Education Economics
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/cede20

Returns to investment in education: a further update

George Psacharopoulos & Harry Anthony Patrinos

Version of record first published: 05 Oct 2010.

To cite this article: George Psacharopoulos & Harry Anthony Patrinos (2004): Returns to investment in education: a further update, Education Economics, 12:2, 111-134

To link to this article: http://dx.doi.org/10.1080/0964529042000239140

Education Economics, Vol. 12, No. 2, August 2004

Returns to Investment in Education: A Further Update

GEORGE PSACHAROPOULOS & HARRY ANTHONY PATRINOS*

ABSTRACT *Returns to investment in education based on human capital theory have been estimated since the late 1950s. In the 40-plus year history of estimates of returns to investment in education, there have been several reviews of the empirical results in attempts to establish patterns. Many more estimates from a wide variety of countries, including over-time evidence, and estimates based on new econometric techniques, reaffirm the importance of human capital theory. This paper reviews and presents the latest estimates and patterns as found in the literature at the turn of the century. However, because the availability of rate of return estimates has grown exponentially, we include a new section on the need for selectivity in comparing returns to investment in education and establishing related patterns.*

Introduction

Returns to investment in education, in the modern/human capital sense of the term, have been estimated since the late 1950s. In the 40-plus year history of estimates of returns to investment in education, there have been several reviews of the empirical results in attempts to establish patterns (see Psacharopoulos, 1973, 1985, 1994).

The rise in earnings inequality experienced during the 1980s and 1990s in many countries led to renewed interest in estimates of returns to schooling (see, for example, Murphy & Welch, 1992). A very large literature suggests that systematic changes in the production process led to changes in the demand for certain types of labor. It was argued much earlier in the literature that education is more productive the more volatile the state of technology (Nelson & Phelps, 1966; Griliches, 1969; Welch 1970; Schultz, 1975).

A more selective rates of return estimate review focusing on the causality debate between schooling and earnings (Card, 2001) reaffirms Griliches (1970) conclusion that the effect of ability and related factors does not exceed 10% of the estimated schooling coefficient. Instrumental variable (IV) estimates of the returns to education based on family background are higher than classic Ordinary Least Squares estimates based on the early work of Mincer, Becker and Chiswick (Becker & Chiswick, 1966; Mincer, 1974). The estimation method makes little difference on the returns to education. The IV estimates are often higher than Ordinary Least Squares

G. Psacharopoulos, University of Athens, Kasou 5, Athens 11364, Greece. E- mail: gpsach@erols.com
H.A. Patrinos, World Bank, 1818 H Street, NW, Washington DC, 20433, USA.
E-mail: hpatrinos@worldbank.org

ISSN 0964–5292 Print; 1469–5782 Online/04/020111–24
DOI: 10.1080/0964529042000239140

estimates, although it is unclear to what extend this is due to measurement error or inadequate instrumentation (see Trostel *et al.*, 2002).

In this paper, we begin by following the tradition and present latest estimates and patterns. However, because the availability of rate of return estimates has grown exponentially, we include a new section on the need for selectivity in comparing returns to investment in education and establishing related patterns.

The Latest Patterns

The classic pattern of falling returns to education by level of economic development and level of education are maintained (see Tables 1 and 2 and Figures 1–4). Also, in the updated data set the private returns to higher education are increasing. These new results are based on six new observations and updated estimates for 23 countries since the last review (Psacharopoulos, 1994). Estimates of the raw returns to education for 98 countries are presented in Appendix A, Tables A1–A4. These estimates cut along policy issues in the literature. An effort has been made to select rates of return as comparable as possible (but see the section next).

Private returns are higher than 'social' returns, where the latter is defined on the basis of private benefits but total (private plus external) costs (Figure 1). This is because of the public subsidization of education and the fact that typical social rate of return estimates are not able to include social benefits. Nevertheless, the degree of public subsidization increases with the level of education, which has regressive income distribution implications.

Overall, the average rate of return to another year of schooling is 10%. Returns to education by level of country income are presented in Table 3 (and Figure 4). The highest returns are recorded for low-income and middle-income countries. This update includes new country estimates and updated estimates for 42 countries.

Average returns to schooling are highest in the Latin America and the Caribbean region and for the sub-Saharan Africa region (Table 4). Returns to schooling for Asia are at about the world average. The returns are lower in the high-income countries of the OECD. Interestingly, average returns to schooling are lowest for the non-OECD European, Middle East and North African group of countries.

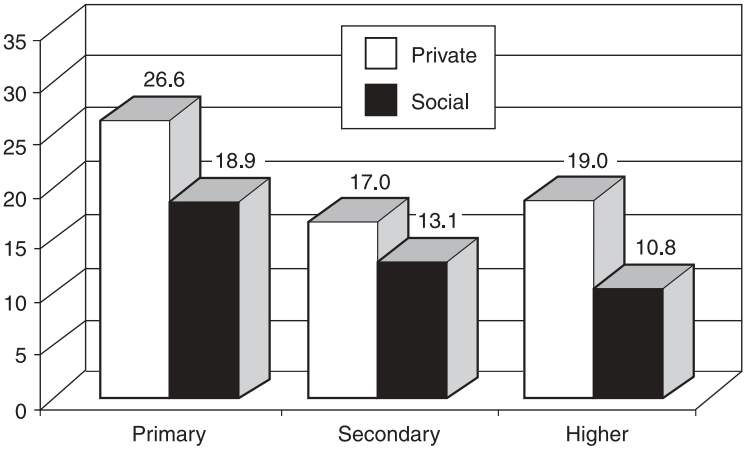

Fig. 1. Returns to investment in education by level, latest year.

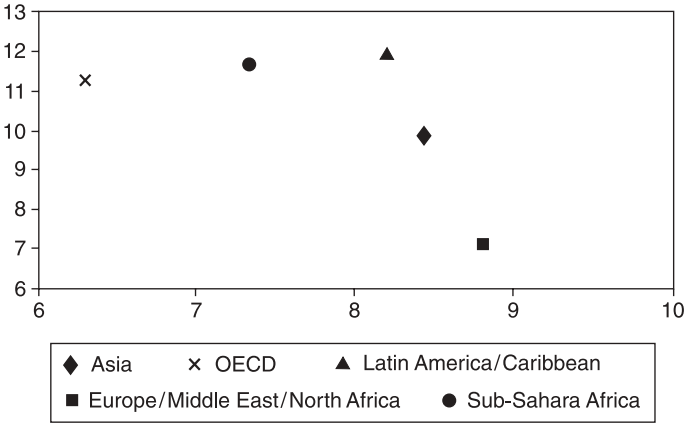

Fig 2. Mincerian returns and mean years of schooling.

During the past 12 years, average returns to schooling have declined by 0.6 percentage points (see Appendix A, Table A4). At the same time, average schooling levels have increased. Therefore, and according to theory, everything else being the same, an increase in the supply of education has led to a slight decrease in the returns to schooling.

Overall, women receive higher returns to their schooling investments (Table 5 and Figure 5). But the returns to primary education are much higher for men (20%) than for women (13%). Women, however, experience higher returns to secondary education (18% versus 14%).

A More Selective Approach

Returns to education compilations, as already presented, have been attacked in the literature (see Bennell, 1996), although not for the right reasons (see Psacharopoulos,

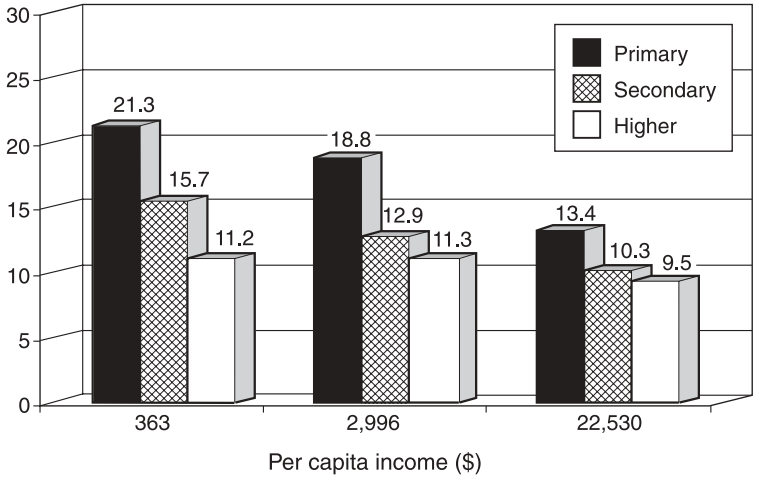

Fig 3. Social returns to investment in education by income level.

