

ECONOMICS OF EDUCATION: FROM THEORY TO PRACTICE

GEORGE PSACHAROPOULOS*

(EUROPEAN EXPERT NETWORK ON ECONOMICS OF EDUCATION, EENEE)

ABSTRACT:

Economics of education is a relatively new field. In the four decades of its existence, it has generated a great number of hypotheses, empirical findings and Nobel Laureates. However, in the world live, there is an obvious divide between theory and practice -- Ministries of Education, in both industrial and developing countries, often act as if economics of education did not exist. Unfortunately, the same applies to international organizations with a mandate in education. The paper starts by reviewing major findings in the economics of education and their relevance to education policy making. It discusses the reasons why some robust research findings do not translate into practice. And it concludes by listing a number of research questions that are still open in the field.

JEL CLASSIFICATION: I2, O15, I28.

KEYWORDS: Economics of education, human capital, education policy.

* 5 Kasou Street, Athens 11364 GREECE - E-mail: gpsach@rcn.com

INTRODUCTION

The field of the economics of education is not as “new” anymore, at least as we were saying a few decades ago. If we place its beginning circa 1960, forty years plus is a reasonable time for a discipline to mature. During these years, an immense literature has developed, not only in the core economics of education per se, but also merging with or spilling over into other fields such as labor economics, pedagogy, sociology and psychology.

In my reading, there have been only three major and distinct theoretical landmarks in the economics of education literature:

- First, the initial contributions of T.W. Schultz (1961a), Gary Becker (1964) and Mincer (1974) that formalized the treatment of education as an investment, rather than a consumption activity.
- Second, the seminal contributions of Arrow (1973), Spence (1973) and Stiglitz (1975) regarding the possibility that education acts as a private signal to the employer, rather than having a social value.
- Third, the contributions of Lucas (1988) and Romer (1986, 1990) regarding the role of education in endogenous growth and related work on externalities (Acemoglu and Angrist 2001).

Thus, the 1960s were characterized by attempts to estimate the rate of return to investment in human capital or the contribution of education to economic growth, the 1970s and 1980s were dominated by attempts to test for the existence of screening, and from the 1990s to date the focus is on identifying education externalities (Venniker 2001) in economic growth and quantifying non-market effects. (See Blaug 1965, Layard and Psacharopoulos 1974, Barro 1991 and Wolfe and Zuvekas 1997.

To look at it in another way, the literature has vacillated between micro and macro issues, in my opinion having never matched well the two together.

TABLE 1. ECONOMICS OF EDUCATION LANDMARK THEORETICAL CONTRIBUTIONS

Date	Concept	Exponent
1960s	Human capital theory	Schultz, Becker, Mincer
1970s	Signaling and screening	Arrow, Stiglitz, Spence
1980s	Endogenous growth	Lucas, Romer
1990s +	Externalities, non-market	Venniker

1. ROBUST FINDINGS

In these forty years, a great number of research results have been generated, enough to satisfy any taste, if not religious affiliation to one school of thought rather than another. My reading of the literature makes me confident the following are findings robust enough to deserve the attention of policy makers.

In compiling the following list, the only assumption I make is that, irrespective of the particular country we are in, policy makers care essentially about two things – economic growth and equity:

