Pergamon

World Development, Vol. 22, No. 9, pp. 1325–1343, 1994
Elsevier Science Ltd
Printed in Great Britain
0305–750X/94 $7.00 + 0.00

0305-750X(94)00048-4

Returns to Investment in Education: A Global Update

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Summary. — The paper provides a comprehensive update of the profitability of investment in education at a global scale. The rate of return patterns established in earlier reviews are upheld: namely, that primary education continues to be the number one investment priority in developing countries; the returns decline by the level of schooling and the country's per capita income; investment in women's education is in general more profitable than that for men; returns in the private competitive sector of the economy are higher than among those working in the public sector; and that the public financing of higher education is regressive. The above findings are discussed in the context of controversies in the field, concluding that investment in education continues to be a very attractive investment opportunity in the world today — both from the private and the social point of view.

1. INTRODUCTION

Compilations of rate of return estimates to investment in education have appeared in the literature since the early 1970s (see Psacharopoulos 1973, 1981 and 1985). This is a further update taking into account work that has been published since 1985, including earlier pieces that came only lately to my attention.

After discussing some methodological issues surrounding rate of return estimates, updated world patterns are presented. Controversies in the literature are discussed in the light of the new evidence. The final section discusses the implications of the findings for educational policy.

2. METHODOLOGICAL ISSUES

Estimates of the profitability of investment in education can be arrived at using two different basic methods which, in theory at least, should give very similar results: (a) the "full" or "elaborate" method, and (b) the "earnings function" method, which has two variants.[1] Understanding the estimation method is important for interpreting rate of return patterns. The method adopted by various authors is often dictated by the nature of the available data.

The elaborate method amounts to working with detailed age-earnings profiles by level of education and finding the discount rate that equates a stream of education benefits to a stream of educational costs at a given point in time. The annual stream of benefits is typically measured by the earnings advantage of graduates of the educational level to which the rate of return is calculated, and the earnings of a control group of graduates of a lower educational level. The stream of costs consists of the foregone earnings of the individual while in school (measured by the mean earnings of graduates of the educational level that serves as control group) in a private rate of return calculation, augmented by the true resource costs of schooling in a social rate of return calculation. Private rates of return are used to explain people's behavior in seeking education of different levels and types, and as distributive measures of the use of public resources. Social rates of return, on the other hand, can be used to set priorities for future educational investments.

The "basic" earnings function method is due to Mincer (1974) and involves the fitting of a semi-log ordinary least squares regression using the natural logarithm of earnings as the dependent variable, and years of schooling and potential years of labor market experience and its square as independent variables. In this semi-log earnings function specification the coefficient on years of schooling can be interpreted as the average private rate of return to one additional year of education, regardless of the educational level to which this year of schooling refers.

The "extended" earnings function method can be used to estimate returns to education at different levels by converting the continuous years of schooling variable into a series of dummy variables referring to the completion of the main schooling cycles, i.e. primary, secondary and tertiary education, or referring to drop outs of these levels, or even to different types of curriculum (say, vocational versus general) within a

* The views expressed here are those of the author and should not be attributed to the World Bank. Final revision accepted: March 4, 1994.

given educational level. After fitting such extended an earnings function, the private rate of return to different levels of education can be derived by comparing adjacent dummy variable coefficients.

The discounting of actual net age-earnings profiles is the most appropriate method (among those listed above) for estimating the returns to education because it takes into account the most important part of the early earnings history of the individual.[2] But this method is very thirsty in terms of data — one must have a sufficient number of observations in a given age-educational level cell for constructing "well-behaved" age-earnings profiles, i.e. noncrossing and concave to the horizontal axis). This is still a luxury in many empirical investigations, hence researchers have resorted to less data-demanding methods.

Authors have found it increasingly convenient to estimate the returns to education based on the Mincerian earnings function method. Although easy to use, there are several pitfalls in using this method. First, in most applications, only the overall rate of return to the typical year of schooling is reported (i.e. the coefficient of years of schooling in the semi-log earnings function). Very few authors go to the trouble of specifying the education variable as a string of dummies in order to estimate the marginal effect of each level of education on earnings. But even authors who do this often label the coefficients of these dummy variables "returns to education," whereas these are marginal wage effects, not rates of return to investment in education. The "returns" notion necessitates taking into account the cost of education, whether private or social, and relating this cost to the wage effect.[3]

Second, there is an important asymmetry between computing the returns to primary education and those to the other levels. Primary school children, mostly aged 6–12 years, do not forego earnings during the entire length of their studies. Hence it is a mistake to mechanically assign to them six years of foregone earnings as part of the cost of their education. When using the full discounting method, it is very easy to assign, say, only three years of opportunity cost to primary education (although it is rare for authors to have actually done this). But when using the basic earnings function method, foregone earnings are automatically imputed to the rate of return calculation for the full length of one's schooling cycle. Hence such estimates grossly underestimate the average rate of return to schooling. Of course in the extended earnings function it is easy to allow for differential duration of opportunity costs by assigning one, two, or three years of foregone earnings to primary school graduates.

Finally, Dougherty and Jimenez (1991) have rightly pointed out that the above specification imposes the wrong age-earnings profile to young workers, thus biasing the rate of return calculation, especially for primary education. But the earnings function method has gained popularity because of its ease of estimation.

3. UPDATE SCOPE AND SOURCES

Given the growth of the literature, the compilation of returns to education has become untractable. For example, rates of return have been estimated for such diverse groups as mainland Chinese working in Hong Kong (Chung, 1989), or Mexican Americans and their Anglo counterparts who graduated from Pan American University (Raymond and Sesnowitz, 1983). The selection of the results that follow is based on whether the authors of an original work have reported the returns to education based on any one of the standard methodologies described above. This has eliminated works that (a) even having "returns to education" in their title (such as Suarez-Berenguela, 1987; Stelcner, Arriagada and Moock, 1987), the reported results do not allow a ready estimation of the returns to education; (b) works that have included too many variables in the fitted earnings function, other than human capital variables, and have biased the returns to education reporting earnings functions only within occupations (e.g., Monson, 1979) and thus artificially biasing downward the returns to education — a point made by Becker nearly 20 years ago and still ignored by many authors (see Becker, 1964); and (c) works that have wrongly reported the returns to primary education by tacitly assigning foregone earnings to those 6–8 years old (such as Glewwe, 1991). Preference has been given to reporting returns based on the "full method."