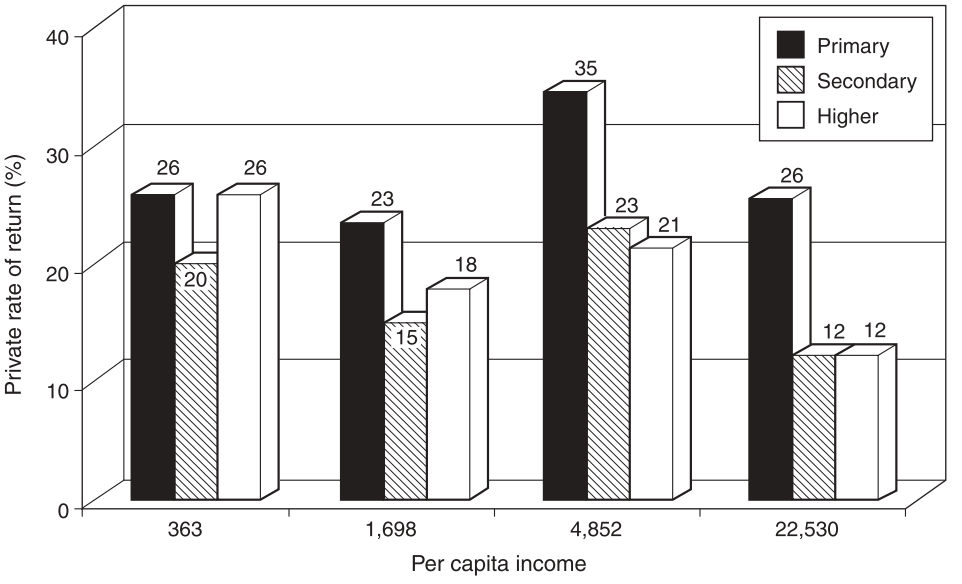

Fig. 4. Private returns to investment in education by income.

1996). The real reason one should be skeptical about indiscriminate rate of return compilations, and in spite of the efforts of the compilers, is that in the original works the estimates are rarely fully comparable. There are two main sources of non-comparability: data sample coverage and methodology.

Ideally, a rate of return to investment in education should be based on a representative sample of the country's population. But in reality this is the exception rather than the rule. This is problematic when the estimated rates of return are based on a survey of firms—rather than households—because firm-based samples are highly selective. In order to control survey costs, such samples focus on large firms with many employees. Second, the questionnaire is typically filled by the payroll department rather than by the individual employee. Typically, this approach leads to the use of samples concentrated only in urban areas.

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

	Social			Private		
Region	Primary	Secondary	Higher	Primary	Secondary	Higher
Asia*	16.2	11.1	11.0	20.0	15.8	18.2
Europe/Middle East/North Africa*	15.6	9.7	9.9	13.8	13.6	18.8
Latin America/Caribbean	17.4	12.9	12.3	26.6	17.0	19.5
OECD	8.5	9.4	8.5	13.4	11.3	11.6
Sub-Saharan Africa	25.4	18.4	11.3	37.6	24.6	27.8
World	18.9	13.1	10.8	26.6	17.0	19.0

Source: Table A1.
*Non-OECD.

Table 2. Returns to investment in education by level, latest year, averages by per-capita income group (%)

Per-capita income group	Mean per capita (US$)	Social			Private		
		Primary	Secondary	Higher	Primary	Secondary	Higher
High income ($9266 or more)	22,530	13.4	10.3	9.5	25.6	12.2	12.4
Low income ($755 or less)	363	21.3	15.7	11.2	25.8	19.9	26.0
Middle income (to $9265)	2996	18.8	12.9	11.3	27.4	18.0	19.3
World	7669	18.9	13.1	10.8	26.6	17.0	19.0

Source: Table A1.

Another problem occurs when rate of return estimates are based on samples that include civil servants. This is a problem because public sector wages typically do not reflect market wages. Of course, in many countries—although fewer now than in the past—the majority of university graduates end up in public sector employ-

Table 3. The coefficient on years of schooling: mean rate of return (based on Mincer–Becker–Chiswick)

Per-capita income group	Mean per capita (US$)	Years of schooling	Coefficient (%)
High income ($9266 or more)	23,463	9.4	7.4
Low income ($755 or less)	375	7.6	10.9
Middle income (to $9265)	3025	8.2	10.7
World	9160	8.3	9.7

Source: Table A2.

ment. The concentration of graduates in public sector employment is identified as a problem in growth studies (see, for example, Pissarides, 2000). However, civil service pay-based rate of return estimates are useful in private calculations regarding the incentives set by the state to invest in education—and opt for employment in the public sector.

Table 4. The coefficient on years of schooling: rate of return (based on Mincer–Becker–Chiswick): regional averages

Region	Mean per capita (US$)	Years of schooling	Coefficient (%)
Asia	5182	8.4	9.9
Europe/Middle East/North Africa	6299	8.8	7.1
Latin America/Caribbean	3125	8.2	12.0
OECD	24,582	9.0	7.5
Sub-Saharan Africa	974	7.3	11.7
World	9160	8.3	9.7

Source: Table A2.
*Non-OECD.

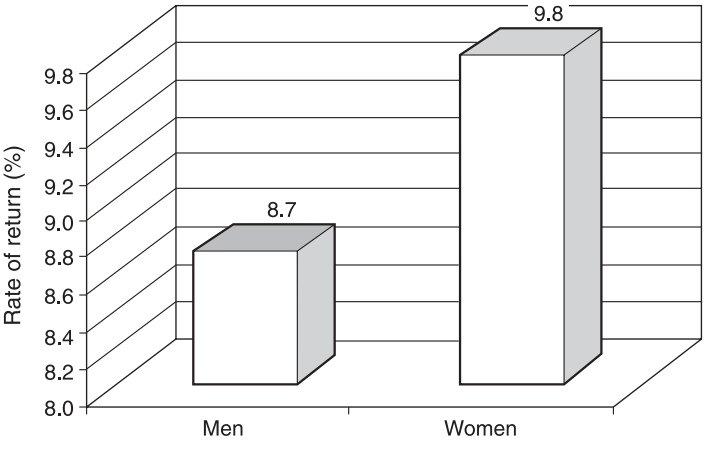

Fig. 5. Mincerian returns to education by gender.

Turning to methodology, a less serious problem occurs when wage effects are confused for returns to education. Mincer (1974) has provided a great service and convenience in estimating returns to education by means of the semi-log earnings function (see also Becker & Chiswick, 1966). However, for the sake of that convenience, many researchers use the raw coefficients of education in the extended (dummy-form) function to report returns to education, whereas these are wage effects.

Another methodological limitation, despite Becker's (1964) warning, is that many researchers feel obliged to throw in the regression whatever independent variables they seem to have in the data set, including occupation. In effect, this procedure leads to stealing part of the effect of education on earnings that comes from occupational mobility. Of course, researchers who include occupation dummies in earnings functions do so because they are interested in modeling earnings, not necessarily in evaluating the rate of return to schooling. Obviously, such practice creates a problem when people other that the authors of these studies interpret the schooling coefficient as a Mincerian rate of return.

Perhaps the returns to education estimates that stem from the work of Ashenfelter and others using twins (Ashenfelter & Krueger, 1994; Miller *et al.*, 1995; Ashenfelter & Rouse, 1998; Rouse, 1999; Behrman & Rosenzweig, 1999) and other natural experiments are the most reliable of all. According to this work, the overall private rate of return to investment in education in the United States is of the order of 10%. This figure establishes a benchmark for what the social rate of return would be (a couple of percentage points lower, if not adjusted for externalities), or

Table 5. Returns to education by gender (%)

Educational level	Men	Women
Primary	20.1	12.8
Secondary	13.9	18.4
Higher	11.0	10.8
Overall	8.7	9.8

Source: Table A3.

what the rate of return should be in a country with a lower per-capita income that the United States (several percentage points higher, as based on the extrapolation of the non-so-comparable returns to education presented earlier).

Incidentally, estimates of the returns to education based on analysis of twins' earnings—as well as estimates using IV measures (see, for example, Card, 2001) come to an average rate of return that is very similar to the global average presented in this compliation: 10%.

In our survey, it would be preferable if we could cite for each country only estimates incorporating the most rigorous methodology described earlier. That would give us less than a few countries. The returns presented in Appendix A, Table A2 and A3 are mostly based on large random samples of the population, and no extraneous variables such as occupation or personal characteristics such as being married have been included in the right-hand-side of the earnings function. Selectivity bias has been accounted for in the case of women in most Latin American countries (based originally on Psacharopoulos & Tzannatos, 1992), although such correction was not statistically significant. Few studies have instrumented years of schooling.

Extensions

There is a concern in the literature with what might be called 'social' rates of return that include true social benefits, or externalities. Efforts to make such estimates are numerous, but the estimates vary widely. The earnings of educated individuals do not reflect the external benefits that affect society as a whole but are not captured by the individual. Such benefits are known as externalities or spillover benefits, since they spill over to other members of the community. They are often hard to identify and even harder to measure. In the case of education, some have succeeded in identifying positive externalities but few have been able to quantify them (but see Weisbrod, 1964; Haveman & Wolfe, 1984). If one could include externalities, then social rates of return may well be higher than private rates of return to education. A recent review finds that empirical evidence is scarce and inconclusive, providing some support for human capital externalities, but not very strong (Venniker, 2001). These studies estimate externalities in the form of individual's human capital enhancing the productivity of other factors of production through channels that are not internalized by the individual (similar to Lucas' [1988] theory). As Venniker (2001) states, evidence is not unambiguous. In fact, some estimates give negative values, while others give very high estimates. In developing countries, our review corroborates the 'education for all' drive, especially in sub-Saharan Africa. The results also strengthen the case for combating child labor; not only in terms of physical hazard to the child, but also in terms of a foregone investment.

