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Integrating less developed countries in comparative estimations of returns to education

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ABSTRACT This study supports the use of methodologies perceived as a straightforward and uncomplicated as a possible solution to the challenge insufficient data availability for the estimation of returns to education. The study provides evidence to suggest that an estimation of returns to education which acknowledges and addresses the issue of incomplete data can be insightful, particularly to the development of policies on cost-effective investments in education in less developed countries. In this study, returns to education in 28 countries are estimated through both the earnings function and short-cut methods. Both methods are based on Mincer's (1974) proposition that the rate of return is nothing else than the relative change in earnings following a given change in schooling, often referenced as the Mincer Model or Mincerian Equation. The conclusions from this study provide evidence to suggest that utilizing the short-cut method as a substitute for the earnings function method when the required data is unavailable is, despite its limitations, entirely acceptable. The study also addresses the issues of data availability on average years of schooling by country; the aggregation of bachelors, masters, and doctoral levels into a tertiary level of education; and negative returns to education.

Keywords: Returns to education, Mincer model, Short-cut method, Earning function method

Introduction

Since the inception of the notion that human capital, in formal education, has a significant correlation with economic growth and development in the 1960s and 1970s (Becker, 1964; Mincer, 1974; Schultz, 1961), a parallel increase in investments in education has been observed. However, a significant correlation between education and development does not justify indiscriminate investments in education with the sole purpose of promoting economic growth. In order for the allocation of resources to be effective, it must be consistent with the demands of individual societies and their economies (Lim, 1996). When the allocation of resources is inefficient, countries are at risk of making inadequate gains from their investments (Judson, 1998). Studies have been conducted attempting to suggest the optimal allocation of resources in education.

These studies have arrived at different, and often conflicting, conclusions concerning the efficient distribution of resources. This is particularly true when studies address investments at different levels of education. For instance, some suggest that, in order to obtain the highest returns, investments should be made in primary education, regardless of the country's level of economic development (Hossain, 1997; Michaelowa, 2000; Psacharopoulos, 2006; Sakellariou, 2003; Schultz, 1993). Others support the notion that returns to investments in education fall as the level of schooling increases (Amaghionyeodiwe & Osinubi, 2007; Carnoy, 1995; Curtin & Nelson, 1999; Gibson & Fatai, 2006; Zhang & Zou, 2007). A third position is that returns to education are non-linear, rising and falling as education increases (Heckman, et al., 2008; Trostel, 2005) and finally, some find the evidence regarding the optimal allocation of resources in education to be inconclusive (Harmon & Walker, 1999; Krueger & Lindahl, 2001; US Department of Labor, 2000).

Parallel with studies focused on individual countries, studies have been conducted by comparing returns to investments in education among different countries. The majority of the literature, when providing international data on returns to education, tend to be compilations of studies conducted through extensive spans of time and utilizing a wide array of methodologies (Psacharopoulos & Patrinos, 2004). These compilations, although substantial in magnitude, lack the essential aspect of comparability. Furthermore, comparable international studies on returns to education are, generally speaking, limited to developed countries for which data are available to conduct them (Trostel, et al., 2002). The majority of these studies do not provide figures for less developed countries. The main reason for a lack of studies on returns to investments in education that address the needs of less developed countries is that these countries fall short in the provision of the essential data necessary for the estimation of these returns. There are numerous methodologies for estimating returns to education (e.g. ordinary least squares, quantile regression, Heckman's two-stage selection model, instrumental variables, the elaborate method, and the Mincerian equation, among others). Nonetheless, the challenge for studies conducted in less developed countries is, again, the lack of readily available data for the application of these methodologies.

It is clear that there are data-rich, econometrically sound methodologies, and consequently, ideal in the estimating of returns to education. On the other end of the spectrum, however, there are methodologies that might be perceived as flawed, since their data demand is low. These seemingly resilient methodologies, when carefully applied, and their results carefully interpreted, although limited, might be a viable solution to the challenge of data availability found when attempting to estimate returns to education in less developed countries.

This study provides evidence to suggest the use of methodologies perceived as straightforward and uncomplicated as a possible solution to the challenge of insufficient data for the estimation of returns to education. Additionally, the study provides evidence to suggest that an estimation of returns to education which acknowledges and addresses the issue of incomplete data can be insightful, particularly to the development of policies on cost-effective investments in education in less developed countries. In this study, returns to investments in education for 28 countries are estimated through both, the earnings function and short-cut methods. Both methods are based on Mincer's

(1974) proposition that the rate of return is nothing else than the relative change in earnings following a given change in schooling, often referenced as the Mincer Model or Mincerian Equation. The conclusions of this study provide evidence to suggest that utilizing the short-cut method as a substitute for the earnings function method when the required data are unavailable is, despite its limitations, entirely acceptable.

Two Methods for the Estimation of Returns to Investments in Education Based on the Mincerian Equation

Traditionally, the most frequently utilized methodologies in the estimation of returns to education based on the Mincerian Equation are the earnings function and short-cut methods. The earnings function method estimates private returns to education by means of a regression of log earnings on years of schooling, years of experience and years of experience squared. The returns to education are estimated based on the regression coefficients on schooling. The short-cut method estimates private returns to education solely as the proportion of earnings and years of schooling. It is important to emphasize that Mincer's proposition has been widely referenced since its inception in the 1970s, and has also been accepted as a standard method in estimating rates of return to investments in education (Asaoka, 2006; Heckman et al., 2003; Patrinos & Psacharopoulos, 2010; Psacharopoulos, 1981).

The Earnings Function Method

The earnings function method for estimating returns to education is essentially a regression of the basic form:

$$\ln Y_i = a + b \cdot S_i + c \cdot EX_i + d \cdot EX_i^2 \qquad (1)$$

where Y represents the wages of individual (i), S is his years of schooling, and EX his years of labor market experience. Experience as a quadratic term captures the nonlinear relationship between earnings and experience, earnings tending to increase in the early years after entering the labor market, flatten, and decrease through time (Gunderson & Oreopoulos, 2010; Harmon et al., 2003).

The b coefficient in equation 1 can be interpreted as the private rate of return to one extra year of schooling (r), provided that other costs are negligible. In other words, the relative change in earnings following a change in schooling is the rate of return only when forgone earnings are the only cost of education:

$$b = \frac{\partial \ln Y}{\partial S} = \left[\frac{Y_z - Y_x}{Y_x}\right]\frac{1}{\Delta S} = \frac{Y_z - Y_x}{Y_x \cdot \Delta S} = r \qquad (2)$$

where $\partial \ln Y$ is the relative change in earnings, and ∂S is a given change in schooling, and Y_z and Y_x the earnings of individuals with *z* and *x* years of schooling, *z* being the individual's highest year of education, and *x* its immediate lower year. It is important to establish that *r* can be considered as both, the private financial return to schooling (assuming no tuition or other costs), and the proportionate effect on wages of an increment to *S*, which can, in turn, be compared to other investments (Gunderson & Oreopoulos, 2010; Harmon et al., 2003; Mincer, 1974; Psacharopoulos, 1981).