The material is organized into three sets of tables. First, text tables provide summary patterns of the returns to education classified along different dimensions representing issues in the literature. Second, the appendix gives two master tables of the latest rate of return evidence for individual countries using the Full and the Mincerian methods. Third, a set of more detailed tables on which the summaries have been based are available from the author on request. Given the large number of sources, only new citations are given in the references section. When "see Psacharopoulos (1985)" is listed as a source of a rate of return estimate, the reader should consult that earlier publication in order to trace the true original reference containing the cited estimate.

4. WORLD PATTERNS

Table 1 shows that among the three main levels of education, primary education continues to exhibit the highest social profitability in all world regions. The

lowest social rate of return average referring to higher education in OECD countries (8.7%) is close to the (long-term) opportunity cost of capital. This means that the profitability of human and physical capital, at the margin, has reached virtual equilibrium.

As depicted in Figure 1, private returns are considerably higher than social returns because of the public subsidization of education. The degree of public subsidy increases with the level of education considered, which has regressive policy implications.

(a) *Diminishing returns*

As shown in Tables 2 and 3, and depicted in Figures 2, 3 and 4, social and private returns at all levels largely decline by the level of the country's per capita income. This is another reflection of the law of diminishing returns to the formation of human capital at the margin. The same overall declining pattern is detected (although less neatly) regarding the Mincerian returns to education (Table 4 and Figure 5).

(b) *Returns over time*

The declining pattern of the returns to education is also observed over time (Table 5 and 6) where all social returns have declined between 2–8 percentage points on average in a 15-year period. It is of interest, however, that the returns to higher education have increased by about two percentage points during this period, i.e. university graduates were able not only to maintain their position, but also increase their appropriation of public funds.

(c) *Males vs. females*

Table 7 and Figure 6 confirm that, overall, the returns to female education are higher than those for males. Individual levels of education show a more mixed pattern. One issue in the literature regarding the returns to education for men relative to women is whether female estimates have been adjusted for selectivity bias, i.e. by taking into account the prior decision of a woman on whether to participate in the labor force (see Heckman, 1979). As summarized in Table 8 (based on 22 case studies in Latin American countries using the same correction methodology, Psacharopoulos and Tzannatos, 1992a, 1992b), selectivity correction does not in fact influence much the rate of return estimate for females, and the returns experienced by females, whether corrected or not, exceed those for males by more than one percentage point.

(d) *Secondary school curriculum*

Doubts have been repeatedly raised regarding the economic profitability of vocational education (for a review see Psacharopoulos, 1987). One type of vocational education that has been singled out as an issue, is the separate vocational/technical track of secondary schools (McMahon 1988). Table 9 (also depicted in Figure 7), confirms the earlier (counterintuitive) finding that the returns to the academic/general secondary school track are higher than the vocational track. The difference between the profitability of the two subjects is more dramatic regarding the social returns because of the much higher unit cost of vocational/technical education.

What is often forgotten in vocational education discussions is that there exist strong education-training complementarities. Psacharopoulos and Velez (1992b), using Colombian data, found a strong positive interaction between training and years of formal education in determining earnings. They found that training really has an effect on earnings after a worker has eight years of formal education.

In a more macro exercise, Mingat and Tan (1988) examined the economics of training provided under 115 physical capital investments. They found that such training was particularly productive when a country's educational system is highly developed. According to their most conservative estimate, the rate of return to training can be of the order of 20%, if 50% of the country's adult population is literate.

(e) *Higher education faculty*

Table 10 shows a large variation between the returns to higher education faculties, the lowest social returns being for physics, sciences and agronomy, and the highest private returns for engineering, law and economics.

(f) *Sector of employment*

Table 11 (also depicted in Figure 8) shows that the returns in the private/competitive sector of the economy are higher than for those who work in the public/non-competitive sector. This finding lends support in using labor market earnings as a proxy for productivity in estimating the returns to education. Table 12 shows that the returns in the self-employment sector of the economy are somehow lower than in the dependent employment sector.

The sector of employment relates to the so-called, although now abated, labor market segmentation literature. Testing of this elusive hypothesis has continued in the 1980s. The difficulty in identifying labor market

duality is due to the fact that scarce longitudinal data on how people with different levels of education move from low-pay to high-pay sectors on jobs are required. Cross-sectional data, the most widely available data type, are not suitable for testing this hypothesis. But even continuing on this tradition, Dabos and Psacharopoulos (1991) analyzed the earnings of Brazilian males in 1980 and found sizeable returns to education across labor market "segments," especially among rural workers and the self-employed. This funding was upheld even after correcting for dependent variable selectivity bias regarding who enters a particular economic sector.

If self-employment is defined as a distinct "sector" of the labor market, Blau (1986) using Malaysian data, rejected the hypothesis that the self-employed earn less than wage employees. Similarly, Speare and Harris (1986), using Indonesian data, found little segmentation between the modern and informal sectors.

5. CONTROVERSIES

Several critiques of the rate of return concept have been published during the 1980s, many of them repeating points made in the nascent economics of education literature in the early 1960s, e.g., Klees (1986), Leslie (1899), Behrman and Birdsall (1987), and Behrman (1987).

On the issue of whether or not earnings really reflect productivity, Chou and Lau (1987) repeated the Jamison and Lau (1982) production function methodology for Thailand and upheld the results. They found that one additional year of schooling adds about 2.5% to farm output. Phillips and Marble (1986) fitted an agricultural production function using Guatemalan data and found that four years of education increased agricultural productivity. Lau, Jamison and Louat (1991) introduced education in an aggregate production function and found its effect varies considerably across countries and regions. In East Asia, for example, one additional year of education contributed over 3% to real GDP. Azhar (1991) fitted a wheat and rice production function in Pakistan and found that education enhances the utilization of existing inputs (worker effect or technical efficiency aspect).