The evidence comes from a few studies. The cross-country regressions take the log of Gross Domestic Product per capita explained by average schooling and additional control variables. The micro studies refer to individual log wage explained by individual years of schooling, average years of schooling in a relevant geographical area, and additional control variables. The social returns equal the sum of the two schooling coefficients. Heckman and Klenow (1997) estimate the externality by comparing the schooling coefficient from cross-country regressions with those from cross-individual regressions. When they take into account differences in technology, social returns become similar to private returns. Rauch (1993) looks at the effect of average education on workers' wages and finds significant externalities. However, average and own education may be highly correlated. Acemoglu and Angrist (2000)

correct for this using instrumental variables. A few studies in Africa have focused on estimating external benefits of education in agriculture using the education of neighboring farmers. A 1-year rise in the average primary schooling of neighboring farmers is associated with a 4.3% rise in output compared with a 2.8% effect of own farmer primary education in Uganda (Appleton & Balihuta, 1996; reported in Appleton, 2000). Another study finds 56% and 2% figures for Ethiopia, but seems rather too high (Weir, 1999; reported in Appleton, 2000). The results overall are inconclusive.

Policy Issues

Not only has the academic literature on returns to schooling increased, as is evidenced here, both in quantity and quality, but the policy implications have changed, too. No longer are returns to education seen as prescriptive, but rather as indicators, suggesting areas of concentration. A good example is the impact of technology on wage differentials, which led to a huge literature on changing wage structures (see, for example, Krueger, 1993; Patrinos, 2001).

At the same time, the importance of returns to education is seen in their adoption as a key indicator by the OECD (2001a) in their annual *Education at a Glance* series and other policy documents (OECD, 1997, 2001b). Increasingly, governments and other agencies are funding studies of returns to education along with other research, to guide macro-policy decisions about the organization and financing of education reforms. This was the case in the United Kingdom's higher education reforms as well as the Australian higher education financing reforms.

Innovative use of rate of return studies is being used to both set overall policy guidelines and to evaluate specific programs. Examples include the Indonesia school-building program (Duflo, 2001), India's blackboard project (Chin, 2001) and Ethiopia's major sector investment program (World Bank, 1998).

Above all, returns to schooling are a useful indicator of the productivity of education and incentive for individuals to invest in their own human capital. Public policy needs to heed this evidence in the design of policies and crafting of incentives that both promote investment and ensure that low-income families make those investments.

Conclusion

By way of summary, and based on the fix provided by the newer quasi-experimental research on the economics of education, investment in education behaves in a more or less similar manner as investment in physical capital. In advanced industrial countries, the returns to human and physical capital tend to be equated at the margin.

At the same time, we should point to a major research gap, which is the marriage between the micro and the macro evidence on the returns to education. Whereas at the micro case, as amply demonstrated earlier, it is established beyond any reasonable doubt that there are tangible and measurable returns to investment in education, such evidence is not as consistent and forthcoming in the macro literature (see, for example, Pritchett, 2001; for a different perspective, see Krueger & Lindahl, 1998; Psacharopoulos, 2000).

More research on the social benefits of schooling is needed. For developing countries, there is a need for more evidence on the impact of education on earnings using a quasi-experimental design. There are more opportunities today for this type of research. Moreover, this research needs to be used to create programs that promote more investment and reform financing mechanisms.

Acknowledgements

The views expressed in this paper are the authors' and should not be attributed to the World Bank Group. Comments received from Barry Chiswick, Walter McMahon, an anonymous referee for this journal, and from Steve Bradley are greatly appreciated. The excellent contributions of Kyriakos Georgiades are greatly appreciated. The authors also acknowledge the research assistance of Leila Mamedova and Anahit Poghosyan.

References

Acemoglu, D. & Angrist, J. (2000) How large are human capital externalities? Evidence from compulsory schooling laws, *mimeo* (Cambridge, MA, MIT).

Alba-Ramirez, A. & San Segundo, M.-J. (1995) The return to education in Spain, *Economics of Education Review,* 14(2), pp. 155–166.

Appleton, S. (2000) Education and health at the household level in sub-Saharan Africa, *Working Paper No. 33* (Cambridge, MA, Harvard University Center for International Development).

Appleton, S. & Balihuta, A. (1996) Education and agricultural productivity: evidence from Uganda, *Working Paper No. WPS/96–5* (Oxford, Centre for the Study of African Economies, Oxford University).

Arai, M. & Kjellstrom, C. (1999) Returns to human capital in Sweden, in: Asplund, R. and Pereira, P. T. (Eds) *Returns to Human Capital in Europe* (Helsinki, ETLA, The Research Institute of the Finnish Economy).

Ashenfelter, O. & Krueger, A. B. (1994) Estimates of the economic return to schooling from a new sample of twins, *American Economic Review,* 84(5), pp. 1157–1173.

Ashenfelter, O. & Rouse, C. E. (1998) Income, schooling, and ability: evidence from a new sample of twins, *Quarterly Journal of Economics,* 113, pp. 253–284.

Asplund, R. (1999) Earnings and human capital: evidence for Finland, in: Asplund, R. & Pereira, P. T. (Eds) *Returns to Human Capital in Europe* (Helsinki, ETLA, The Research Institute of the Finnish Economy).

Barth, E. & Roed, M. (1999) The return to human capital in Norway, in: Asplund, R. & Pereira, P. T. (Eds) *Returns to Human Capital in Europe* (Helsinki, ETLA, The Research Institute of the Finnish Economy).

Becker, G. S. (1964) *Human Capital: A Theoretical and Empirical Analysis* (New York, National Bureau of Economic Research).

Becker, G. S. & Chiswick, B. R. (1966) Education and the distribution of earnings, *American Economic Review*, 56, pp. 358–369.

Bedi, A. (1997) The importance of school quality as determinant of earnings in a developing country: evidence from Honduras, *International Journal of Educational Development,* 17(4), pp. 427–437.

Behrman, J. R. & Rosenzweig, M. R. (1999) 'Ability' bias in schooling returns and twins: a test and new estimates, *Economics of Education Review,* 18(2), pp. 159–167.

Belli, P. & Ayadi, M. A. (1998) Returns to investment in education: the case of Nicaragua, *mimeo* (Washington, DC, World Bank).

Bennell, P. (1996) Rates of return to education: does the conventional pattern prevail in sub-Saharan Africa?, *World Development,* 24(1), pp. 183–199.

Bevc, M. (1993) Rates of return to investment in education in former Yugoslavia in the 1970s and 1980s by region, *Economics of Education Review,* 12(4), pp. 325–343.

Brunello, G., Comi, S. & Lucifora, C. (1999) Returns to education in Italy: a review of the applied literature, in: Asplund, R. & Pereira, P. T. (Eds) *Returns to Human Capital in Europe* (Helsinki, ETLA, The Research Institute of the Finnish Economy).

Card, D. (2001) Estimating the return to schooling: progress on some persistent econometric problems, *Econometrica,* 69(5), pp. 1127–1160.

Chin, A. (2001) The returns to school quality when school quality is very low: evidence from operation blackboard in India, *mimeo* (Texas, Department of Economics, University of Houston).

Christensen, J. J. & Westergard-Nielsen, N. (1999) Wages and human capital: the Danish evidence, in: Asplund, R. & Pereira, P. T. (Eds) *Returns to Human Capital in Europe* (Helsinki, ETLA, The Research Institute of the Finnish Economy).

Cohen, B. & House, W. J. (1994) Education, experience and earnings in the labor market of a developing economy: the case of urban Khartoum, *World Development,* 22(10), pp. 1549–1565.

Cohn, E. (1997) The rate of return to schooling in Canada, *Journal of Education Finance,* 23(2), pp. 193–206.
Cohn, E. & Addison, J. T. (1998) The economic returns to lifelong learning, *Education Economics,* 6(3), pp. 253–308.
Dabalen, A. (1998) Returns to education in Kenya and South Africa: instrumental variable estimates, *mimeo* (Berkeley, CA, University of California).
Duflo, E. (2001) Schooling and labor market consequences of school construction in Indonesia: evidence from an unusual policy experiment, *American Economic Review,* 91(4), pp. 795–813.
EdInvest (1999) The Gambia: an assessment of the private education sector. Available online: http://www.ifc.org/edinvest/.
Fersterer, J. & Winter-Ebmer, R. (1999) Human capital and earnings in Austria, in: Asplund, R. & Pereira, P. T. (Eds) *Returns to Human Capital in Europe* (Helsinki, ETLA, The Research Institute of the Finnish Economy).
Filer, R., Jurajda, S. & Planovsky, J. (1999) Education and wages in the Czech and Slovak Republics during transition, *Labour Economics,* 6, pp. 581–593.
Fiszbein, A. & Psacharopoulos, G. (1993) A cost benefit analysis of educational investment in Venezuela: 1989 update, *Economics of Education Review,* 12(4), pp. 293–298.
Funkhouser, E. (1996) The urban informal sector in central America, *World Development,* 24(11), pp. 1737–1751.
Glewwe, P. (1996) The relevance of standard estimates of rates of return to schooling for education policy: a critical assessment, *Journal of Development Economics,* 51, pp. 267–290.
Griffin, P. & Cox Edwards, A. (1993) Rates of return to education in Brazil: do labor market conditions matter?, *Economics of Education Review,* 12(3), pp. 245–256.
Griliches, Z. (1969) Capital–skill complementarity, *Review of Economics and Statistics,* 51(4), pp. 465–468.
Griliches, Z. (1970) Notes on the role of education in production functions and growth accounting, in: Hansen, W. L. (Ed.) *Education, Income and Human Capital* (New York, National Bureau of Economic Research).
Harmon, C. & Walker, I. (1995) Estimates of the economic return to schooling for the United Kingdom, *American Economic Review,* 85(5), pp. 1278–1286.
Harmon, C. & Walker, I. (1999) The marginal and average returns to schooling in the UK, *European Economic Review,* 43, pp. 879–887.
Hartog, J., Odink, J. & Smits, J. (1999) Private returns to education in the Netherlands, in: Asplund, R. & Pereira, P. T. (Eds) *Returns to Human Capital in Europe* (Helsinki, ETLA, The Research Institute of the Finnish Economy).
Haveman, R. H. & Wolfe, B. (1984) Schooling and economic well-being: the role of non-market effects, *Journal of Human Resources,* 19(3), pp. 128–140.
Heckman, J. & Klenow, P. (1997) Human capital policy, *mimeo* (Chicago, IL, University of Chicago).
Hossain, S. I. (1997) Making education in China equitable and efficient, *Policy Research Working Paper No. 1814* (Washington, DC, World Bank).
Horowitz, A. & Schenzler, C. (1999) Returns to general, technical and vocational education in developing countries: recent evidence from Suriname, *Education Economics,* 7(1), pp. 5–19.
Ichino, A. & Winter-Ebmer, R. (1999) Lower and upper bounds of returns to schooling: an exercise in IV estimation with different instruments, *European Economic Review,* 43, pp. 889–901.
Isacsson, G. (1999) Estimates of the return to schooling in Sweden from a large sample of twins, *Labour Economics,* 6, pp. 471–489.
Jones, P. (2001) Are educated workers really more productive?, *Journal of Development Economics,* 64, pp. 67–79.
Katsis, A., Mattson, R. & Psacharopoulos, G. (1998) Explaining educational development in Pakistan: an analysis of the 1991 Household Survey, *Journal of Educational Planning and Administration,* 13(1), pp. 17–36.
Kingdon, G. G. (1998) Does the labour market explain lower female schooling in India?, *Journal of Development Studies,* 35(1), pp. 39–65.
Kling, J. (1999) Interpreting instrumental variable estimates of the returns of schooling, *Working Paper No. 415* (Princeton, NJ, Industrial Relations Section, Princeton University).
Kroncke, C. & Smith, K. (1999) The wage effects of ethnicity in Estonia, *Economics of Transition,* 7(1), pp. 179–199.
Krueger, A. B. (1993) How computers have changed the wage structure: evidence from microdata, 1984–89, *Quarterly Journal of Economics,* 108(1), pp. 33–60.

