for much of the 1980s, a time when average schooling levels increased only 11 percent (Barro and Lee (2010)). Yet from 1990 to 2010, schooling levels increased by more than 69 percent, and the returns to schooling declined significantly. Mexico has seen a more volatile movement in the returns to schooling, having increased in the 1990s and declined steadily since 2000. Returns to schooling have fluctuated widely in Thailand as well. Returns to schooling are rising in Mauritius, even though average schooling levels have increased by a full year during the same time. Both Turkey and South Africa display quite stable returns over time, although at very different levels.
The earnings function used here to estimate the returns to schooling includes a measure of labor market experience. Experience in this model is potential labor market experience estimated as age minus years of schooling minus six. With potential experience-squared in the equation, this model allows us to estimate the potential returns to years of experience. On average, across countries, the estimated rate of return to one additional year of work experience in nonagricultural activities is roughly one-half the return to one additional year of education at the beginning of work life.

Comparison with Alternative Estimates

Psacharopoulos and Patrinos (2004) and Psacharopoulos and Patrinos (2012) find that the overall, average rate of return to another year of schooling is 10 percent. Estimates of the returns to schooling by level of national income show that the highest returns are recorded for low-income and middle-income economies. Average returns to schooling are highest in the Latin America and the Caribbean region and for the sub-Saharan Africa region. Returns to schooling for Asia are at about the world average. The returns are
lower in the high-income economies of the OECD. Average returns to schooling are lowest for the non-OECD European, Middle East and North African group of economies.

The only differences that we find are the relatively low returns to schooling for South Asia and the relatively high returns in high-income economies, though these differences may be due to country coverage.

Both data sets show a decline in the rates of return over time. On average, the average returns estimated by Psacharopoulos and Patrinos (2004) are slightly lower. This is most likely due to additional control variables that are being used in the studies that Psacharopoulos and Patrinos (2004) review. Also, Psacharopoulos and Patrinos (2004) cover, in general, a period previous to our estimates.

Comparing these new, consistent estimates with Psacharopoulos and Patrinos (2004), we estimate, in terms of latest year available, for 131 economies, an average rate of return of 9.9 percent (with a standard deviation of 3.6 and a range of 1.5 to 20.7. Psacharopoulos and Patrinos (2004), for 91 economies, estimate a rate of return of 9.4 percent (with a standard deviation of 3.96, and a range of 0.3 to 28.8 percent. Our new estimates contain 40 more economies. Together, the two compilations cover 146 economies (76% of the 193 countries recognized by the United Nations). In terms of world population in 2010, the country estimates reviewed in Psacharopoulos and Patrinos (2004) cover 84 percent of the globe. This new study covers 92 of the world’s population. Combined, the two studies cover more than 95 percent of the global population. In Figure 12 we plot all estimates. It is interesting to see how consistent and stable the estimates are.
VI. CONCLUSION

Our new data set of comparable estimates of the returns to schooling covers 131 countries/economies. We use 545 harmonized household surveys to provide the estimates that cover the period from 1970 to 2011. This compilation of comparable estimates addresses several issues in the literature such as (i) the definition of the dependent variable—which we keep consistent throughout; (ii) the variables used as controls—we use the basic Mincerian specification; (iii) sample definitions—we limit the analysis to the same samples throughout in terms of age, employment status and earnings; and (iv) estimation method—which we apply consistently to every survey. The results show: (i) returns to schooling are more concentrated around the mean than previously thought; (ii) the basic model used is more stable than one may have expected; and (iii) the returns are higher/lower in the higher/lower schooling levels. We also combine our new estimates with the Psacharopoulos and Patrinos (2004) review in order to form a comparison. In doing so, we mostly confirm previous findings and stylized facts—and create a time-trend that goes back to the 1960s, confirming that returns to schooling do decline.

This comparable data set on returns to schooling should be helpful for a variety of empirical work. Our comparable estimates provide a reasonable proxy for the value of human capital for a broad group of countries. This new data set is useful for studying the links across countries between schooling attainment and the returns to schooling. Moreover, it can be used to examine economic growth, competitiveness, inequality, democracy, institutions and political freedom. An early version of the data set was used to test Theodore Schultz’s hypothesis that the returns to human capital are highest in economic environments experiencing unexpected price, productivity, and technology shocks that create “disequilibria” (King, Montenegro, and Orazem (2012)) and to look at the returns to schooling in the context of job creation in the next World Development Report 2013 on Jobs (World Bank (2012)).
References

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