One much debated hypothesis in the 1970s refers to "screening," namely that earnings differences might be due to the superior ability of the more educated, rather than to their extra education. But Katz and Ziderman (1980), using Israeli data, found strong screening effects at work. Cohn, Kiker and de Oliveira (1987), using US data, found no empirical support for

Table 1. *Returns to investment in education by level (percentage) full method, latest year, regional averages*

	Social			Private		
Country	Prim.	Sec.	Higher	Prim.	Sec.	Higher
Sub-Saharan Africa	24.3	18.2	11.2	41.3	26.6	27.8
Asia*	19.9	13.3	11.7	39.0	18.9	19.9
Europe/Middle East/North Africa*	15.5	11.2	10.6	17.4	15.9	21.7
Latin America/Caribbean	17.9	12.8	12.3	26.2	16.8	19.7
OECD	14.4	10.2	8.7	21.7	12.4	12.3
World	18.4	13.1	10.9	29.1	18.1	20.3

Source: Table A-1.
*Non-OECD.

Table 2. *Returns to investment in education by level (percentage) full method, latest year, averages by per capita income group*

	Mean per capita	Social			Private		
Country	(US$)	Prim.	Sec.	Higher	Prim.	Sec.	Higher
Low income ($610 or less)	299	23.4	15.2	10.6	35.2	19.3	23.5
Lower middle income (to $2,449)	1,402	18.2	13.4	11.4	29.9	18.7	18.9
Upper middle income (to $7,619)	4,184	14.3	10.6	9.5	21.3	12.7	14.8
High income ($7,620 or more)	13,100	n.a.	10.3	8.2	n.a.	12.8	7.7
World	2,020	20.0	13.5	10.7	30.7	17.7	19.0

Source: Table A-1.

Table 3. *The coefficient on years of schooling: Mincerian mean rate of return*

Country	Mean per capita income (US$)	Years of schooling	Coefficient (percent)
Low income ($610 or less)	301	6.4	11.2
Lower middle income (to $2,449)	1,383	8.4	11.7
Upper middle income (to $7,619)	4,522	9.9	7.8
High income ($7,620 or more)	13,699	10.9	6.6
World	3,665	8.7	10.1

Source: Table A-2.

Table 4. *The coefficient on years of schooling: Mincerian rate of return (regional averages)*

Country	Years of schooling	Coefficient (percent)
Sub-Saharan Africa	5.9	13.4
Asia*	8.4	9.6
Europe/Middle East/North Africa*	8.5	8.2
Latin America/Caribbean	7.9	12.4
OECD	10.9	6.8
World	8.4	10.1

Source: Table A-2.
*Non-OECD.

Table 5. *Change in the returns to investment in education over a 15-year period: Full method (percentage points)*

Educational Level	Social	Private
Primary	−8.2	−2.0
Secondary	−5.7	−1.9
Higher	−1.7	1.7

Source: Table A-9.1 (available from the author).

Table 6. *Change in the returns to education over a 12-year period: Mincerian method*

Returns to education (% points)	−1.7
Mean years of schooling	2.4

Source: Table A-10.1 (available from the author).

Table 7. *Returns to education by gender (percentage)*

Educational level	Men	Women
Primary	20.1	12.8
Secondary	13.9	18.4
Higher	13.4	12.7
Overall*	11.1	12.4

Source: Table A-3 (available from the author).
*Mincerian method.

Table 8. *Selectivity correction on the returns to education by gender (percentage)*

Selectivity correction	Males	Females
No	11.3	12.7
Yes	11.3	12.6

Source: Table 4-4 (available from the author).

Table 9. *Returns to secondary education by curriculum type (percentage)*

	Rate of return	
Curriculum type	Social	Private
Academic/General	15.5	11.7
Technical/Vocational	10.6	10.5

Source: Tables A-5 (Available from the author).

Table 10. *Returns to higher education by faculty (percentage)*

Subject	Social	Private
Agriculture	7.6	15.0
Soc. Science, Arts & Human.	9.1	14.6
Economics & Business	12.0	17.7
Enginering	10.9	19.0
Law	12.7	16.8
Medicine	10.0	17.7
Physics	1.8	13.7
Sciences	8.9	17.0

Source: Table A-6 (available from the author).

Table 11. *Returns to education by economic sector (percentage)*

Economic sector	Rate of return
Private	11.2
Public	9.0

Source: Table A-7 (available from the author).

Table 12. *Returns to education in self vs. dependent employment (percentage)*

Employment type	Rate of return
Self employment	10.8
Dependent employment	12.2

Source: Table A-8 (available from the author).

the screening hypothesis. In addition, Boissiere, Knight and Sabot (1985) found strong support for the human capital hypothesis in explaining earnings differentials in Kenya and Tanzania.

On the interactions between education, earnings and ability, Chou and Lau (1987) introduced Raven's progressive matrices as proxies for genetic ability in an agricultural production function in Thailand and found that the effect of education on farm productivity is upheld. Bound, Griliches and Hall (1986), using US data, found no significant effect of ability on earnings. Psacharopoulos and Velez (1992a) in a study on Colombia introduced reasoning ability (measured by means of Raven's matrices) and the coefficient of years of schooling was reduced from 10.5 to 9.4%. Moreover, Glewwe (1991), using the Raven matrices variable in an earnings function in Ghana, failed to register an effect different than zero in the earnings determination process. Willis (1986), after an exhausting review of the literature, concluded that the complexity of the econometric and theoretical issues surrounding the ability–education–earnings nexus is such that it is difficult to reach any firm conclusion about the size or even the direction of the bias.