Krueger, A. B. & Lindahl, M. (1998) Education for growth: why and for whom?, *mimeo* (Princeton, NJ, Princeton University)
Lambropoulos, H. & Karadjia, E. (1999) The financing and the economics of higher education in Egypt, *mimeo* (Washington, DC, World Bank).
Lassibille, G. & Navarro Gomez, L. (1998) The evolution of returns to education in Spain 1980–1991, *Education Economics,* 6(1), pp. 3–10.
Liu, Z. (1998) Earning, education and economic returns to urban China, *Economic Development and Cultural Change,* 46(4), pp. 697–725.
Lorenz, W. & Wagner, J. (1993) A note on returns to human capital in the eighties: evidence from twelve countries, *Jahrbucher fur National Okonomie und Statistik,* 211(1–2), pp. 60–72.
Lucas, R. E. (1988) On the mechanics of economic development, *Journal of Monetary Economics,* 22, pp. 3–22.
Maani, S. A. (1996) Private and social rates of return to secondary and higher education in New Zealand: evidence from the 1991 Census, *Australian Economic Review,* 1, pp. 82–100.
Magoula, T. & Psacharopoulos, G. (1999) Schooling and monetary rewards in Greece: an over-education false alarm, *Applied Economics,* 31, pp. 1589–1597.
Maluccio, J. (1998) Endogeneity of schooling in the wage function: evidence from the rural Philippines, *FCND Discussion Paper No. 54* (Washington, DC, International Food Policy Research Institute).
Mason, A. & Khandker, S. (1997) Household schooling decisions in tanzania, *mimeo* (Washington DC, World Bank).
Menon, M. (1995) Factors influencing the demand for higher education in Cyprus, Doctoral dissertation, University of London.
Miller, P., Mulvey, C. & Martin, N. (1995) What do twins studies reveal about the economic returns to education? A comparison of Australian and U.S. findings, *American Economic Review,* 85(3), pp. 586–599.
Mincer, J. (1974) *Schooling, Experience, and Earnings* (New York, National Bureau of Economic Research).
Mokitimi, N. R. & Nieuwoudt, W. L. (1995) Off-farm wage returns to education: evidence from Lesotho, *Development Southern Africa,* 12(6), pp. 839–849.
Moock, P., Patrinos, H. & Venkataraman, M. (1998) Education and earnings in a transition economy (Vietnam), *World Bank Policy Research Paper 1920* (Washington, DC, World Bank).
Mora, J.-G. (1999) Socioeconomic background, schooling, and monetary rewards in Spain, *mimeo* (Valencia, University of Valencia).
Munich, D., Terrell, K. & Svejnar, J. (1999) Returns to human capital from the communist wage grid to transition: retrospective evidence from Czech micro data, *mimeo, William Davidson Institute Working Paper No. 277* (Ann Arbor, MI, University of Michigan).
Murphy, K. & Welch, F. (1992) The structure of wages, *Quarterly Journal of Economics,* 107, pp. 285–326.
Nelson, R. R. & Phelps, E. S. (1966) Investment in humans, technological diffusion, and economic growth, *American Economic Review,* 65(2), pp. 69–75.
Nesterova, V. D. & Sabirianova, K. Z. (1998) Investing in human capital under economic transformation in Russia, Economic Education and Research Consortium, Russia Economic Research Program, *Working Paper Series No. 99/04* (Moscow).
Noorkoiv, R., Orazem, P. F., Puur, A. & Vodopivec, M. (1998) Employment and wage dynamics in Estonia, 1989–95, *Economics of Transition,* 6(2), pp. 481–503.
OECD (1997) *Human Capital Investment: An International Comparison* (Paris, OECD).
OECD (2001a) *Education at a Glance: OECD Indicators 2001* (Paris, OECD).
OECD (2001b) *Education Policy Analysis 2001* (Paris, OECD).
Parajuli, D. (1999) External efficiency and equity in Nepalese education, *mimeo* (Washington, DC, World Bank).
Patrinos, H. A. (1995) Education and earnings differentials, *mimeo* (Washington, DC, World Bank).
Patrinos, H. A. (2001) Technology and labor market outcomes: implications for education, *mimeo* (Washington, DC, World Bank.)
Patrinos, H. A., Velez, E. & Psacharopoulos, G. (1994) Language, education and earnings in Asuncion, Paraguay, *Journal of Developing Areas,* 29, pp. 57–68.
Pissarides, C. A. (2000) Human capital and growth: a synthesis report, OECD Development Centre, *Technical Papers No. 168* (Paris, OECD).

Pritchett, L. (2001) Where has all the education gone?, *World Bank Economic Review,* 15(3), pp. 367–393.
Psacharopoulos, G. (1973) *Returns to Education: An International Comparison* (Amsterdam, Elsevier).
Psacharopoulos, G. (1985) Returns to education: a further international update and implications, *Journal of Human Resources,* 20(4), pp. 583–604.
Psacharopoulos, G. (1994) Returns to investment in education: a global update, *World Development,* 22(9), pp. 1325–1343.
Psacharopoulos, G. (1996) A reply to Bennell, *World Development,* 24(1), p. 201.
Psacharopoulos, G. (2000) The economic costs of child labor, *By the Sweat and Toil of Children* (Washington, DC, Department of Labor).
Psacharopoulos, G. & Tzannatos, P. (1992) *Women's Employment and Pay in Latin America* (Washington, DC, World Bank).
Psacharopoulos, G. & Mattson, R. (1998) Estimating the returns to education: a sensitivity analysis of methods and sample size, *Journal of Educational Development and Administration,* 12(3), pp. 271–287.
Psacharopoulos, G., Velez, E., Panagides, A. & Yang, H. (1996) The returns to education during boom and recession: Mexico 1984, 1989 and 1992, *Education Economics,* 4(3), pp. 219–230.
Rauch, J. (1993) Productivity gains from geographic concentration of human capital: evidence from the cities, *Journal of Urban Economics,* 34, pp. 380–400.
Rouse, C. E. (1999) Further estimates of the economic return to schooling from a new sample of twins, *Economics of Education Review,* 18(2), pp. 149–157.
Rummery, S., Vella, F. & Verbeek, M. (1999) Estimating the returns to education for Australian youth via rank-order instrumental variables, *Labour Economics,* 6, pp. 491–507.
Rutkowski, J. (1997) Low wage employment in transitional economies of Central and Eastern Europe, *Economic Policy and Transitional Economies,* 7(1), pp. 105–130.
Ryoo, J.-K., Nam, Y.-S. & Carnoy, M. (1993) Changing rates of return to education over time: a Korean case study, *Economics of Education Review,* 12(1), pp. 71–80.
Sakellariou, C. (2003) Rates of return to investments in formal and technical/vocational education in Singapore, *Education Economics,* 11(1). pp. 73–87.
Schady, N. R. (2000) What education pays? Non-linear returns to schooling among Filipino men, *mimeo* (Washington, DC, World Bank).
Schultz, T. W. (1975) The value of the ability to deal with disequilibria, *Journal of Economic Literature,* 13(3), pp. 827–846.
Schultz, T. P. (1994) Human capital investment in women and men, *International Center for Economic Growth Occasional Paper No. 44* (New Haven, CT, Yale University).
Tansel, A. (1994) Wage employment, earning and returns to schooling for men and women in Turkey, *Economics of Education Review,* 13(4), pp. 305–320.
Trostel, P., Walker, I. & Woolley, P. (2002) Estimates of the economic return to schooling for 28 countries, *Labour Economics,* 9, pp. 1–16.
Varga, J. (1995) Returns to education in Hungary, *Acta Oeconomica,* 47(1–2), pp. 201–216.
Venniker, R. (2001) Social returns to education: a survey of recent literature on human capital externalities, *CPB (Netherlands Bureau for Economic Policy Analysis) Report 00/1.* Available online: (http://www.cpb.nl/eng/cpbreport/2000_1/s3_4.pdf).
Weber, B. & Wolter, S. (1999) Wages and human capital: evidence from Switzerland, in: Asplund, R. and Pereira, P. T. (Eds) *Returns to Human Capital in Europe* (Helsinki, ETLA, The Research Institute of the Finnish Economy).
Wei, X., Tsang, M. C., Wu, W. & Chen, L.-K. (1999) Education and earning in rural China, *Education Economics,* 7(2), pp. 167–188.
Weir, S. (1999) The effects of education on farmer productivity in rural Ethiopia, *Centre for the Study of African Economies Working Paper No. WPS/99–7* (Oxford, Oxford University).
Weisbrod, B. A. (1964) *External Benefits of Education* (Princeton, NJ, Princeton University, Industrial Relations Section).
Welch, F. (1970) Education in production, *Journal of Political Economy,* 78(1), pp. 35–59.
World Bank (1996a) *Republic of Ghana: basic education sector improvement program, Report No. 15570-GH* (Washington, DC, World Bank).
World Bank (1996b) *Bolivia: Poverty, Equity, and Income, Report No. 15272-BO* (Washington, DC, World Bank).
World Bank (1998) *Ethiopia: Education Sector Development Program, Report No. 17739-ET* (Washington, DC, World Bank).