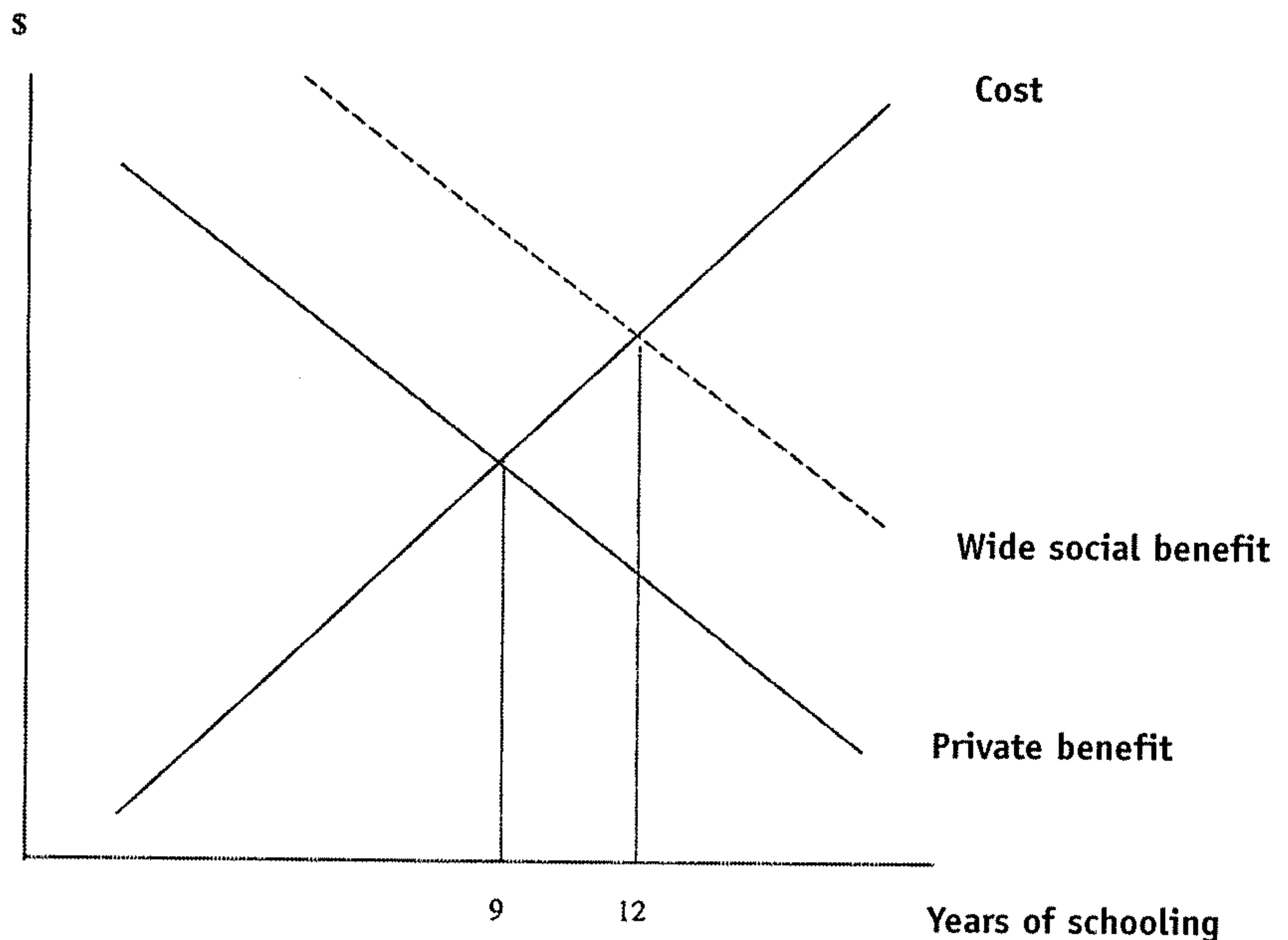
$$\textit{Well being} = f(\textit{Efficiency}, \textit{Equity})$$

To start with, I do not make a distinction between developing and industrial countries because, if a theory is valid, its predictions must hold as well in Africa as they do in Europe. Of course every country is different from all others in many respects, and this should be taken into account by fine tuning the results by means of country-specific research.

Efficiency. Privately, education is a good investment, in the sense it yields a rate of return equal or above that of other investment opportunities. This is particularly so regarding higher education (see Psacharopoulos and Patrinos, 2004). Regarding the social dimension, we have to make a distinction between what I call a “narrow” and a “wide” social rate of return.

- The narrow social rate is the one that has been traditionally estimated in the economics of education literature, i.e. it is essentially the private rate adjusted upwards for taxes (as the latter are a transfer from the social point of view) and downwards by the costs of education borne by the state. Because of the state subsidization of education, the end result of this tradeoff is that the narrow social rate of return to investment in education is lower than the private rate by a couple of percentage points. Still, the narrow social rate is typically higher than the social discount rate or returns to investment in other forms of capital.
- The wide social rate of return includes the external effects of education, e.g. a lower crime rate or better health. Unfortunately, in my reading, attempts to capture these external effects have not been as successful as documenting the private market effects. However, intuitive logic (rather than cross-country regressions a la Barro, 1991) dictates that the external effects of education must be substantial. When these are added to the narrow social rate of return, the wide social rate may well exceed not only the narrow rate, but also the private rate of return. (See Figure 1).