The crux of the matter is that the undisputable and universal positive correlation between education and earnings can be interpreted in many different ways.[4] As Ashenfelter (1991) put it, the causation question on whether education really affects earnings can only be answered with experimental data generated by exposing at random different people to various amounts of education. Given the fact that moral and pragmatic considerations prevent the generation of such pure data, researchers will have to make do with indirect

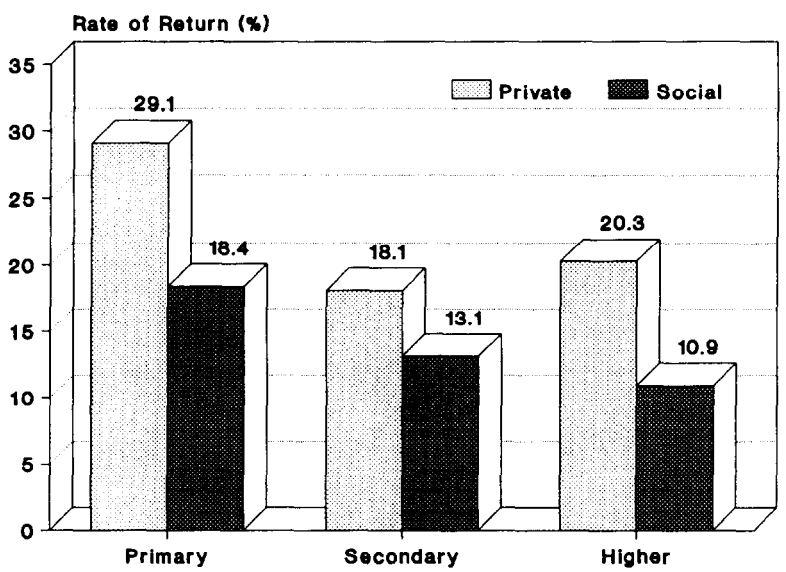

Figure 1. *Returns to investment in education by level, latest year.*

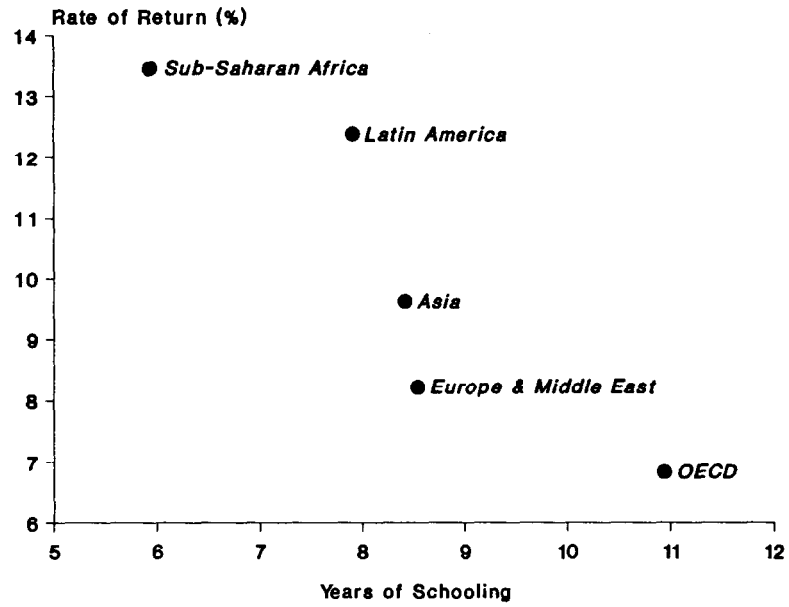

Figure 2. *Mincerian returns and mean years of schooling.*

inferences or natural experiments. Three recent papers report the results of using natural experiments in order to asses the effect of selectivity bias on the returns to education. One example of such a natural experiment was carried out with identical twins who received different amounts of education (as to control for differences in genetic ability). Ashenfelter and Krueger (1992) used such sample of twins and found no bias in the estimated returns to schooling. On the contrary, they found that measurement errors in self-reported schooling differences result in a substantial underestimation from conventionally estimated returns to investment in education.