An important limitation of this approach is the assumption that rates of return are the same for all levels of schooling, thus, making it difficult to resolve the predicament of allocation of resources to different educational levels. In other words, when estimating returns to an additional year of education, this approach to estimating returns to education assumes the returns to be the same, regardless of the educational level. Nevertheless, an additional year of a higher level of education has the potential of yielding higher returns than an additional year of education in a lower level of schooling. Also, returns to the year previous to a completed level of education have been observed to be lower than the returns of the year in which a level is completed, also known as the sheepskin effect (Heckman, Lochner, & Todd, 2006; US Department of Labor, 2000).

In view of these shortcomings, it is possible to incorporate an *educational level* component to the rate of return concept. This can be accomplished by incorporating educational levels through a series of dummy variables (i.e. PRIM, SEC and TERT) to the earnings function model (Psacharopoulos, 1981)[1]. $r = b + 2eS$ The resulting regression function is as follows:

$$\ln Y = a + b \cdot PRIM + c \cdot SEC + d \cdot TERT + e \cdot EX + f \cdot EX^2 \tag{3}$$

from which returns by educational level can be estimated[2] .

The Short-Cut Method

In essence, the short-cut method is a simplified version of the earnings function method, and estimates private returns to education under the assumption that earnings are strictly proportional to the number of years spent in school. Social returns to education are estimated by incorporating costs of education to the denominator of the equation (Mincer, 1974). Private returns to education are estimated, according to the short-cut method, as mathematical approximations to the *b* coefficient in the earnings function regression (see equation 2):

$$_{private}\, r_k = \frac{\overline{Y}_k - \overline{Y}_{(k-\Delta s)}}{S_k \cdot \overline{Y}_{(k-\Delta s)}} \tag{4}$$

Where ${}_{private}r_k$ is the private rate of return to investment in k level of education, $\overline{Y}_k$ is the mean earnings of individuals with a completed k level of education, Δ_s is the difference in years of schooling between k and the immediate lower level of education, and S_k is the number of years in the subscripted educational level.

Social returns to investments in education are estimated through the following equation:

$$ {}_{social}r_k = \frac{\overline{Y}_k - \overline{Y}_{(k-\Delta s)}}{S_k \cdot (\overline{Y}_{(k-\Delta s)} + C_k)} \tag{5} $$

where C_k is the public expenditure per pupil in k level of education.

In order to improve the estimates of returns to the primary level of education, a [preparatory or] *pre-primary* level of education may be introduced. The years of education and income of individuals with less than a completed primary level of education can be compared against that of individuals with a completed primary level of education. This additional educational level would allow for greater accuracy in the estimation of returns to primary education.

Limitations of Estimating Returns to Education through the Mincerian Equation

The Mincerian Equation, as a mean to estimate returns to education, is certainly not flawless. This method's inadequacies are clear and well documented. Among the most commonly observed are that:

It assumes, infinite and equidistant age-earnings profiles for every level of education

The earnings function method approximates age-earnings profiles as curves which remain constantly equidistant between educational levels (See Figure 1). The model assumes that once a certain educational level has been achieved, wages will remain constant, in relation to the immediately lower level (Psacharopoulos, 1995).

Individuals with fewer years of education than the average person will be assigned higher rates of return than the estimated average return

When estimating returns to an additional year of schooling, the Mincerian Equation ignores the notion that individuals with lower levels of education will be assigned higher returns than individuals with the average years of schooling in the sample. This is due to the fact that their income is most likely lower, and thus, their actual return to an extra year of schooling also lower than that of a more highly educated individual. The opposite is true for those individuals with the highest levels of education in the sample. As a result of their likely higher income levels, these individuals will be assigned lower returns per year of schooling than the individuals with the -lower- average level of education.

When incorporating an educational level component to the Mincerian Equation, the model considers given number of years of schooling to represent educational levels (i.e., primary = 6, secondary = 12, tertiary = 16). In this case, individuals with the minimum required years for a given level (i.e., 12 for secondary education) will be assigned the same return than those individuals with more schooling than the required by the particular level (e.g., 14), but who have not completed the subsequent educational level (tertiary = 16) (Heckman, et al., 2006; US Department of Labor, 2000).

It assumes that individuals forgo earnings at all points during their education

The assumption that individuals forgo earnings at all points during their education is impacted by the average level of education of the particular economy for which returns are estimated. For instance, the forgone earnings of young children in economies with high levels of educational attainment are small and, consequently, the calculated rate of return is not likely to be much higher than it should be. In constrast, in economies with low educational attainment, young children's foregone earnings are likely to be high, underestimating the true rate of return (US Department of Labor, 2000). This fact may be observed as children in economies with high levels of educational attainment are not likely to enter the workforce, and consequently, not likely to forgo earnings during the initial years of their education. On the other hand, and contrary to children in developed nations, children in economies with lower educational attainment levels are more likely to enter the workforce at an earlier age, and thus, forgo earnings as a part of their investment in education. The forgone earnings of individuals during their education are correlated to the particular country's level of educational attainment. Overall, returns to education tend to be lower when educational attainment is high, prevalent in developed nations. The returns tend to be higher when educational attainment is low, particularly at the lower end of the wage distribution, most frequently observed in less developed countries (Moffitt, 2007; Patrinos & Psacharopoulos, 2010).

It assumes that the only cost of schooling is the foregone earnings of the individual

The assumption that the only cost of schooling is the forgone earnings of the individual results from the fact that cost data cannot be readily incorporated into the earnings function method. Consequently, the method overestimates the individual returns to schooling. Furthermore, by not allowing the incorporation of educational costs, the earning function method impedes the estimation of social returns to investments in education (Harmon, et al., 2003; Heckman, et al., 2006, 2008; Psacharopoulos, 1981; US Department of Labor, 2000). Paradoxically, the short-cut method, despite its simplicity in defining returns to education as a rate of wages and schooling, easily accommodates for the integration of educational costs into the estimation of these returns.

It ignores important variables influencing the decision to pursue additional education.

Mincer coefficients ignore psychic costs of education, uncertainty, the value of schooling and sequential revelation of information, and the option value of schooling (Heckman, et al., 2006). As uncertainty is ignored by the Mincerian equation model, the rates of return estimated through the method are upward biased, making it necessary to adjust for this unaccounted variable in the model. The value of schooling and sequential revelation refers to the notion that decisions are made sequentially as information is made available with every extra year of education, allowing for a sequential resolution of uncertainty. This is also a return to increased levels of education not taken into account by the Mincerian model. Finally, the option value of schooling observes how the completion of a particular level of education generates the option of pursuing the following educational level. It is suggested that part of the return to completing a particular level of education -not contemplated by the Micerian equation- is the option of initiating, and completing, the following educational level (Heckman, et al., 2003).