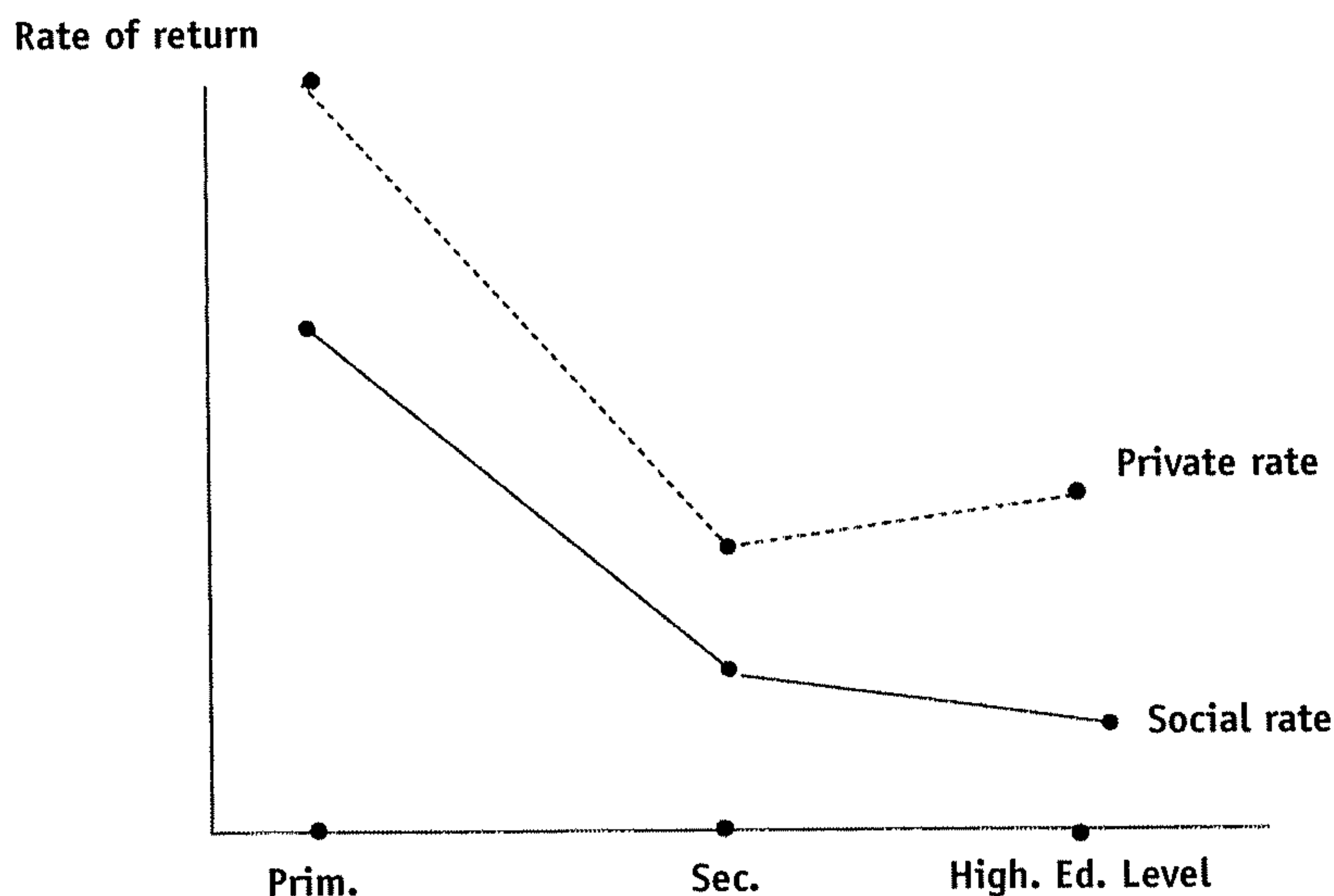
FIGURE 1. SOCIALLY OPTIMAL INVESTMENT IN EDUCATION



This possibility has important implications for policy, for it is one of the few classic cases where state intervention may be justified. To put it in other words, individuals acting on private signals may invest in less education (e.g., 9 years in the case of Figure 1), rather than 12 years that would be optimal from the social point of view.

Returns to education, whether private or social, obey roughly the law of diminishing returns, i.e., the returns are higher as one ascends the education ladder. This finding has an important implication for policy, in the sense that where primary education is not universal, priority should be given to investment in elementary schools relative to universities. Returns to education also decline over time, in the sense that as the ratio of human to physical capital increases, the returns to the former diminish. (See Psacharopoulos 1989a).

Two important qualifications have to be made regarding the above statements. First, the largest discrepancy between the private and the narrow social rate occurs at the university level, the reason being that higher education is subsidized more heavily in almost any country in the world relative to primary education. (See Figure 2). This has another implication for policy, namely increasing the private cost of attending university, so that the private rate is driven closer to the social rate.