Another natural experiment refers to the fact that

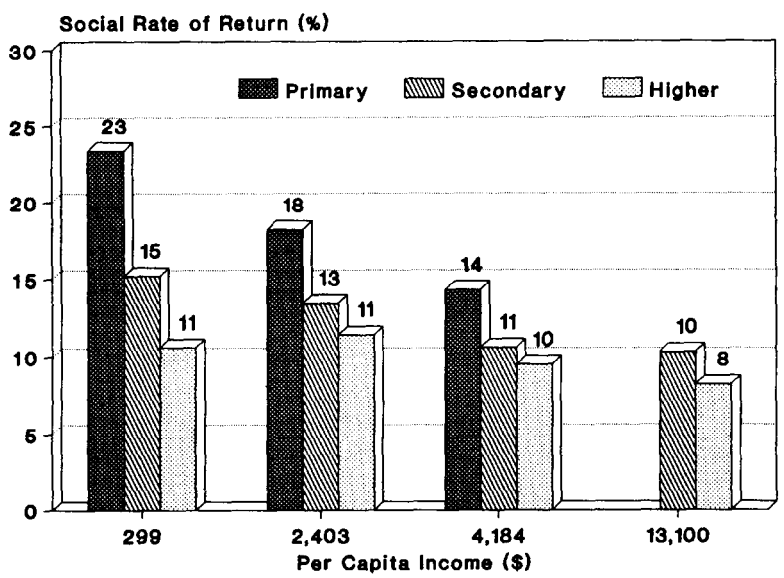

Figure 3. *Social returns to investment in education by income level.*

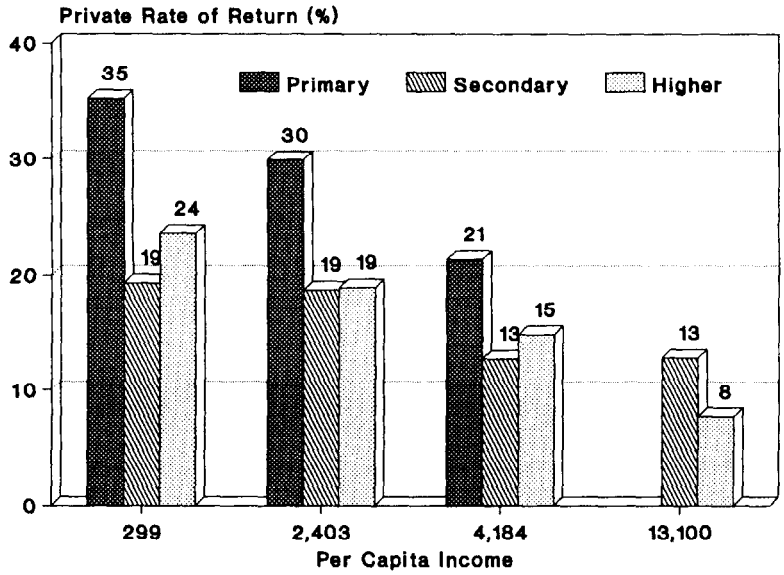

Figure 4. *Private returns to investment in education by income level.*

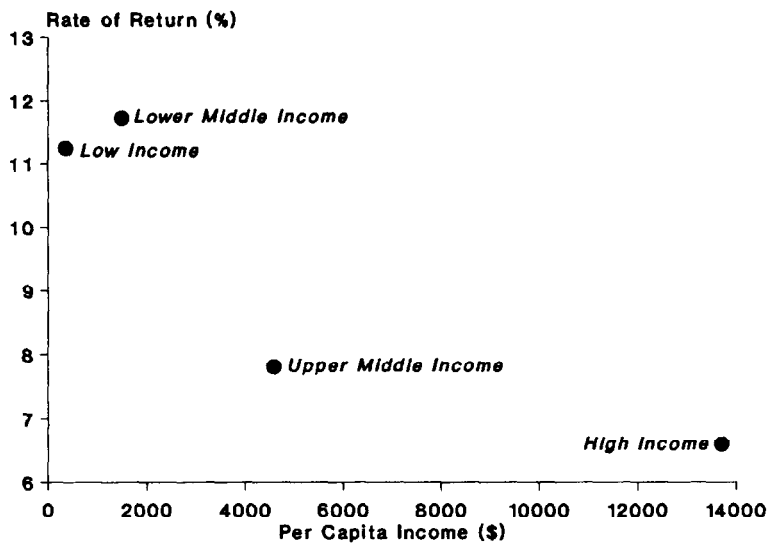

Figure 5. *Mincerian returns by income level.*

many young people in the United States in the early 1970s received more schooling than others as a result of the Vietnam drafting lottery. Those who were likely to be drafted enrolled in school in order to defer military service. By comparing the groups of those with more and less schooling among this cohort of workers, Angrist and Krueger (1992) found that the rate of return to the extra years of schooling was 10% higher than conventional rate of return estimates.

The third natural experiment stems from compulsory school attendance laws. In the United States, those born early in a calendar year start school at an older age relative to those who are born later in the same year, and hence can leave school after completing less years of education. By comparing these two groups, Angrist and Krueger (1991) found a very similar rate of return to investment in education to the one conventionally estimated.

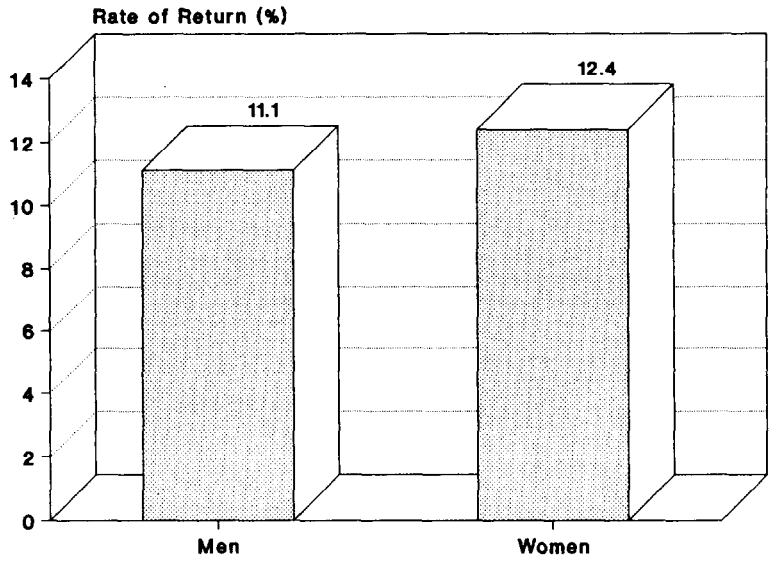

Figure 6. *Mincerian returns to education by gender.*

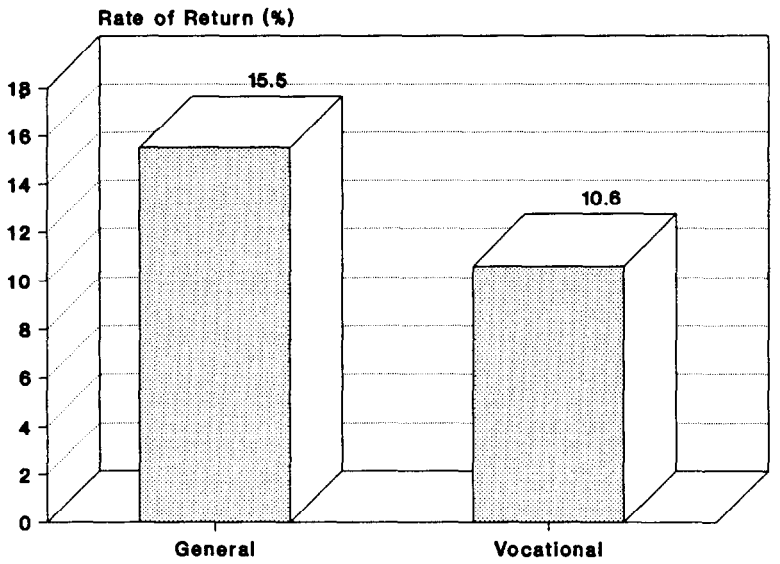

Figure 7. *Social returns to secondary education by curriculum type.*

The issue of the returns to investment in the quality rather quantity of education continues to be the "holy grail" and research frontier in this field.[5] Card and Krueger (1992a) examined the effect of school quality on the returns to education using 1980 US census data. Quality was measured by the student–teacher ratio, the average term length and the relative pay of teachers. They found that people educated in states with high quality schools exhibit higher returns to additional years of schooling. For example, a decrease in class size from 30 to 25 pupils per teacher is associated with a 0.4 percentage point increase in the returns to education. In another paper, Card and Krueger (1992b) found that improvements in the quality of education blacks receive explain 20% of the narrowing of the black–white earnings gap in the United States during 1960–80.