The coefficient of schooling in a regression of log earnings on years of schooling is often erroneously called a rate of return

The coefficient on schooling alone in a regression of log earnings on years of schooling is the proportional change in earnings resulting from a change in one year (or level) of schooling and not a rate of return (Heckman, et al., 2006). The coefficient on schooling in the Mincerian model can be considered a rate of return exclusively when forgone earnings are the only cost of education. It is clear that the coefficient of schooling alone does not represent the rate of return. In order to address this issue, and integrate an opportunity cost to the estimation of the returns (i.e. forgone earnings), the rate of return must be estimated considering the coefficient of the immediate lower level of education and the difference in years of schooling between the observed level and its immediately lower level. See equation 3, from which returns to education can be estimated in relation to coefficients of schooling. The issues limiting the proper estimation of returns to education have yet to be sorted out, measured and explained by the current literature on returns to education. These issues will only be resolved with the availability of richer data (Heckman, et al., 2008).

Other Considerations in Estimating Returns to Education

Endogeneity of educational attainment

Estimates on returns to education seldom account for individual predispositions that make schooling choices vary across the general population. Some of these predispositions may be attributed to individual ability, access to wealth, and parents' education. These elements may bias the returns to education upwards when individuals possess high ability, wealth, and educated parents. The opposite may be observed when ability and wealth are minimal and parents hold low levels of education. Individual ability, wealth, and family background have been observed to have a significant effect on educational attainment (Barro & Lee, 2001; Heckman, et al., 2008). This is of particular concern in less developed countries, where access to education is often limited, the result of a lack of the necessary infrastructure and financial framework for its provision. In this context, individuals with higher predispositions towards education are most likely to gain from its benefits, making observations on returns to higher levels of education biased in their findings.

Attempts to approach the problem of endogeneity of educational attainment have been made by controlling for ability, with the purpose of observing the effects of education on wages. Some of these studies involve measuring wage differentials in twins or siblings with dissimilar levels of education. Clearly, the main assumption is that twins or siblings raised in similar conditions have the same ability, and consequently, their wages are determined by their level of education alone (Card, 2001; Harmon, et al., 2001; Harmon, et al., 2003; Katz & Autor, 1999; US Department of Labor, 2000).

Exogenous factors impacting educational attainment

Exogenous variables influencing estimates on returns to education have also been accounted for in the current literature. Among these, quality of education, compulsory education laws, distance to school, density of students per school, improved health of children, and improved civic participation have been observed. Studies have been conducted with the purpose of controlling for these exogenous factors influencing returns to education (Card, 1995; Currie & Moretti, 2003; Dee, 2004; Duflo, 2001; Hanushek & Zhang, 2009; Lee & Barro, 2001; Leigh & Ryan, 2008; Salas, 2004). When estimating returns to education at the international level, it is important to consider the differences in conditions prevalent in countries at different levels of economic development. For instance, unlike less developed countries, developed countries have a more stable infrastructure and institutions providing greater opportunities for educational attainment, particularly, laws against child labor, and compulsory education laws promoting a more unrestricted access to education.

Alternative methodologies utilized in the estimation of rates of return

In addition to the methodologies observed in this study, a handful of alternative methodologies have been applied in the estimation of rates of return to investments in education. The most common are ordinary least squares (OLS), quantile regression (QR), Heckman's two-stage selection model, instrumental variables (IV), and the elaborate method.

Ordinary Least Squares (OLS)

Ordinary least squares (OLS) estimate a regression line which passes through the mean of the sample. This is to say that OLS captures the effect of education on individuals earning the average wage attributed to a particular number of years of education (Harmon, et al., 2003)

Quantile Regression (QR)

Quantile regression (QR), an alternative methodology to OLS, "allows us to estimate the return to education within different quantiles of the wage distribution"(Harmon, et al., 2003, p. 128). In other words, QR observes the returns to education at particular segments of the wage distribution. This means that QR measures the returns to education of individuals with a certain level of education, as opposed to returns to particular years of education estimated through OLS. This method accounts for the so-called sheepskin effect (Gibson & Fatai, 2006). According to Harmon, et al., (2003) QR are only necessary when 'the wage return from increments in education deviates from linearity in years of education' (p. 127).

Heckman's Two-Stage Selection Model

Both, the OLS and QR methods for estimating returns to investments in education have the sample selectivity problem resulting from data on wages observed only for people who are in wage employment (Serumaga-Zake & Kotze, 2003). In order to adjust for this predisposition, Heckman's two-stage selection model for estimating returns to education 'involves a two-stage procedure for which [first,] the probability that an individual will be employed is determined according to a probit regression function using personal variables (e.g. wealth index, parents' education, relationship to household head, age and education) as regressors' (Serumaga-Zake & Kotze, 2003, p. 104). The 'second stage' of this method consists of the inclusion of the probability of employment term (the 'selectivity correction' variable) in the wage function. The two major limitations of Heckman's two-stage selection model is that it may fail to address the joint-decision selection problem that concerns two hurdles: labor supply (whether the individual chooses to be employed or not) and employment (whether the individual chooses to work for an offered wage, or a particular job) (Serumaga-Zake & Kotze, 2003).

Instrumental Variables (IV)

The instrumental variables IV method for estimating returns to investments in education examines how wages differ between groups whose education is different for exogenous reasons (Harmon, et al., 2003). Put simply, the IV method provides a solution to the problem of wages being affected by not only education, but also by the combined effect of education and other variables originated externally, such as proximity to schools and compulsory school laws. The instrumental variables method accounts for the existence of these variables in its estimation of returns to investments in education (See Card, 2001) for an application of the instrumental variables method).

The Elaborate Method

The elaborate method, or the discounting of actual net age-earnings profile, is an appropriate method for estimating returns to education since it follows from the algebraic definition of the rate of return (which equates a stream of benefits to a stream of costs at a given point in time). The limitations of the elaborate method are that it requires detailed data on age-earnings profiles by educational level and these data are difficult to come across in most countries (See Psacharopoulos (1981) for a details and examples of the elaborate method).

Substitution of the Earnings Function Method by the Short-Cut Method

Estimating returns to education through the earnings function method is a more data-rich strategy than the short-cut method. Nonetheless, and despite the differences in data requirements between the methods, careful estimation of returns to education using limited data can be insightful, especially for countries where the lack of data has impeded their calculation. When applying different methods to the estimation of returns to education, the conclusions tend to be similar. The difference in results lays on the specificity and comparability of the data utilized in the estimation of these returns, data often incomplete and thus, unreliable (Psacharopoulos & Patrinos, 2004; Tsang, 1988).

Menon (1997, 2008) estimated perceived rates of return to higher education in Cyprus, via both the elaborate and short-cut methods. She concluded that the results were sufficiently correlated to support the notion that the short-cut method may be a proper substitute for the elaborate method when data for the estimation of returns through the elaborate method are not easily obtainable. Similarly, Mincer (1974) stated that the proper implementation of the short-cut method gives rise to a useful, quick, and easy method for assessing rates of return to schooling. Data availability tends to be the decisive factor in the selection of the methodology intended for the estimation of returns to investments in education. And notwithstanding the earnings function method been perceived as a better alternative when compared with the short-cut method, the data required for its implementation is often unavailable. When attempting to estimate international returns to investments in education, particularly in less developed countries, data tend to be limited. And even though other models are suggested to be more accurate in the estimation of rates of returns, they are ineffective when estimating and comparing returns to education in countries with deficient data (i.e., less developed countries).