Appendix A

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

		Social			Private			
Country	Year	Primary	Secondary	Higher	Primary	Secondary	Higher	Source
Argentina	1989	8.4	7.1	7.6	10.1	14.2	14.9	Psacharopoulos (1994)
Australia	1976			16.3		8.1	21.1	Psacharopoulos (1994)
Austria	1981					11.3	4.2	Psacharopoulos (1994)
Bahamas	1970		20.6			26.1		Psacharopoulos (1994)
Belgium	1960		17.1	6.7		21.2	8.7	Psacharopoulos (1994)
Bolivia	1990	13.0	6.0	13.0	20.0	6.0	19.0	Psacharopoulos (1994)
Botswana	1983	42.0	41.0	15.0	99.0	76.0	38.0	Psacharopoulos (1994)
Brazil	1989	35.6	5.1	21.4	36.6	5.1	28.2	Psacharopoulos (1994)
Burkina Faso	1982	20.1	14.9	21.3				Psacharopoulos (1994)
Canada	1994					7.8	13.0	Cohn (1997)
Chile	1989	8.1	11.1	14.0	9.7	12.9	20.7	Psacharopoulos (1994)
China	1993	14.4	12.9	11.3	18.0	13.4	15.1	Hossain (1997)
Colombia	1989	20.0	11.4	14.0	27.7	14.7	21.7	Psacharopoulos (1994)
Costa Rica	1989	11.2	14.4	9.0	12.2	17.6	12.9	Psacharopoulos (1994)
Cyprus	1979	7.7	6.8	7.6	15.4	7.0	5.6	Psacharopoulos (1994)
Denmark	1964			7.8			10.0	Psacharopoulos (1994)
Dominican Republic	1989				85.1	15.1	19.4	Psacharopoulos (1994)
Ecuador	1987	14.7	12.7	9.9	17.1	17.2	12.7	Psacharopoulos (1994)
El Salvador	1990	16.4	13.3	8.0	18.9	14.5	9.5	Psacharopoulos (1994)
Estonia	1995	14.0	2.2	10.3				Noorkoiv *et al.* (1998)
Ethiopia	1996	14.9	14.4	11.9	24.7	24.2	26.6	World Bank (1998)
France	1976					14.8	20.0	Psacharopoulos (1994)
Germany (West)	1978					6.5	10.5	Psacharopoulos (1994)
Ghana	1967	18.0	13.0	16.5	24.5	17.0	37.0	Psacharopoulos (1994)
Greece	1993		6.5	5.7		8.3	8.1	Magoula and Psacharopoulos (1999)
Guatemala	1989				33.8	17.9	22.2	Psacharopoulos (1994)

Table A1. *Continued*

Country	Year	Social			Private			Source
		Primary	Secondary	Higher	Primary	Secondary	Higher	
Honduras	1989	18.2	19.7	18.9	20.8	23.3	25.9	Psacharopoulos (1994)
Hong Kong	1976		15.0	12.4		18.5	25.2	Psacharopoulos (1994)
Hungary	1993		6.0	2.6		8.2	13.4	Varga (1995)
India	1995				2.6	17.6	18.2	Kingdon (1998)
Indonesia	1989		11.0	5.0				Psacharopoulos (1994)
Iran	1976	15.2	17.6	13.6		21.2	18.5	Psacharopoulos (1994)
Israel	1958	16.5	6.9	6.6	27.0	6.9	8.0	Psacharopoulos (1994)
Italy	1969					17.3	18.3	Psacharopoulos (1994)
Ivory Coast	1984				25.7	30.7	25.1	Psacharopoulos (1994)
Jamaica	1989	17.7	7.9		20.4	15.7		Psacharopoulos (1994)
Japan	1976	9.6	8.6	6.9	13.4	10.4	8.8	Psacharopoulos (1994)
Kenya	1980		10.0			16.0		Psacharopoulos (1994)
Korea	1986		8.8	15.5		10.1	17.9	Psacharopoulos (1994)
Lesotho	1980	10.7	18.6	10.2	15.5	26.7	36.5	Psacharopoulos (1994)
Liberia	1983	41.0	17.0	8.0	99.0	30.5	17.0	Psacharopoulos (1994)
Malawi	1982	14.7	15.2	11.5	15.7	16.8	46.6	Psacharopoulos (1994)
Malaysia	1978					32.6	34.5	Psacharopoulos (1994)
Mexico	1992	11.8	14.6	11.1	18.9	20.1	15.7	Cohn and Addison (1998)
Morocco	1970	50.5	10.0	13.0				Psacharopoulos (1994)
Nepal	1999	15.7	8.1	9.1	16.6	8.5	12.0	Parajuli (1999)
Netherlands	1965		5.2	5.5		8.5	10.4	Psacharopoulos (1994)
New Zealand	1991		12.4	9.5		13.8	11.9	Maani (1996)
Nicaragua	1996	13.6	10.4	14.7				Belli and Ayadi (1998)
Nigeria	1966	23.0	12.8	17.0	30.0	14.0	34.0	Psacharopoulos (1994)
Norway	1966		7.2	7.5		7.4	7.7	Psacharopoulos (1994)
Pakistan	1991				8.4	13.7	31.2	Katsis *et al.* (1998)
Panama	1989				5.7	21.0	21.0	Psacharopoulos (1994)
Papua New Guinea	1986	12.8	19.4	8.4	37.2	41.6	23.0	Psacharopoulos (1994)

Table A1. *Continued*

Country	Year	Social			Private			Source
		Primary	Secondary	Higher	Primary	Secondary	Higher	
Paraguay	1990	20.3	12.7	10.8	23.7	14.6	13.7	Psacharopoulos (1994)
Peru	1990				13.2	6.6	40.0	Psacharopoulos (1994)
Philippines	1988	13.3	8.9	10.5	18.3	10.5	11.6	Psacharopoulos (1994)
Puerto Rico	1959	24.0	34.1	15.5	68.2	52.1	29.0	Psacharopoulos (1994)
Senegal	1985	23.0	8.9		33.7	21.3		Psacharopoulos (1994)
Sierra Leone	1971	20.0	22.0	9.5				Psacharopoulos (1994)
Singapore	1998	16.7	10.1	13.9	22.2	12.9	18.7	Sakellariou (2003)
Somalia	1983	20.6	10.4	19.9	59.9	13.0	33.2	Psacharopoulos (1994)
South Africa	1980	22.1	17.7	11.8				Psacharopoulos (1994)
Spain	1991	7.4	8.5	13.5				Lassibille and Navarro (1998)
Sri Lanka	1981					12.6	16.1	Psacharopoulos (1994)
Sudan	1974		8.0	4.0		13.0	15.0	Psacharopoulos (1994)
Sweden	1967		10.5	9.2			10.3	Psacharopoulos (1994)
Taiwan	1972	27.0	12.3	17.7	50.0	12.7	15.8	Psacharopoulos (1994)
Tanzania	1991				7.9	8.8		Mason and Khandker (1997)
Thailand	1989				16.0	12.9	11.8	Schultz (1994)
The Gambia	1997	33.5	12.1		37.1	12.7		EdInvest (1999)
Tunisia	1980					13.0	27.0	Psacharopoulos (1994)
Turkey	1987			8.5	1.9	8.6	16.2	Tansel (1994)
Uganda	1965	66.0	28.6	12.0				Psacharopoulos (1994)
United Kingdom	1986	8.6	7.5	6.5				Cohn and Addison (1998)
United States	1987		10.0	12.0				Psacharopoulos (1994)
Uruguay	1989	21.6	8.1	10.3	27.8	10.3	12.8	Psacharopoulos (1994)
Venezuela	1989	23.4	10.2	6.2	36.3	14.6	11.0	Psacharopoulos (1994)
Vietnam	1992	13.5	4.5	6.2	10.8	3.8	3.0	Moock *et al.* (1998)
Yemen	1985	2.0	26.0	24.0	10.0	41.0	56.0	Psacharopoulos (1994)
Yugoslavia	1986	3.3	2.3	3.1	14.6	3.1	5.3	Psacharopoulos (1994)
Zambia	1983			5.7			19.2	Psacharopoulos (1994)
Zimbabwe	1987	11.2	47.6	–4.3	16.6	48.5	5.1	Psacharopoulos (1994)