Several books and papers have appeared in the

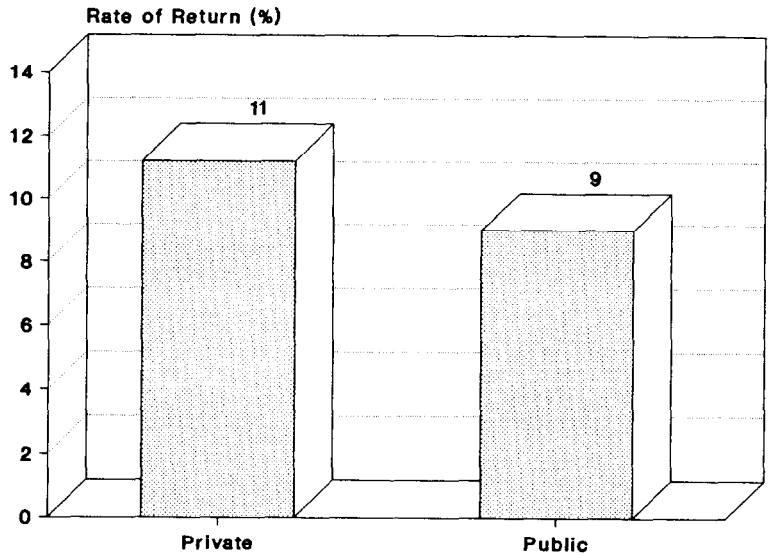

Figure 8. *Returns to education by sector employment.*

literature in the last 15 years claiming that there might be something called "overeducation" in the labor markets, in the United States and in other countries. Different authors have defined it differently.[6] For example, Freeman (1976) defined it as a falling private rate of return to college education in the United States. Rumberger (1981, 1987) cites unrealized expectations, the discrepancy between the educational attainment of workers and the educational requirements of their jobs, or simply "surplus schooling." Surplus schooling is defined as the number of years completed minus years of schooling required by the job, the latter determined from the Dictionary of Occupational Titles, or as subjectively reported by the worker. Using this definition, Rumberger finds that the incidence of overeducation in the United States increased during 1960–76.

Beyond Cohn's (1992) challenge to the surplus schooling thesis, the notion of overeducation might be mechanical and mislead policy. From what point of view can there really be "overeducation"? From the private point of view, one can talk about rates of return below a market level. But if people are willing to invest in their education, in spite of low private returns, they must be deriving some value other than monetary. In addition, if they finance their own education, this is a zero-sum game from the point of view of social policy. These people are not overeducated in any bureaucrat's sense. They are rightly educated according to themselves. One cannot deny people's chance to undertake more education for probable social advancement, or even sheer consumption, if people pay for their own education.

From the social view point there would clearly be a problem if public resources were used to finance a level or type of education that has a social rate of return below the opportunity cost of capital, or if the extra social resources invested in someone's "surplus schooling" does not have a productivity counterpart. As shown above, this has not been demonstrated by any of the "overeducation" or screening literature. Moreover, as shown in the above international comparison, and in more detail for the United States (Kosters, 1990), the premium associated with university studies has been increasing over time. Thus it might be myopic to use norms of years of schooling for specific occupations and say that, because he/she mainly types, a secretary does not need more than secondary education; or because farmers mainly deal with the soil, they do not need to have schooling beyond primary education.

Another debated issue in the literature has been the role of socioeconomic background. Card and Krueger (1992a) find that, holding school quality constant, there is no evidence that parental income or education affects state-level returns to education. But Newman (1991), using Israeli data found that the returns to schooling are higher to those coming from more favorable socioeconomic backgrounds.

Of course education and health interact. For example, Gomes-Neto and Hanushek (1992) find that in Northeast Brazil good student health (defined as good

nutrition and visual acuity) lead to better education performance in terms of achievement and promotion.

6. CONCLUSION

The results of this update are fully consistent with and reinforce earlier patterns. Namely, primary education continues to be the number one investment priority in developing countries, educating females is marginally more profitable than educating males, the academic secondary school curriculum is a better investment than the technical/vocational track, and the returns to education obey the same rules as investment in conventional capital, i.e. they decline as investment is expanded.

Regarding equity considerations, the update has upheld the strong position of university graduates in maintaining their private advantage by means of public subsidization at this level of education.

NOTES

1. I skip the "short-cut" and the "net present value" methods as these are now used less frequently in the literature. For a fuller discussion of the different rate of return estimation methods, see Psacharopoulos and Ng (1994).

2. To purists, the best method would be the net present value. The popularity of this method has declined because net present values are not easily comparable across countries and currencies.

3. It is noted that in the extended (dummy) specification each education coefficient has to be related to the one referring to the previous educational level and divided by the number of years of incremental years of schooling separating the two levels in order for the result to be interpreted as a rate of return.

4. For a superb treatise in this respect, see Blaug (1972).

5. See Solmon (1985) for a useful review of the concepts involved.

6. For a review see Patrinos (1992), and for a recent exchange Cohn (1992), Gill and Solberg (1992) and Verdugo (1992).

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APPENDIX

Table A1. *Returns to investment in education by level (percentage) full method, latest year*