The Study

In order to not only make an appeal to the literature with regards to the correlation between returns to education estimated through different methodologies, private rates of return to investments in education were estimated via both, the earnings function and the short-cut methods. The purpose of this study is to generalize Menon's findings beyond Cyprus and observe whether her conclusions regarding the existing correlation between returns to education estimated through two different methods in Cyprus holds true when tested in a group of countries with sufficient data availability. Returns were estimated for 28 countries with data available for the application of the earnings function and the short-cut methods.

Private returns to education through the earnings function method were estimated by way of the function:

$$\ln Y = a + b \cdot PRIM + c \cdot SEC + d \cdot TERT + e \cdot EX + f \cdot EX^2 + g \cdot FEMALE + h \cdot MARRIED + i \cdot PUBLIC + j \cdot UNION + k \cdot YR + l \cdot e \quad (9)$$

Where *Y* represents individual wages, PRIM*, SEC* and *TERT* are educational level dummy variables (with the purpose of adding a level of education component to the analysis), *EX* represents years of experience, and EX^2 years or experience squared. *FEMALE*, *MARRIED, PUBLIC* and *UNION* are dummy variables for gender, marital status, public or private employment and union employed, and *YR* represents year, with *e* as the error term. Also *PREPRI* represents the dummy variable for a 'pre-primary' level of education, category omitted in order to avoid multicolinearity.

The data

The data utilized in this study were gathered by the International Social Survey Program (ISSP) from 1985 to 1995. ISSP data are gathered from national surveys designed to be consistent with each other and thus, broadly comparable. Nonetheless, the data were designed for qualitative analysis and it is likely that there may be errors in measurement, particularly in earnings and schooling (Harmon, et al., 2001; Harmon, et al., 2003; Trostel, et al., 2002). It is important to emphasize the fact that the data utilized in the study did not result from the most recent ISSP available survey. However, the data have been used with the purpose of observing the estimation of returns to education through two alternative methods and their substitutability, not the estimation of returns with the purpose of providing support for current decision making regarding present-day educational policies.

In order to increase comparability, data are typically adjusted for weekly earnings. The same approach was taken on this study. Also, dummy variables *PREPRI*, *PRIM*, *SEC* and *TERT* account for *attained* educational levels based on years of schooling: $PREPRI < 6$ for preprimary and incomplete primary, $6 \leq PRIM < 12$ for primary and incomplete secondary, $12 \leq SEC < 16$ for secondary and incomplete tertiary, and $TERT \geq 16$ for complete tertiary.

It is important to report that data adjusted for wages per week presented outliers for the United States in 1991, the Netherlands in 1995, Ireland in 1989, Norway in 1989, 1990 and 1991 and Russia in 1994 and 1995. In order to adjust for measurement errors, values five standard deviations above and below the mean of weekly earnings were removed from the sample prior to conducting this study. Also, data on Great Britain and Northern Ireland do not provide figures on incomplete primary levels of education, nor for completed tertiary levels of education. This is unlikely to be observed in a random selection of individuals in these countries and, consequently, it biases returns to an additional year of schooling for these countries. In order to increase the level of rigor of the study, returns to the different educational levels were estimated accounting for both, observed average years of schooling per educational level per country, and for the international standard classification of education that estimates 6 years to primary education, 12 to secondary and 16 to tertiary (UNESCO, 1997).

The results

Estimating private returns to education via both, average years per educational level per country, and standard years per educational level

Private returns to education were initially estimated via both average years per educational level per country, and standard years per educational level. The returns were estimated by means of both the earnings function and the short-cut methods (see tables 1 and 2 on pages 88-89). The estimation of returns based on average years per educational level per country is more precise, since it reflects the specific reality of every country observed. However, a highly significant correlation between the returns estimated by means of the earnings function method via standard and average years per level of education was observed (F 1, 78) = 352.29, $p < .001$. According to the model, it is possible to explain 82% (Adj R^2) of the results of estimating returns to education using observed average years per level by estimating the same returns using the standard years per educational level. When estimating returns to education by means of the short-cut method using both average years per educational level per country, and standard years' comparable results were observed. A significant correlation was observed between the results (F 1, 78) = 313.24, $p < .001$. And 80% (Adj R^2) of the estimated returns to education via average years may be explained by estimating the same returns via standard years per educational level.

Estimating returns to education with average years per educational level provides a more accurate estimation of these returns for the country being observed at the particular moment in time. Nevertheless, it is acceptable to suggest that, when data on average years per educational level are not accessible, estimating returns to education using the standard years per educational level provided by the international standard classification of education is entirely adequate.

Estimating private returns to education accounting for Bachelors', Masters' and Doctoral subcategories of the tertiary level of education

There is the potential concern of the tertiary level of education being a broad category, grouping a large number of years and levels together. Hence, this study was further conducted via the classification of the tertiary level of education in bachelors', masters', and doctoral subcategories. These subcategories are based on the average number of years observed per country for each category, and the standard number of years per level, 16 for bachelors', 18 for masters' and 23 for doctoral (see table 3, page 90). The purpose for the addition of this categorization is to provide a sensibility check on the returns presented in tables 1 and 2 (pages 88-89). This sensibility check provides evidence to suggest that the estimated returns to primary, secondary and tertiary education are not significantly affected by the returns observed in these subcategories.

Substituting the earnings function method by the short-cut method

A significant positive correlation was found between the returns to education estimated through both, the earnings function and the short-cut methods. The estimation by means of the earnings function method was conducted using the strongest possible regression specification, controlling for gender, marital status, type of employment, and year. This was conducted with the purpose of establishing the fact that when the strongest possible specification was applied to the earnings function method, the results were, nonetheless, correlated with the results estimated via the short-cut method. Additionally, and for comparison purposes between methods, the returns estimated by means of the earnings function method were generated via the average years per educational level per country per year, and the short-cut estimates were generated via standard years per educational level. This was conducted with the purpose of increasing the level of rigor to this comparison and substitution. As this specification was inserted into the model, it was found that the methods were, nonetheless, substitutable.

The results suggest the existence of a significant correlation between the returns to schooling estimated by means of the earnings function and short-cut methods (F 1, 78) = 27.86, $p < .001$. A linear correlation coefficient (*r*) of .51 suggests a strong positive relationship between the models. Also, it is possible to explain 25% (Adj. R^2) of the results of the earnings function method by the short-cut method. Figure 2 (on page 87) represents the fit-line between the results yielded by the earnings function and short-cut methods.

Correlation between methods by educational level

The correlation between the earnings function and short-cut methods was also measured by educational level. These observations confirm a stronger relationship between the methods. At the primary level, the data displayed a significant correlation between the returns estimated by the earnings function and short-cut methods $F (1, 24) = 26.73$, $p < .001$. The relationship between the results was observed to be very strong ($r = .73$), and 51% (Adj. R^2) of the results of the earnings function method can be explained by the short-cut method. It is important to establish that in the majority of the countries observed, primary education is virtually universal. In these cases, given the average years per educational level in the estimation of returns through the earnings function method, the results are rather the returns to an incomplete secondary level of education.