Table A2. The coefficient on years of schooling, latest year

Country	Year	Mean years of schooling	Coefficient (%)	Source
Argentina	1989	9.1	10.3	Psacharopoulos (1994)
Australia	1989		8.0	Cohn and Addison (1998)
Austria	1993		7.2	Fersterer and Winter-Ebmer (1999)
Bolivia	1993		10.7	Patrinos (1995)
Botswana	1979	3.3	19.1	Psacharopoulos (1994)
Brazil	1989	5.3	14.7	Psacharopoulos (1994)
Burkina Faso	1980		9.6	Psacharopoulos (1994)
Canada	1989		8.9	Cohn (1997)
Chile	1989	8.5	12.0	Psacharopoulos (1994)
China	1993		12.2	Hossain (1997)
Colombia	1989	8.2	14.0	Psacharopoulos (1994)
Costa Rica	1991		8.5	Funkhouser (1996)
Cote d'Ivoire	1986	6.9	20.1	Psacharopoulos (1994)
Cyprus	1994		5.2	Menon (1995)
Denmark	1990		4.5	Christensen and Westergard-Nielsen (1999)
Dominican Republic	1989	8.8	9.4	Psacharopoulos (1994)
Ecuador	1987	9.6	11.8	Psacharopoulos (1994)
Egypt	1997		5.2	Lambropoulos and Karadjia (1999)
El Salvador	1992		7.6	Funkhouser (1996)
Estonia	1994	10.9	5.4	Kroncke and Smith (1999)
Ethiopia	1972	6.0	8.0	Psacharopoulos (1994)
Finland	1993		8.2	Asplund (1999)
France	1977	6.2	10.0	Psacharopoulos (1994)
Germany	1988		7.7	Cohn and Addison (1998)
Ghana	1995	9.7	7.1	Jones (2001)
Greece	1993		7.6	Magoula and Psacharopoulos (1999)
Guatemala	1989	4.3	14.9	Psacharopoulos (1994)
Honduras	1991		9.3	Funkhouser (1996)
Hong Kong	1981	9.1	6.1	Psacharopoulos (1994)
Hungary	1987	11.3	4.3	Psacharopoulos (1994)
India	1995		10.6	Kingdon (1998)
Indonesia	1995	8.0	7.0	Duflo (2001)
Iran	1975		11.6	Psacharopoulos (1994)
Israel	1979	11.2	6.4	Psacharopoulos (1994)
Italy	1987		2.7	Brunello *et al.* (1999)
Jamaica	1989	7.2	28.8	Psacharopoulos (1994)
Japan	1988		13.2	Cohn and Addison (1998)
Kenya	1986	8.0	16.0	Dabalen (1998)
Korea	1986	8.0	13.5	Ryoo *et al.* (1993)
Kuwait	1983	8.9	4.5	Psacharopoulos (1994)
Malaysia	1979	15.8	9.4	Psacharopoulos (1994)
Mexico	1992		7.6	Psacharopoulos *et al.* (1996)
Morocco	1970	2.9	15.8	Psacharopoulos (1994)
Nepal	1999	3.9	9.7	Parajuli (1999)
Netherlands	1994		6.4	Hartog *et al.* (1999)
Nicaragua	1996		12.1	Belli and Ayadi (1998)
Norway	1995		5.5	Barth and Roed (1999)
Pakistan	1991		15.4	Katsis *et al.* (1998)
Panama	1990	9.2	13.7	Psacharopoulos (1994)
Paraguay	1990	9.1	11.5	Psacharopoulos (1994)
Peru	1990	10.1	8.1	Psacharopoulos (1994)

Table A2. *Continued*

Country	Year	Mean years of schooling	Coefficient (%)	Source
Philippines	1998	8.8	12.6	Schady (2000)
Poland	1995–1996		7.0	Nesterova and Sabirianova (1998)
Portugal	1991		8.6	Cohn and Addison (1998)
Puerto Rico	1989		15.1	Griffin and Cox Edwards (1993)
Russian Federation	1996	11.7	7.2	Nesterova and Sabirianova (1998)
Singapore	1998	9.5	13.1	Sakellariou (2003)
South Africa	1994	7.1	4.1	Dabalen (1998)
Spain	1991		7.2	Mora (1999)
Sri Lanka	1981	4.5	7.0	Psacharopoulos (1994)
Sudan	1989	10.2	9.3	Cohen and House (1994)
Sweden	1991		5.0	Cohn and Addison (1998)
Switzerland	1991		7.5	Weber and Wolter (1999)
Taiwan	1972	9.0	6.0	Psacharopoulos (1994)
Tanzania	1980		11.9	Psacharopoulos (1994)
Thailand	1989		11.5	Patrinos (1995)
Tunisia	1980	4.8	8.0	Psacharopoulos (1994)
United Kingdom	1987	11.8	6.8	Psacharopoulos (1994)
United States	1991–1995		10.0	Rouse (1999)
Uruguay	1989	9.0	9.7	Psacharopoulos (1994)
Venezuela	1992		9.4	Psacharopoulos and Mattson (1998)
Vietnam	1992	7.9	4.8	Moock *et al.* (1998)
Yugoslavia	1986		4.8	Bevc (1993)

Table A3. Returns to education by level of education and gender

Country	Education				Source
	Year	Level	Men	Women	
Argentina	1985	Overall	9.1	10.3	Psacharopoulos (1994)
Argentina	1989	Overall	10.7	11.2	Psacharopoulos (1994)
Austria	1981	Overall	10.3	13.5	Psacharopoulos (1994)
Bolivia	1989	Overall	7.3	7.7	Psacharopoulos (1994)
Botswana	1975	Overall	16.4	18.2	Psacharopoulos (1994)
Brazil	1980	Overall	14.7	15.6	Psacharopoulos (1994)
Brazil	1989	Overall	15.4	14.2	Psacharopoulos (1994)
Canada	1989	Overall	8.9		Patrinos (1995)
Czech Republic	1984	Overall	2.4	4.2	Munich *et al.* (1999)
Czech Republic	1988	Overall	4.0	5.7	Nesterova and Sabirianova (1998)
Czech Republic	1989	Overall	2.7	3.8	Munich *et al.* (1999)
Czech Republic	1992	Overall	5.3	6.7	Nesterova and Sabirianova (1998)
Czech Republic	1993	Overall	5.2	5.8	Munich *et al.* (1999)
Czech Republic	1996	Overall	5.8	7.0	Munich *et al.* (1999)
Chile	1987	Overall	13.7	12.6	Psacharopoulos (1994)
Chile	1989	Overall	12.1	13.2	Psacharopoulos (1994)
China	1985	Overall	4.5	5.6	Psacharopoulos (1994)
Colombia	1973	Overall	18.1	20.8	Psacharopoulos (1994)
Colombia	1973	Overall	10.3	20.1	Psacharopoulos (1994)
Colombia	1988	Overall	11.1	9.7	Psacharopoulos (1994)
Colombia	1989	Overall	14.5	12.9	Psacharopoulos (1994)
Costa Rica	1974	Overall	14.7	14.7	Psacharopoulos (1994)
Costa Rica	1989	Overall	10.1	13.1	Psacharopoulos (1994)
Costa Rica	1989	Overall	10.5	13.5	Psacharopoulos (1994)
Cote d'Ivoire	1987	Overall	13.6	12.1	Schultz (1994)
Cyprus	1984	Overall	8.9	12.7	Psacharopoulos (1994)
Denmark	1990	Overall	5.1	3.4	Christensen and Westergard-Nielsen (1999)
Dominican Republic	1989	Overall	7.8	12.0	Psacharopoulos (1994)
Ecuador	1987	Overall	11.4	10.7	Psacharopoulos (1994)
Ecuador	1987	Overall	9.8	11.5	Psacharopoulos (1994)
El Salvador	1990	Overall	9.6	9.8	Psacharopoulos (1994)
Finland	1980	Overall	9.3	–	Asplund (1999)
Finland	1987	Overall	7.4	6.4	Asplund (1999)
Finland	1989	Overall	8.4	7.8	Asplund (1999)
Finland	1991	Overall	8.8	8.7	Asplund (1999)
Finland	1993	Overall	7.8	8.3	Asplund (1999)
Germany	1974	Overall	13.1	11.2	Psacharopoulos (1994)
Germany	1977	Overall	13.6	11.7	Psacharopoulos (1994)
Ghana	1989	Overall	4.4	4.2	Schultz (1994)
Ghana	1992	Overall	9.3	10.6	World Bank (1996a)
Greece	1977	Overall	4.7	4.5	Psacharopoulos (1994)
Greece	1993	Overall	6.9	9.0	Magoula and Psacharopoulos (1999)
Guatemala	1989	Overall	14.2	16.3	Psacharopoulos (1994)
Honduras	1989	Overall	17.2	19.8	Psacharopoulos (1994)
India	1978	Overall	5.3	3.6	Psacharopoulos (1994)
Italy	1978	Overall	2.9	–	Brunello *et al.* (1999)
Italy	1983	Overall	6.0	3.5	Brunello *et al.* (1999)
Italy	1985	Overall	3.5	3.9	Brunello *et al.* (1999)