		Social			Private			
Country	Year	Prim.	Sec.	Higher	Prim.	Sec.	Higher	Source
Argentina	1989	8.4	7.1	7.6	10.1	14.2	14.9	Psacharopoulos and Ng (1994)
Australia	1976			16.3		8.1	21.1	See Psacharopoulos (1985)
Austria	1981					11.3	4.2	See Psacharopoulos (1985)
Bahamas	1970		20.6			26.1		See Psacharopoulos (1985)
Belgium	1960		17.1	6.7		21.2	8.7	See Psacharopoulos (1985)
Bolivia	1989	9.3	7.3	13.1	9.8	8.1	16.4	Psacharopoulos and Ng (1994)
Botswana	1983	42.0	41.0	15.0	99.0	76.0	38.0	See Psacharopoulos (1985)
Brazil	1989	35.6	5.1	21.4	36.6	5.1	28.2	Psacharopoulos and Ng (1994)
Canada	1985		10.6	4.3		20.7	8.3	Vaillancourt (1992), Table 7
Chile	1989	8.1	11.1	14.0	9.7	12.9	20.7	Psacharopoulos and Ng (1994)
Colombia	1989	20.0	11.4	14.0	27.7	14.7	21.7	Psacharopoulos and Ng (1994)
Costa Rica	1989	11.2	14.4	9.0	12.2	17.6	12.9	Psacharopoulos and Ng (1994)
Cyprus	1979	7.7	6.8	7.6	15.4	7.0	5.6	See Psacharopoulos (1985)
Denmark	1964			7.8			10.0	See Psacharopoulos (1985)
Dominican Rep.	1989				85.1	15.1	19.4	Psacharopoulos and Ng (1994)
Ecuador	1987	14.7	12.7	9.9	17.1	17.2	12.7	Psacharopoulos and Ng (1994)
El Salvador	1990	16.4	13.3	8.0	18.9	14.5	9.5	Psacharopoulos and Ng (1994)
Ethiopia	1972	20.3	18.7	9.7	35.0	22.8	27.4	See Psacharopoulos (1985)
France	1976					14.8	20.0	Jarousse (1985/86). p. 37
Germany	1978					6.5	10.5	See Psacharopoulos (1985)
Ghana	1967	18.0	13.0	16.5	24.5	17.0	37.0	See Psacharopoulos (1985)
Great Britain	1978		9.0	7.0		11.0	23.0	See Psacharopoulos (1985)
Greece	1977	16.5	5.5	4.5	20.0	6.0	5.5	See Psacharopoulos (1985)
Guatemala	1989				33.8	17.9	22.2	Psacharopoulos and Ng (1994)
Honduras	1989	18.2	19.7	18.9	20.8	23.3	25.9	Psacharopoulos and Ng (1994)
Hong Kong	1976		15.0	12.4		18.5	25.2	See Psacharopoulos (1985)
India	1978	29.3	13.7	10.8	33.4	19.8	13.2	See Psacharopoulos (1985)

continued

Table A1. *Cont.*

Country	Year	Social			Private			Source
		Prim.	Sec.	Higher	Prim.	Sec.	Higher	
Indonesia	1989		11.0	5.0				McMahon and Boediono (1992), Table 7
Iran	1976	15.2	17.6	13.6		21.2	18.5	See Psacharopoulos (1985)
Israel	1958	16.5	6.9	6.6	27.0	6.9	8.0	See Psacharopoulos (1985)
Italy	1969					17.3	18.3	See Psacharopoulos (1985)
Ivory Coast	1984				25.7	30.7	25.1	Komenan (1987), p. 25
Jamaica	1989	17.7	7.9		20.4	15.7		Psacharopoulos and Ng (1992)
Japan	1976	9.6	8.6	6.9	13.4	10.4	8.8	See Psacharopoulos (1985)
Kenya	1980		10.0			16.0		Knight and Sabot (1987), p. 260
Lesotho	1980	10.7	18.6	10.2	15.5	26.7	36.5	See Psacharopoulos (1985)
Liberia	1983	41.0	17.0	8.0	99.0	30.5	17.0	See Psacharopoulos (1985)
Malawi	1982	14.7	15.2	11.5	15.7	16.8	46.6	See Psacharopoulos (1985)
Malaysia	1978					32.6	34.5	See Psacharopoulos (1985)
Mexico	1984	19.0	9.6	12.9	21.6	15.1	21.7	Psacharopoulos and Ng (1994)
Morocco	1970	50.5	10.0	13.0				See Psacharopoulos (1985)
Nepal	1982					15.0	21.7	USAID (1988), p. 2–162
Netherlands	1965		5.2	5.5		8.5	10.4	See Psacharopoulos (1985)
New Zealand	1966		19.4	13.2		20.0	14.7	See Psacharopoulos (1985)
Nigeria	1966	23.0	12.8	17.0	30.0	14.0	34.0	See Psacharopoulos (1985)
Norway	1966		7.2	7.5		7.4	7.7	See Psacharopoulos (1985)
Pakistan	1975	13.0	9.0	8.0	20.0	11.0	27.0	See Psacharopoulos (1985)
Panama	1989				5.7	21.0	21.0	Psacharopoulos and Ng (1994)
Papua N.G.	1986	12.8	19.4	8.4	37.2	41.6	23.0	McGavin (1991), p. 215
Paraguay	1990	20.3	12.7	10.8	23.7	14.6	13.7	Psacharopoulos and Ng (1994)
Peru	1990				13.2	6.6	40.0	Psacharopoulos and Ng (1994)
Philippines	1988	13.3	8.9	10.5	18.3	10.5	11.6	Hossain and Psacharopoulos (1993)
Puerto Rico	1959	24.0	34.1	15.5	68.2	52.1	29.0	See Psacharopoulos (1985)
Rhodesia	1960	12.4						See Psacharopoulos (1985)
Senegal	1985	23.0	8.9		33.7	21.3		Mingat and Jarousse (1985), p. 52
Sierra Leone	1971	20.0	22.0	9.5				See Psacharopoulos (1985)
Singapore	1966	6.6	17.6	14.1		20.0	25.4	See Psacharopoulos (1985)
Somalia	1983	20.6	10.4	19.9	59.9	13.0	33.2	See Psacharopoulos (1985)
South Africa	1980	22.1	17.7	11.8				Trotter (1984), p. 75
South Korea	1986		8.8	15.5		10.1	17.9	Ryoo (1988), p. 158
Spain	1971	17.2	8.6	12.8	31.6	10.2	15.5	See Psacharopoulos (1985)
Sri Lanka	1981					12.6	16.1	Sahn and Aldeman (1988), p. 166
Sudan	1974		8.0	4.0		13.0	15.0	See Psacharopoulos (1985)
Sweden	1967		10.5	9.2			10.3	See Psacharopoulos (1985)
Taiwan	1972	27.0	12.3	17.7	50.0	12.7	15.8	See Psacharopoulos (1985)
Tanzania	1982		5.0					See Psacharopoulos (1985)
Thailand	1970	30.5	13.0	11.0	56.0	14.5	14.0	See Psacharopoulos (1985)
Tunisia	1980					13.0	27.0	Bonattour (1986), p. 15
Turkey	1968			8.5		24.0	26.0	See Psacharopoulos (1985)
Uganda	1965	66.0	28.6	12.0				See Psacharopoulos (1985)
Upper Volta	1982	20.1	14.9	21.3				See Psacharopoulos (1985)
United States	1987		10.0	12.0				McMahon (1991), Table 1
Uruguay	1989	21.6	8.1	10.3	27.8	10.3	12.8	Psacharopoulos and Ng (1994)
Venezuela	1989	23.4	10.2	6.2	36.3	14.6	11.0	Psacharopoulos and Ng (1994)
Yemen	1985	2.0	26.0	24.0	10.0	41.0	56.0	USAID (1986), T.235
Yugoslavia	1986	3.3	2.3	3.1	14.6	3.1	5.3	Bevc (1989), p. 6
Zambia	1983			5.7			19.2	Cole (1988), p. 11
Zimbabwe	1987	11.2	47.6	–4.3	16.6	48.5	5.1	Bennell and Malaba (1991), T.3