At the secondary level, a significant correlation was also observed between the returns estimated via both methods $F (1, 26) = 76.37$, $p < .001$. The relationship between the methods was also suggested to be very strong ($r = .86$), and 74% (Adj. R^2) of the results of the earnings function method can be explained by the short-cut method.

Also, at the tertiary level of education, a significant correlation was found between the methods $F(1, 24) = 77.23$, $p < .001$. The relationship between the results yielded by both methods is very strong ($r = .87$), and 75% (Adj. R^2) of the results of the earnings function method can be explained by the short-cut method.

When interpreting returns to education estimated by means of the short-cut method, it is important to note the existence of biases in the directionality of the estimations in relation to the same returns estimated via the earnings function method. Returns to primary education estimated by means of the short-cut method tend to be upward biased when compared with the same returns estimated via the earnings function method. On the contrary, returns to secondary education tend to be downward biased when estimated via the short-cut method in relation to returns estimated through the earnings function method. And lastly, the directionality of the returns to tertiary education estimated by means of the short-cut method, in relation to the earnings function method, is unclear.

The strong correlation observed between methods by educational level might be attributed to the fact that both methods are based on a parallel understanding of the concept of returns to education as being the result of the interaction among similar variables. As stated earlier, the short-cut method is essentially a simplified version of the earnings function method, suggested to be invoked in instances when data availability is limited.

Additionally, both, the earnings function method and the short-cut method display similar limitations, particularly the fact that, when estimating returns by educational level through the Mincerian Equation (and consequently, through both, the earnings function and short-cut methods), the returns to secondary and tertiary education are estimated through the specific consideration of the forgone earnings resulting from the attainment of higher levels of education. However, the estimation of returns to primary education is limited in the observance of forgone earnings. Essentially, the estimation of returns to primary education is based solely on the wages earned by an individual with a completed primary education level, and the number of years required to complete the same level, ignoring the earnings forgone while completing a primary level of education. As stated earlier, an additional preprimary level of education would allow for greater accuracy in the estimation of returns to primary education. Yet, limited data availability, in most cases, prevents us from this more accurate estimation of returns to primary education. This difference in the estimation of returns to primary education, as observed, has the potential of decreasing the strength of association of the returns estimated through the earnings function and short-cut methods for primary education.

Negative Returns to Investments in Education

The results of this study yielded a number of surprisingly low and negative returns to education. This fact, though unforeseen, is certainly not unprecedented. Abundant literature addresses the issue of negative returns to education, particularly with reference to returns to education in developed countries, comparable with the countries observed in this study. Returns to education are often influenced by the impact of undereducation and overeducation on wages. Overeducation and undereducation are observed when workers' levels of education are higher or lower than is required for the job they perform (Galasi, 2004).

In the last 20 to 40 years, the proportion of graduates in the work force has risen dramatically, resulting in a labor force with more education than is required for their jobs. This issue is particularly predominant in developed nations, where returns to education are observed to fall as the educated population rises (Chevalier, 2003; Daly, Büchel, & Duncan, 2000; Dolton & Vignoles, 2000; Hartog, 2000; Moffitt, 2007). Typically, returns to surplus education are smaller than the returns to required education. In developed countries, overeducation is associated with a pay penalty of 5 to 26% (Chevalier, 2003; Cohn & Ng, 2000; Dolton & Vignoles, 2000; Galasi, 2004).

Overeducation and undereducation are suggested to be the result of changes in supply and demand through time. In the United States and the United Kingdom, for example, an excess supply of graduates resulted in the fall of the returns to an academic degree in the 1970s and 1980s. However, by the end of the 1990s, workplaces with a demand for educated workers reappeared, increasing the returns to investments in education to educated workers (Chevalier, 2003; Freeman, 1976). Then, again, by the beginning of the 21st century, the proportion of individuals with higher levels of education increased, resulting in the wage returns to education falling (Galasi, 2004). Currently, and as a result of the existing international financial crisis, an oversupply of graduates has triggered a period in which returns to education have fallen again. According to the history of industrial economies of the last 40 years, during periods of transition, the education supply and demand pattern is characterized by a tendency towards undereducation at the beginning of the transition, with high returns to education, followed by a tendency to overeducation at the end of such transition, resulting in diminishing returns to education (Dutta, et al., 1999; Galasi, 2004).

Contrary to the idea of overeducation resulting from a temporary disequilibrium, is possible that the effects of overeducation might be permanent. This is accounted for by the fact that overeducated individuals tend to continue to be overeducated, even after years in the same type of employment. According to this view, overeducation results from the permanent misallocation of resources, costly to both, society and individuals. The obvious solution to the issue of overeducation is the proper allocation of resources in education (Chevalier, 2003).

Another observed agent influencing returns to education in developed countries is the establishment of minimum wages. And although their effect has been observed to be lesser than that of supply and demand, minimum wages have been associated with declines in returns to education (Funkhouser, 1998). Stable economies with established minimum wages might reduce the perceived need for education, since wages are predetermined and not necessarily contingent on required levels of education. The case of negative returns to investments in education in Russia and other former communist nations might also be a reflection of the earlier governmental control and non-market compensation factors (Benitez-Silva & Sheidvasser, 2000).

A final reasonable explanation for the low and negative returns to education encountered throughout this study is that, the application of ordinary least square (OLS) regression analysis in their estimation could have downwardly biased the results. Returns to education estimated through OLS regression methods have been reported to be downward biased, often by sizeable amounts, when compared with returns estimated through alternative methods (Card, 2001; Harmon & Walker, 1995, 1999; Heckman, et al., 2006).

Discussion

Investments in formal education have been suggested to be correlated with economic growth and development. This positive correlation has incentivized an increase in investments in education. However, this notion poses the challenge of the efficient allocation of resources in the multiple alternatives, within education, competing for them. The inefficient allocation of resources in education may result in the misuse of resources and loss of potential returns.

Studies on returns to education offer conflicting suggestions regarding the efficient allocation of resources. Some suggest that returns to investments in education are always highest at the primary level. Others suggest that these returns are always highest at the tertiary level of education. A different position on this debate proposes that returns to education are non-linear, increasing at the secondary level, and decreasing at the tertiary level. Apart from these views, another standpoint on this debate finds the evidence provided by studies on rates of return, with regards to investments at different levels of education, to be inconclusive.

The controversies regarding the different patterns on returns to investments in education are certainly real. However, these controversies have been suggested to be the result of comparing studies conducted using different methodologies and data collection techniques. Through the course of this study, these controversies were addressed by suggesting the estimation of international returns to investments in education through a single methodology, the short-cut method. The short-cut method allows for a more comprehensive estimation of returns to education at the international level since, given its simplicity and reliability, it admits a greater number of low-income economies (with limited data availability) into these comparisons.

Policy implications

The results of this study may be applied as the basis for the deciding on methodologies used with the purpose of establishing industrial policies understanding education as a sector expected to offer good prospects for economic growth. As stated earlier, lower income economies tend to have a limited availability of data to be applied in the estimation of returns to education. Sophisticated, data rich methodologies have a limited application in the estimation of these returns, since the data necessary for their implementation are not always readily available. However, this study has suggested the viability of the short-cut method for estimating returns to education based on the Mincerian equation, a methodology that, apart from being easily implemented, has also shown to be effective in the estimation of these returns, especially when faced by the challenge of limited data availability. The greatest advantage of applying the short-cut method to the estimation of returns to education is that private returns can be estimated with data on schooling and wages only; making it especially attainable for lower income economies.