Table A3. *Continued*

Country	Education				Source
	Year	Level	Men	Women	
Italy	1987	Overall	0.0	3.0	Brunello *et al.* (1999)
Ivory Coast	1984	Overall	11.1	22.6	Psacharopoulos (1994)
Jamaica	1989	Overall	12.3	21.5	Psacharopoulos (1994)
Jamaica	1989	Overall	28.0	31.7	Psacharopoulos (1994)
Lesotho	1993	Overall	10.6	16.5	Mokitimi and Nieuwoudt (1995)
Malaysia	1979	Overall	5.3	8.2	Psacharopoulos (1994)
Mexico	1984	Overall	13.2	14.7	Psacharopoulos (1994)
Mexico	1984	Overall	14.1	15.0	Psacharopoulos (1994)
Nicaragua	1978	Overall	8.5	11.5	Psacharopoulos (1994)
Norway	1980	Overall	3.2	4.9	Barth and Roed (1999)
Norway	1983	Overall	4.7	5.5	Barth and Roed (1999)
Norway	1987	Overall	4.3	6.2	Barth and Roed (1999)
Norway	1989	Overall	4.1	3.9	Barth and Roed (1999)
Norway	1991	Overall	4.2	5.3	Barth and Roed (1999)
Panama	1989	Overall	9.7	11.9	Psacharopoulos (1994)
Panama	1989	Overall	12.6	17.1	Psacharopoulos (1994)
Paraguay	1990	Overall	10.3	12.1	Psacharopoulos (1994)
Peru	1985	Overall	11.5	12.4	Psacharopoulos (1994)
Peru	1990	Overall	8.5	6.5	Psacharopoulos (1994)
Philippines	1988	Overall	12.4	12.4	Psacharopoulos (1994)
Portugal	1977	Overall	7.5	8.4	Psacharopoulos (1994)
Portugal	1985	Overall	9.4	10.4	Psacharopoulos (1994)
Russia	1991	Overall	3.1	5.4	Munich *et al.* (1999)
Russia	1994	Overall	6.7	9.6	Munich *et al.* (1999)
Singapore	1998	Overall	11.1	15.2	Sakellariou (2003)
Slovakia	1984	Overall	2.8	4.4	Munich *et al.* (1999)
Slovakia	1993	Overall	4.9	5.4	Munich *et al.* (1999)
South Africa	1990	Overall	2.3	0.8	Mokitimi and Nieuwoudt (1995)
South Korea	1976	Overall	10.3	1.7	Psacharopoulos (1994)
South Korea	1980	Overall	17.2	5.0	Psacharopoulos (1994)
Sri Lanka	1981	Overall	6.9	7.9	Psacharopoulos (1994)
Sweden	1968	Overall	8.9	8.7	Arai and Kjellstrom (1999)
Sweden	1974	Overall	5.3	5.5	Arai and Kjellstrom (1999)
Sweden	1980	Overall	4.3	4.3	Arai and Kjellstrom (1999)
Sweden	1981	Overall	5.1	4.1	Arai and Kjellstrom (1999)
Sweden	1991	Overall	5.0	4.0	Arai and Kjellstrom (1999)
Switzerland	1982	Overall	5.5	9.1	Weber and Wolter (1999)
Switzerland	1991	Overall	8.3	7.5	Weber and Wolter (1999)
Switzerland	1992	Overall	8.2	7.8	Weber and Wolter (1999)
Switzerland	1993	Overall	7.8	7.9	Weber and Wolter (1999)
Switzerland	1995	Overall	9.1	9.0	Weber and Wolter (1999)
Switzerland	1997	Overall	–	6.1	Weber and Wolter (1999)
Thailand	1972	Overall	9.1	13.0	Psacharopoulos (1994)
Uruguay	1989	Overall	9.0	10.6	Psacharopoulos (1994)
Venezuela	1976	Overall	9.9	13.5	Psacharopoulos (1994)
Venezuela	1987	Overall	10.0	13.1	Psacharopoulos (1994)
Venezuela	1989	Overall	9.1	11.1	Psacharopoulos (1994)
Venezuela	1989	Overall	8.4	8.0	Psacharopoulos (1994)
Vietnam	1992	Overall	3.4	6.8	Moock *et al.* (1998)
Yugoslavia	1976	Overall	5.8	6.6	Psacharopoulos (1994)
Yugoslavia	1986	Overall	4.9	4.8	Psacharopoulos (1994)

Table A3. *Continued*

Country	Education				Source
	Year	Level	Men	Women	
Mean			**8.7**	**9.8**	
Puerto Rico	1959	Primary	29.5	18.4	Psacharopoulos (1994)
Taiwan	1982	Primary	8.4	16.1	Psacharopoulos (1994)
Indonesia	1982	Primary	19.0	17.0	Psacharopoulos (1994)
Great Britain	1841	Literacy	24.5	3.5	Psacharopoulos (1994)
Great Britain	1871	Literacy	19.0	9.0	Psacharopoulos (1994)
Mean			**20.1**	**12.8**	
Canada	1980	Secondary	2.0	6.0	Psacharopoulos (1994)
Canada	1985	Secondary	10.6	18.6	Psacharopoulos (1994)
France	1969	Secondary	13.9	15.4	Psacharopoulos (1994)
France	1976	Secondary	14.8	16.2	Psacharopoulos (1994)
Great Britain	1971	Secondary	10.0	8.0	Psacharopoulos (1994)
Indonesia	1982	Secondary	23.0	11.0	Psacharopoulos (1994)
Indonesia	1986	Secondary	11.0	16.0	Psacharopoulos (1994)
Puerto Rico	1959	Secondary	27.3	40.8	Psacharopoulos (1994)
South Korea	1971	Secondary	13.7	16.9	Psacharopoulos (1994)
Sri Lanka	1981	Secondary	12.6	35.5	Psacharopoulos (1994)
Suriname	1993	Secondary	10.7	–0.8	Horowitz and Schenzler (1999)
Mean			**13.9**	**18.4**	
Australia	1976	University	21.1	21.2	Psacharopoulos (1994)
Canada	1980	University	5.5	10.5	Psacharopoulos (1994)
Canada	1985	University	8.3	18.8	Psacharopoulos (1994)
Cyprus	1994	Higher	5.2	7.2	Menon (1995)
Denmark	1990	University	3.5	5.2	Cohn and Addison (1998)
Finland	1987	University	6.6	7.7	Cohn and Addison (1998)
France	1969	University	22.5	13.8	Psacharopoulos (1994)
France	1976	University	20.0	12.7	Psacharopoulos (1994)
France	1976	University	20.0	12.7	Psacharopoulos (1994)
Great Britain	1971	University	8.0	12.0	Psacharopoulos (1994)
Indonesia	1982	University	10.0	9.0	Psacharopoulos (1994)
Indonesia	1986	University	9.0	10.0	Psacharopoulos (1994)
Japan	1976	University	6.9	6.9	Psacharopoulos (1994)
Japan	1980	University	5.7	5.8	Psacharopoulos (1994)
Norway	1991	University	4.0	4.2	Cohn and Addison (1998)
Puerto Rico	1959	University	21.9	9.0	Psacharopoulos (1994)
South Korea	1971	University	15.7	22.9	Psacharopoulos (1994)
Sweden	1991	University	4.4	5.0	Cohn and Addison (1998)
Mean			**11.0**	**10.8**	

Table A4. Comparable over time returns to investment in education in selected countries