Table A2. *The coefficient on years of schooling: Mincerian rate of return, latest year*

Country	Year	Mean years of schooling	Coefficient (percent)	Source
Argentina	1989	9.1	10.3	Psacharopoulos and Ng (1994)
Australia	1987	9.7	5.4	Lorenz and Wagner (1990), pp. 13–14
Austria	1981		11.6	See Psacharopoulos (1985)
Bolivia	1989	10.1	7.1	Psacharopoulos and Ng (1994)
Botswana	1979	3.3	19.1	Lucas and Stark (1985), p. 917
Brazil	1989	5.3	14.7	Psacharopoulos and Ng (1994)
Burkina Faso	1980		9.6	Ram and Singh (1988), p. 421
Canada	1981	13.2	5.2	Lorenz and Wagner (1990), pp. 13–14
Chile	1989	8.5	12.0	Psacharopoulos and Ng (1994)
China	1985	3.0	5.0	Jamison and van der Gaag (1987), p. 163
Colombia	1989	8.2	14.0	Psacharopoulos and Ng (1994)
Costa Rica	1989	6.9	10.9	Psacharopoulos and Ng (1994)
Cote d'Ivoire	1986	6.9	20.1	van der Gaag and Vijverberg (1989), p. 374
Cyprus	1984	9.5	11.0	Demetriades and Psacharopoulos (1987), p. 599
Dominican Rep.	1989	8.8	9.4	Psacharopoulos and Ng (1994)
Ecuador	1987	9.6	11.8	Psacharopoulos and Ng (1994)
El Salvador	1990	6.9	9.7	Psacharopoulos and Ng (1994)
Ethiopia	1972	6.0	8.0	See Psacharopoulos (1985)
France	1977	6.2	10.0	Jarousse and Mignat (1986), p. 11
Germany	1987	10.1	4.9	Lorenz and Wagner (1990), pp. 13–14
Ghana	1989	10.0	8.5	Glewwe (1991), p. 13
Great Britain	1987	11.8	6.8	Lorenz and Wagner (1990), pp. 13–14
Greece	1987	10.0	2.7	Lambropoulos and Psacharopoulos (1992), Table 7
Guatemala	1989	4.3	14.9	Psacharopoulos and Ng (1994)
Honduras	1989	6.5	17.6	Psacharopoulos and Ng (1994)
Hong Kong	1981	9.1	6.1	See Psacharopoulos (1985)
Hungary	1987	11.3	4.3	Lorenz and Wagner (1990), pp. 13–14
India	1980	16.8	4.9	Rao and Datta (1989), p. 377
Indonesia (Java)	1981	5.0	17.0	Byron and Takahashi (1989), p. 115
Iran	1975		11.6	See Psacharopoulos (1985)
Israel	1979	11.2	6.4	Lorenz and Wagner (1990), pp. 13–14
Italy	1987	10.7	2.3	Lorenz and Wagner (1990), pp. 13–14
Jamaica	1989	7.2	28.8	Psacharopoulos and Ng (1992)
Japan	1975	11.1	6.5	Hill (1983), p. 467
Kenya	1970	3.5	16.4	See Psacharopoulos (1985)
Korea, South	1986	8.0	10.6	Ryoo (1988), p. 160
Kuwait	1983	8.9	4.5	Al-Qudsi (1989), p. 270
Malaysia	1979	15.8	9.4	Chapman and Harding (1985), p. 366
Mexico	1984	6.6	14.1	Psacharopoulos and Ng (1992)
Morocco	1970	2.9	15.8	See Psacharopoulos (1985)
Netherlands	1983	9.5	7.4	Lorenz and Wagner (1990), pp. 13–14
Nicaragua	1987	6.5	9.7	Behrman, Wolfe and Blau (1985), p. 11
Pakistan	1979	8.6	9.7	Shabbir (1991), p. 12
Panama	1990	9.2	13.7	Psacharopoulos and Ng (1994)
Paraguay	1990	9.1	11.5	Psacharopoulos and Ng (1994)
Peru	1990	10.1	8.1	Psacharopoulos and Ng (1994)
Philippines	1988	9.0	8.0	Hossain and Psacharopoulos (1993)
Poland	1986	11.1	2.9	Lorenz and Wagner (1990), pp. 13–14
Portugal	1985	9.5	10.0	Kiker and Santos (1991), p. 192
Singapore	1974	8.5	13.4	Liu and Wong (1981), p. 280
South Vietnam	1964		16.8	See Psacharopoulos (1981), p. 280
Sri Lanka	1981	4.5	7.0	See Psacharopoulos (1985)
Sweden	1974	12.4	6.7	See Psacharopoulos (1985)
Switzerland	1987	11.0	7.9	Lorenz and Wagner (1990), pp. 13–14
Taiwan	1972	9.0	6.0	See Psacharopoulos (1985)
Tanzania	1980		11.9	See Psacharopoulos (1985)

Continued

Table A2. *Cont.*

Country	Year	Mean years of schooling	Coefficient (percent)	Source
Thailand	1971	4.1	10.4	See Psacharopoulos (1985)
Tunisia	1980	4.8	8.0	Bonattour (1986), p. 15
United Kingdom	1975	13.0	8.0	See Psacharopoulos (1985)
United States	1987	13.6	9.8	Lorenz and Wagner (1990), pp. 13–14
Uruguay	1989	9.0	9.7	Psacharopoulos and Ng (1994)
Venezuela	1989	9.1	8.4	Psacharopoulos and Ng (1994)