Additionally, when data on expenditure per pupil in education are available, social returns to education can also be easily estimated.

In summary, low-income economies are in critical need for the establishment of policies focusing on specific ways to promote economic growth and development. However, and due to the fact that, in most cases, these economies lack the necessary data for the application of sophisticated econometric models supporting the establishment of these policies, low-income economies are often left behind when these policies are developed, particularly at the international level. When education is viewed as an industry with the potential of producing substantial returns, the short-cut method has been suggested to be an important tool for the estimation of returns to education, particularly applicable in the context of low-income economies and their limited data availability.

Conclusion

Through the estimation of returns to investments in education for 28 countries by means of the earnings function and short-cut methods, this study proposes the existence of a highly significant correlation between returns estimated via both methods. Moreover, as returns to education by educational level (primary, secondary and tertiary) are compared, the correlation between the results yielded by both methods is even stronger. The limitations of the Mincerian Model are clear and well documented. However, it is important to reiterate that most low-income economies do not possess the infrastructure needed to provide the data necessary for the application of more rigorous methodologies to the question of sound investments in education. It is the intention of this study to claim the Mincerian equation, and more specifically, the short-cut method, as a valuable tool for the estimation of returns to education, particularly in low-income economies. Given the fact that, generally speaking, low-income economies lack the data necessary for the estimation of these returns with sophisticated, econometrically rigorous methods, the short-cut method based on Mincer's equation, is certainly a method preferable to more highly sophisticated ones, within the specific context of low-income economies, and international comparisons including countries at different levels of development. These estimates on returns to education, when carefully interpreted, may provide sound policy recommendations for the allocation of limited resources to education.

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Notes

1. An alternative approach to adding an educational level dimension to the rate of return concept is to add an $e \cdot S^2$ term in equation (1), where *e* is the estimated coefficient on years-of-schooling-squared (Psacharopoulos, 1981). In this case, differentiation with respect to *S* yields

$$r = b + 2eS$$

By substituting different values of *S* in the right-hand side of this equation, one can arrive at a regression-based rate of return structure corresponding to the different *levels* of education (i.e., to primary education *S*=6, secondary education *S*=*12*, to tertiary education, *S*=*16*).

2. The rates of return to the different levels of education, relative to their immediate lower level, are derived from the estimated coefficients of *b*, *c* and *d* in the function, and are:

$$r_{(primary\ vs.\ illiterates)} = \frac{b}{S_p}$$

$$r_{(secondary\ vs.\ primary)} = \frac{c-b}{S_s - S_p}$$

$$r_{(tertiary\ vs.\ secondary)} = \frac{d-c}{S_t - S_s}$$

where *S* stands for the number of years of schooling of the subscripted educational level (*p* = primary, *s* = secondary, *t* = tertiary)(Psacharopoulos, 1981).

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Appendix 1

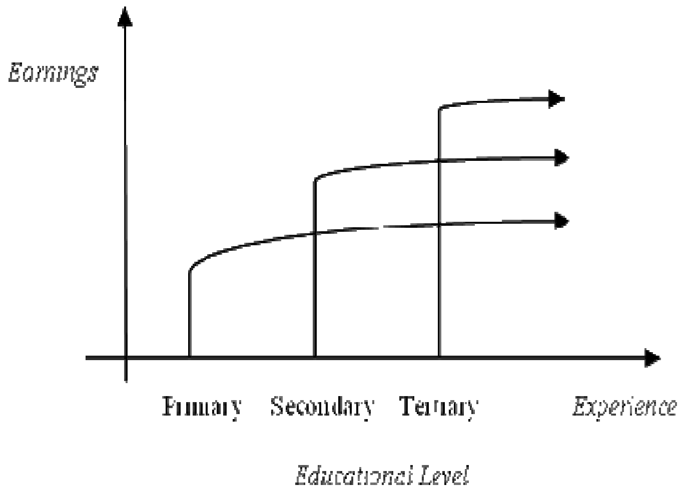

Figure 1: Infinitely equidistant earnings for the different levels of education as estimated through the earnings function method.

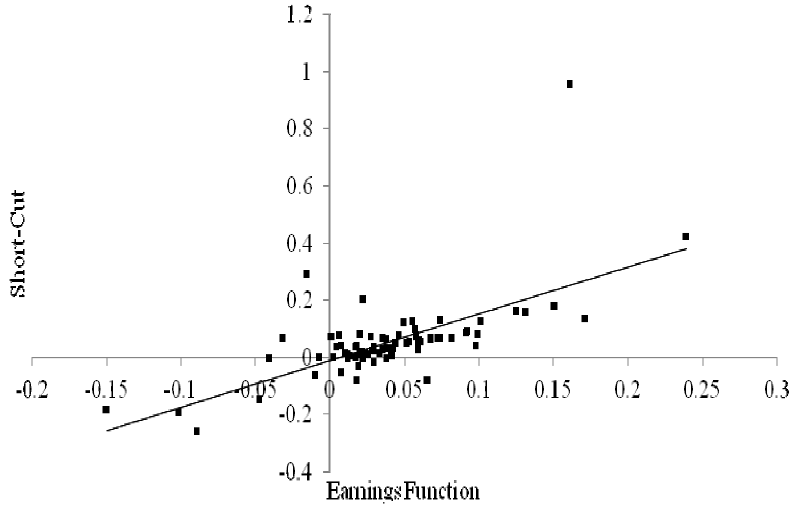

Figure 2: Regression fit line between the results on rates of return to education estimated through the earnings function and short-cut methods