Country	Year	Rate of return (%)	Source
Australia	1980	7.9	Miller *et al.* (1995)
Australia	1981	8.4	Patrinos (1995)
Australia	1985	10.9	Rummery *et al.* (1999)
Australia	1987	5.4	Patrinos (1995)
Australia	1989	8.0	Cohn and Addison (1998)
Austria	1981	11.6	Psacharopoulos (1994)
Austria	1983	7.9*	Fersterer and Winter-Ebmer (1999)
Austria	1985	7.6*	Fersterer and Winter-Ebmer (1999)
Austria	1987	7.4*	Fersterer and Winter-Ebmer (1999)
Austria	1989	7.6*	Fersterer and Winter-Ebmer (1999)
Austria	1991	7.4*	Fersterer and Winter-Ebmer (1999)
Austria	1993	7.2*	Fersterer and Winter-Ebmer (1999)
Bolivia	1981	12.2	World Bank (1996b)
Bolivia	1988	9.5	World Bank (1996b)
Bolivia	1989	7.1	World Bank (1996b)
Bolivia	1990	10.1	Psacharopoulos and Mattson (1998)
Bolivia	1991	8.9	World Bank (1996b)
Bolivia	1992	10.0	World Bank (1996b)
Bolivia	1993	10.7	Patrinos (1995)
Brazil	1970	16.5	Patrinos (1995)
Brazil	1980	14.5	Patrinos (1995)
Brazil	1989	14.7	Patrinos (1995)
Canada	1981	8.5	Patrinos (1995)
Canada	1986	8.8	Patrinos (1995)
Canada	1989	8.9	Patrinos (1995)
Chile	1974	8.3	Patrinos (1995)
Chile	1980	9.6	Patrinos (1995)
Chile	1989	8.2	Patrinos (1995)
China	1988	3.6	Liu (1998)
China	1991	4.8	Wei *et al.* (1999)
China	1993	12.2	Hossain (1997)
Colombia	1965	17.3	Patrinos (1995)
Colombia	1974	12.8	Patrinos (1995)
Colombia	1989	8.2	Patrinos (1995)
Costa Rica	1980	10.5	Funkhouser (1996)
Costa Rica	1983	8.1	Funkhouser (1996)
Costa Rica	1985	8.1	Funkhouser (1996)
Costa Rica	1988	9.1	Funkhouser (1996)
Costa Rica	1991	8.5	Funkhouser (1996)
Cyprus	1984	11.0	Psacharopoulos (1994)
Cyprus	1994	5.2	Menon (1995)
Czech Republic	1995	8.1	Filer *et al.* (1999)
Czech Republic	1996	8.5	Filer *et al.* (1999)
Czech Republic	1997	9.0	Filer *et al.* (1999)
Denmark	1976–1984	2.6	Christensen and Westergard-Nielsen (1999)
Denmark	1990	4.5	Christensen and Westergard-Nielsen (1999)
El Salvador	1985	7.9	Funkhouser (1996)
El Salvador	1988	7.8	Funkhouser (1996)
El Salvador	1990	7.6	Funkhouser (1996)
El Salvador	1992	7.6	Funkhouser (1996)
Estonia*	1989	1.5	Kroncke and Smith (1999)

Table A4. *Continued*

Country	Year	Rate of return (%)	Source
Estonia*	1994	5.4	Kroncke and Smith (1999)
Finland	1980	9.1	Asplund (1999)
Finland	1987	7.0	Asplund (1999)
Finland	1989	8.2	Asplund (1999)
Finland	1991	8.8	Asplund (1999)
Finland	1993	8.2	Asplund (1999)
Germany	1986	5.5	Ichino and Winter-Ebmer (1999)
Germany	1988	7.7	Cohn and Addison (1998)
Germany (East)	1989	4.4	Munich *et al.* (1999)
Germany (East)	1991	4.1	Munich *et al.* (1999)
Germany (West)	1977	12.6	Patrinos (1995)
Germany (West)	1987	4.9	Patrinos (1995)
Ghana	1989	8.5	Glewwe (1996)
Ghana	1995	7.1	Jones (2001)
Greece	1964	8.6	Patrinos (1995)
Greece	1977	5.8	Patrinos (1995)
Greece	1985	7.9	Cohn and Addison (1998)
Greece	1987	2.7	Patrinos (1995)
Greece	1993	7.6	Magoula and Psacharopoulos (1999)
Guatemala	1977	12.7	Funkhouser (1996)
Guatemala	1986	9.8	Funkhouser (1996)
Guatemala	1989	14.9	Psacharopoulos (1994)
Honduras	1986	12.5	Bedi (1997)
Honduras	1989	11.5	Funkhouser (1996)
Honduras	1990	10.4	Funkhouser (1996)
Honduras	1991	9.3	Funkhouser (1996)
Indonesia	1981	17.0	Psacharopoulos (1994)
Indonesia	1995	7.0	Duflo (2001)
Italy	1977	4.5	Brunello *et al.* (1999)
Italy	1983	5.5	Brunello *et al.* (1999)
Italy	1985	4.5	Brunello *et al.* (1999)
Italy	1986	4.6	Brunello *et al.* (1999)
Italy	1987	2.7	Brunello *et al.* (1999)
Japan	1975	6.5	Psacharopoulos (1994)
Japan	1978	4.4	Cohn and Addison (1998)
Japan	1988	13.2	Cohn and Addison (1998)
Kenya	1970	16.4	Psacharopoulos (1994)
Kenya	1986	16.0	Dabalen (1998)
Korea	1974	12.0	Ryoo *et al.* (1993)
Korea	1979	14.1	Ryoo *et al.* (1993)
Korea	1986	13.5	Ryoo *et al.* (1993)
Mexico	1984	6.5	Patrinos (1995)
Mexico	1989	7.5	Patrinos (1995)
Mexico	1991	16.1	Psacharopoulos *et al.* (1996)
Mexico	1992	7.6	Psacharopoulos *et al.* (1996)
Netherlands	1962	11.0	Hartog *et al.* (1999)
Netherlands	1965	12.2	Hartog *et al.* (1999)
Netherlands	1972	11.3	Hartog *et al.* (1999)
Netherlands	1979	10.9	Hartog *et al.* (1999)
Netherlands	1982	7.0	Cohn and Addison (1998)
Netherlands	1985	7.2	Hartog *et al.* (1999)
Netherlands	1986	5.2	Cohn and Addison (1998)

Table A4. *Continued*

Country	Year	Rate of return (%)	Source
Netherlands	1988	5.7	Cohn and Addison (1998)
Netherlands	1989	7.3	Hartog *et al.* (1999)
Netherlands	1994	6.4	Hartog *et al.* (1999)
Nicaragua	1985	6.5	Funkhouser (1996)
Nicaragua	1993	7.9	Funkhouser (1996)
Nicaragua	1996	12.1	Belli and Ayadi (1998)
Norway	1980	5.5	Barth and Roed (1999)
Norway	1983	6.1	Barth and Roed (1999)
Norway	1987	5.4	Barth and Roed (1999)
Norway	1989	4.9	Barth and Roed (1999)
Norway	1991	5.4	Barth and Roed (1999)
Norway	1995	5.5	Barth and Roed (1999)
Pakistan	1986	4.6	Psacharopoulos (1994)
Pakistan	1991	15.4	Katsis *et al.* (1998)
Panama	1983	12.1	Patrinos (1995)
Panama	1989	13.7	Patrinos (1995)
Panama	1990	13.7	Psacharopoulos (1994)
Paraguay	1983	11.6	Patrinos *et al.* (1994)
Paraguay	1990	11.5	Patrinos *et al.* (1994)
Peru	1985	11.5	Patrinos (1995)
Peru	1990	8.1	Psacharopoulos (1994)
Peru	1991	5.7	Patrinos (1995)
Philippines	1982	8.0	Patrinos (1995)
Philippines	1988	8.0	Patrinos (1995)
Philippines	1994	7.3	Maluccio (1998)
Philippines	1998*	12.6	Schady (2000)
Poland	1986	2.9	Lorenz and Wagner (1993)
Poland	1987	5.0	Rutkowski (1997)
Poland	1992	7.0	Rutkowski (1997)
Poland	1995–1996	7.0	Nesterova and Sabirianova (1998)
Portugal	1977	9.1	Patrinos (1995)
Portugal	1985	10.0	Patrinos (1995)
Portugal	1991	8.6	Cohn and Addison (1998)
Russian Federation	1995	7.5	Nesterova and Sabirianova (1998)
Russian Federation	1996	7.2	Nesterova and Sabirianova (1998)
Singapore	1974	13.4	Psacharopoulos (1994)
Singapore	1998	13.1	Sakellariou (2003)
South Africa	1994	4.1	Dabalen (1998)
South Korea	1974	12.0	Ryoo *et al.* (1993)
South Korea	1976	6.5	Patrinos (1995)
South Korea	1979	14.1	Ryoo *et al.* (1993)
South Korea	1980	11.1	Patrinos (1995)
South Korea	1986	13.5	Ryoo *et al.* (1993)
Spain	1985	7.7	Cohn and Addison (1998)
Spain	1990	9.0	Alba-Ramirez and Segundo (1995)
Spain	1991	7.2	Mora (1999)
Sweden	1968	7.8	Arai and Kjellstrom (1999)
Sweden	1974	4.3	Arai and Kjellstrom (1999)
Sweden	1981	3.5	Arai and Kjellstrom (1999)
Sweden	1984	3.9	Arai and Kjellstrom (1999)
Sweden	1990	4.5	Isacsson (1999)
Sweden	1991	5.0	Cohn and Addison (1998)

Table A4. *Continued*

Country	Year	Rate of return (%)	Source
Switzerland	1987	7.9	Psacharopoulos (1994)
Switzerland	1990	7.5	Weber and Wolter (1999)
Thailand	1971	10.4	Psacharopoulos (1994)
Thailand	1986	12.4	Patrinos (1995)
Thailand	1989	11.5	Patrinos (1995)
United Kingdom	1975	8.0	Patrinos (1995)
United Kingdom	1982	15.3	Harmon and Walker (1995)
United Kingdom	1984	13.3	Harmon and Walker (1999)
United Kingdom	1987	6.8	Patrinos (1995)
United States	1976	7.5	Kling (1999)
United States	1978	7.9	Patrinos (1995)
United States	1987	9.8	Psacharopoulos (1994)
United States	1991–1995	10.0	Psacharopoulos (2000)
Venezuela	1975	13.7	Patrinos (1995)
Venezuela	1984	11.2	Patrinos (1995)
Venezuela	1989	9.6	Fiszbein and Psacharopoulos (1993)
Venezuela	1992	9.4	Psacharopoulos and Mattson (1998)
Vietnam	1992	4.8	Moock *et al.* (1998)
Vietnam (South)	1964	16.8	Psacharopoulos (1994)
Yugoslavia	1976	6.8	Bevc (1993)
Yugoslavia	1986	4.8	Bevc (1993)

*Data are for male population only.