Appendix 2

	Private Rates of Return (Earnings Function Method)					
	Average Years per Level			Standard Years per Level		
Country	Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
Australia	0.011	0.051	0.043	0.018	0.029	0.038
	(0.013)	*(0.007)*	*(0.010)*	*(0.021)*	*(0.004)*	*(0.009)*
West Germany	0.005	0.033	0.046	0.007	0.021	0.059
	(0.010)	*(0.006)*	*(0.006)*	*(0.016)*	*(0.004)*	*(0.008)*
Great Britain	...	0.107	...	...	0.049	...
		(0.007)			*(0.003)*	
United States	0.002	0.114	0.096	0.002	0.059	0.099
	(0.022)	*(0.026)*	*(0.016)*	*(0.035)*	*(0.014)*	*(0.016)*
Austria	-0.030	0.059	0.045	-0.047	0.033	0.057
	(0.044)	*(0.009)*	*(0.011)*	*(0.069)*	*(0.005)*	*(0.014)*
Hungary	0.012	0.104	0.088	0.020	0.058	0.091
	(0.024)	*(0.010)*	*(0.014)*	*(0.038)*	*(0.005)*	*(0.014)*
Netherlands	0.004	0.036	0.034	0.006	0.023	0.041
	(0.010)	*(0.007)*	*(0.005)*	*(0.016)*	*(0.004)*	*(0.006)*
Italy	0.020	0.063	0.057	0.029	0.044	0.074
	(0.006)	*(0.007)*	*(0.007)*	*(0.009)*	*(0.005)*	*(0.010)*
Ireland	0.098	0.077	0.138	0.150	0.051	0.131
	(0.061)	*(0.010)*	*(0.012)*	*(0.093)*	*(0.006)*	*(0.011)*
Norway	0.005	0.021	0.013	0.007	0.012	0.013
	(0.009)	*(0.005)*	*(0.004)*	*(0.015)*	*(0.003)*	*(0.004)*
Switzerland	0.023	0.097	0.026	0.035	0.067	0.035
	(0.026)	*(0.015)*	*(0.018)*	*(0.040)*	*(0.010)*	*(0.025)*
Slovenia	0.002	0.127	0.105	0.004	0.067	0.101
	(0.009)	*(0.010)*	*(0.016)*	*(0.015)*	*(0.005)*	*(0.015)*
Sweden	0.011	0.035	0.012	0.018	0.020	0.012
	(0.008)	*(0.008)*	*(0.009)*	*(0.013)*	*(0.004)*	*(0.009)*
Czech Rep	0.027	0.027	0.031	0.046	0.012	0.038
	(0.008)	*(0.014)*	*(0.009)*	*(0.013)*	*(0.006)*	*(0.011)*
Poland	-0.005	0.106	0.117	-0.007	0.058	0.125
	(0.013)	*(0.007)*	*(0.010)*	*(0.020)*	*(0.004)*	*(0.011)*
New Zealand	-0.006	0.035	0.017	-0.010	0.017	0.019
	(0.010)	*(0.013)*	*(0.006)*	*(0.018)*	*(0.006)*	*(0.009)*
Bulgaria	-0.054	0.055	0.059	-0.089	0.028	0.060
	(0.045)	*(0.016)*	*(0.015)*	*(0.074)*	*(0.008)*	*(0.016)*
Russia	-0.009	0.038	0.081	-0.016	0.025	0.065
	(0.010)	*(0.007)*	*(0.009)*	*(0.017)*	*(0.006)*	*(0.007)*
Canada	0.0005	0.033	0.046	0.001	0.022	0.053
	(0.016)	*(0.028)*	*(0.012)*	*(0.025)*	*(0.019)*	*(0.013)*
Czechoslovakia	-0.062	0.022	0.033	-0.102	0.010	0.042
	(0.044)	*(0.018)*	*(0.011)*	*(0.072)*	*(0.009)*	*(0.014)*
Philippines	0.026	0.206	0.276	0.038	0.171	0.239
	(0.025)	*(0.034)*	*(0.083)*	*(0.035)*	*(0.029)*	*(0.072)*
Israel	-0.025	0.041	0.084	-0.041	0.021	0.092
	(0.019)	*(0.019)*	*(0.012)*	*(0.031)*	*(0.010)*	*(0.013)*
Japan	0.014	0.151	0.073	0.022	0.082	0.072
	(0.009)	*(0.017)*	*(0.011)*	*(0.014)*	*(0.009)*	*(0.011)*
Spain	0.019	0.048	0.074	0.027	0.038	0.098
	(0.013)	*(0.018)*	*(0.017)*	*(0.019)*	*(0.014)*	*(0.022)*
Latvia	0.095	0.054	0.067	0.161	0.029	0.061
	(0.017)	*(0.029)*	*(0.029)*	*(0.028)*	*(0.016)*	*(0.026)*
Slovak Rep	-0.088	0.053	0.058	-0.150	0.021	0.074
	(0.006)	*(0.015)*	*(0.010)*	*(0.010)*	*(0.006)*	*(0.013)*
East Germany	-0.021	0.027	0.025	-0.032	0.017	0.023
	(0.003)	*(0.007)*	*(0.010)*	*(0.005)*	*(0.004)*	*(0.009)*
N Ireland	...	0.130	...	...	0.055	...

Table 1: Private returns to education for 28 countries estimated by means of the earnings function method with average years per educational level and standard years per educational level

Regression specification includes controls for gender, public and union employment, marital status and year. Estimates are returns on average income from 1985-1995. Data Source: International Social Survey Program. Trostel, Walker and Woolley (2002). Standard Errors in parenthesis.

Appendix 3

Private Rates of Return (Short-Cut Method)						
	Average Years per Level			Standard Years per Level		
Country	Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
Australia	-0.036	0.038	-0.005	-0.080	0.022	-0.003
West Germany	-0.029	0.029	0.044	-0.054	0.019	0.045
Great Britain	...	0.122	...	...	0.122	...
United States	-0.0003	0.056	0.099	-0.001	0.029	0.081
Austria	-0.071	0.027	0.099	-0.148	0.015	0.101
Hungary	0.041	0.135	0.106	0.082	0.075	0.088
Netherlands	0.039	0.015	0.006	0.075	0.010	0.007
Italy	-0.013	0.070	0.128	-0.017	0.049	0.133
Ireland	0.066	0.075	0.209	0.179	0.049	0.158
Norway	0.012	-0.004	0.006	0.039	-0.002	0.005
Switzerland	0.034	0.089	0.026	0.068	0.062	0.028
Slovenia	0.019	0.128	0.165	0.036	0.067	0.128
Sweden	0.019	0.030	0.013	0.042	0.017	0.010
Czech Rep	0.029	0.011	0.036	0.078	0.004	0.034
Poland	0.0003	0.131	0.190	0.0005	0.072	0.162
New Zealand	-0.025	0.005	-0.036	-0.060	0.002	-0.032
Bulgaria	-0.110	0.041	0.072	-0.260	0.021	0.059
Russia	0.157	0.016	-0.127	0.292	0.010	-0.081
Canada	0.038	-0.006	0.058	0.073	-0.004	0.053
Czechoslovakia	-0.118	0.026	0.033	-0.192	0.012	0.034
Philippines	0.037	0.166	0.611	0.062	0.137	0.423
Israel	-0.002	0.020	0.102	-0.005	0.010	0.089
Japan	0.150	0.126	0.087	0.201	0.068	0.069
Spain	0.036	0.041	0.039	0.073	0.033	0.041
Latvia	0.555	0.071	0.072	0.957	0.038	0.053
Slovak Rep	-0.104	0.048	0.066	-0.182	0.019	0.069
East Germany	0.038	0.058	0.016	0.067	0.036	0.012
N Ireland	...	0.125	...	...	0.125	...

Table 2: Private returns to education for 28 countries estimated by means of the short-cut method with average years per educational level and standard years per educational level.

Estimates are returns on average income from 1985-1995. Data Source: International Social Survey Program. Trostel, Walker and Woolley (2002).

Appendix 4

Private Rates of Return (Earnings Function Method)

Country	Observed average years per level					Standard years per level				
	Prim	Sec	Bach	Mast	Doc	Prim	Sec	Bach	Mast	Doc
Australia	0.011	0.051	0.047	0.024	...	0.018	0.029	0.034	0.027	...
	(0.013)	(0.007)	(0.014)	(0.026)		(0.021)	(0.004)	(0.011)	(0.030)	
West Germany	0.005	0.033	0.061	0.016	-0.006	0.008	0.021	0.053	0.021	-0.005
	(0.010)	(0.006)	(0.013)	(0.019)	(0067)	(0.016)	(0.004)	(0.011)	(0.026)	(0.056)
Great Britain	...	0.107	...	...	...	...	0.049	...	...	...
		(0.007)					(0.003)			
United States	0.001	0.114	0.116	0.013	...	0.002	0.059	0.097	0.016	...
	(0.022)	(0.027)	(0.021)	(0.048)		(0.035)	(0.014)	(0.018)	(0.060)	
Austria	-0.030	0.059	0.071	-0.019	-0.060	-0.047	0.032	0.065	-0.030	-0.052
	(0.044)	(0.009)	(0.021)	(0.033)	(0047)	(0.069)	(0.005)	(0.019)	(0.051)	(0.041)
Hungary	0.012	0.104	0.106	-0.020	...	0.020	0.058	0.094	-0.027	...
	(0.024)	(0.010)	(0.018)	(0.047)		(0.038)	(0.005)	(0.016)	(0.065)	
Netherlands	0.004	0.037	0.025	0.057	0.003	0.006	0.023	0.019	0.082	0.003
	(0.010)	(0.007)	(0.010)	(0.013)	(0021)	(0.016)	(0.004)	(0.008)	(0.018)	(0.017)
Italy	0.020	0.063	0.086	-0.007	0.089	0.029	0.044	0.075	-0.009	0.081
	(0.006)	(0.007)	(0.018)	(0.031)	(0053)	(0.009)	(0.005)	(0.016)	(0.038)	(0.048)
Ireland	0.098	0.077	0.177	-0.020	0.081	0.150	0.050	0.134	-0.025	0.086
	(0.061)	(0.010)	(0.017)	(0.035)	(0015)	(0.093)	(0.006)	(0.013)	(0.045)	(0.016)
Norway	0.005	0.021	0.020	-0.010	-0.029	0.007	0.012	0.016	-0.013	-0.023
	(0.009)	(0.005)	(0.007)	(0.011)	(0020)	(0.015)	(0.003)	(0.005)	(0.014)	(0.016)
Switzerland	0.023	0.097	0.027	0.018	0.059	0.035	0.068	0.022	0.026	0.047
	(0.026)	(0.015)	(0.040)	(0.058)	(0056)	(0.039)	(0.010)	(0.034)	(0.085)	(0.044)
Slovenia	0.002	0.127	0.119	-0.073	...	0.003	0.067	0.106	-0.067	...
	(0.009)	(0.010)	(0.020)	(0.048)		(0.015)	(0.005)	(0.018)	(0.044)	
Sweden	0.011	0.035	0.024	-0.030	-0.134	0.018	0.020	0.019	-0.035	-0.115
	(0.008)	(0.008)	(0.011)	(0.029)	(0.117)	(0.013)	(0.004)	(0.009)	(0.034)	(0.101)
Czech Rep	0.027	0.028	0.020	0.077	-0.119	0.047	0.012	0.018	0.080	-0.127
	(0.008)	(0.015)	(0.015)	(0.037)	(0012)	(0.013)	(0.006)	(0.014)	(0.039)	(0.013)
Poland	-0.005	0.106	0.117	...	...	-0.007	0.058	0.125	...	...
	(0.013)	(0.007)	(0.010)			(0.020)	(0.004)	(0.011)		
New Zealand	-0.006	0.035	0.008	0.043	0.063	-0.010	0.017	0.007	0.055	0.051
	(0.010)	(0.013)	(0.012)	(0.021)	(0.044)	(0.018)	(0.006)	(0.010)	(0.027)	(0.035)
Bulgaria	-0.054	0.055	0.077	-0.042	...	-0.089	0.028	0.066	-0.055	...
	(0.045)	(0.016)	(0.019)	(0.050)		(0.074)	(0.008)	(0.017)	(0.065)	
Russia	-0.010	0.037	0.100	-0.035	0.028	-0.016	0.025	0.069	-0.036	0.031
	(0.010)	(0.007)	(0.011)	(0.023)	(0.041)	(0.017)	(0.005)	(0.007)	(0.024)	(0.044)
Canada	0.0003	0.033	0.055	0.036	-0.058	0.001	0.022	0.041	0.050	-0.047
	(0.016)	(0.028)	(0.020)	(0.022)	(0.045)	(0.025)	(0.019)	(0.015)	(0.031)	(0.036)
Czechoslovakia	-0.062	0.023	0.014	0.088	0.064	-0.102	0.011	0.014	0.102	0.053
	(0.044)	(0.018)	(0.018)	(0.040)	(0.018)	(0.072)	(0.009)	(0.018)	(0.046)	(0.015)
Philippines	0.026	0.206	0.376	-0.073	...	0.038	0.171	0.253	-0.106	...
	(0.025)	(0.035)	(0.128)	(0.183)		(0.035)	(0.029)	(0.087)	(0.267)	
Israel	-0.025	0.041	0.098	0.051	-0.057	-0.041	0.021	0.081	0.067	-0.047
	(0.019)	(0.019)	(0.016)	(0.039)	(0056)	(0.031)	(0.010)	(0.013)	(0.052)	(0.046)
Japan	0.014	0.151	0.078	-0.008	-0.060	0.022	0.082	0.072	-0.010	-0.054
	(0.009)	(0.017)	(0.012)	(0.044)	(0024)	(0.014)	(0.009)	(0.011)	(0.052)	(0.022)
Spain	0.018	0.048	0.072	0.084	0.069	0.026	0.038	0.056	0.104	0.060
	(0.013)	(0.018)	(0.033)	(0.046)	(0061)	(0.019)	(0.014)	(0.026)	(0.057)	(0.054)
Latvia	0.096	0.055	0.093	-0.055	...	0.162	0.029	0.070	-0.063	...
	(0.017)	(0.029)	(0.037)	(0.084)		(0.028)	(0.016)	(0.028)	(0.096)	
Slovak Rep	-0.088	0.053	0.075	-0.008	0.008	-0.150	0.021	0.076	-0.008	0.008
	(0.006)	(0.015)	(0.017)	(0.054)	(0034)	(0.010)	(0.006)	(0.018)	(0.049)	(0.033)
East Germany	-0.022	0.027	0.027	0.008	0.039	-0.034	0.017	0.022	0.008	0.036
	(0.007)	(0.007)	(0.011)	(0.033)	(0014)	(0.010)	(0.004)	(0.009)	(0.034)	(0.013)
N Ireland	...	0.130	...	...	...	...	0.055	...	...	...

Table 3: Private returns to education for 28 countries estimated with average years per educational level and standard years per level by means of the earnings function method, accounting for the subcategories Bachelors', Masters' and Doctoral of the tertiary level of education.

Regression specification includes controls for gender, public and union employment, marital status and year. Estimates are returns on average income from 1985-1995. Data Source: International Social Survey Program. Trostel, Walker and Woolley (2002). Standard Errors in parenthesis.