FIGURE 2. PERVERSE SUBSIDIZATION OF HIGHER EDUCATION


Second, in recent years it has been observed that returns to education are increasing over time, denoting the possible existence of education externalities. (See Blackburn 1990). In this sense, all levels of education might have to be subsidized. The problem, however, is that the existence of such externalities is inferred, rather than measured directly.

For any given level of education, and secondary education in particular, a general/academic curriculum is associated with a higher rate of return (private and social) relative to a vocational curriculum. (See Psacharopoulos 1987). This paradoxical and counter-intuitive finding has important policy implications regarding the type of schools a country should promote.

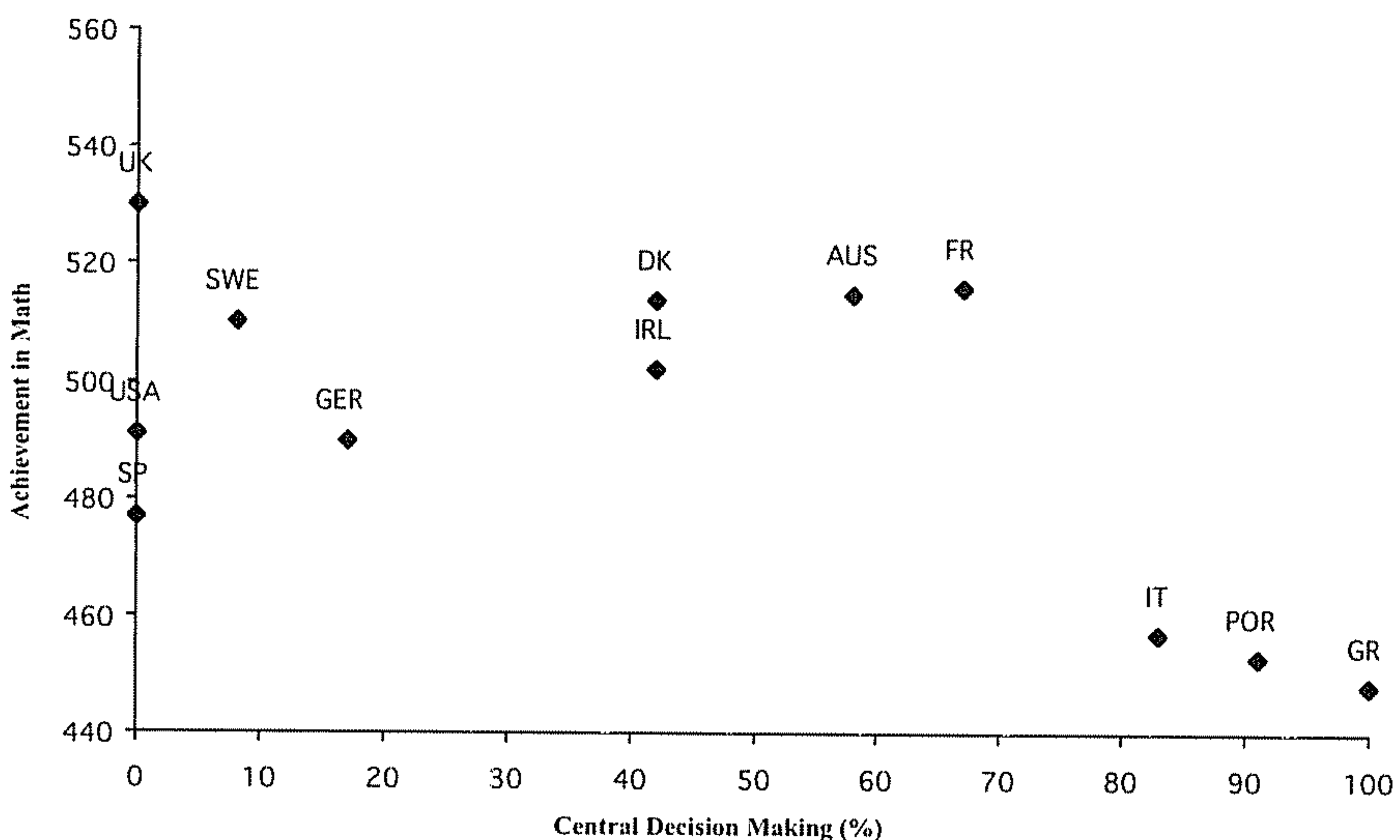
Another finding that seems paradoxical to the lay person, is that investment in the education of women has a higher rate of return relative to that of men. (See Psacharopoulos and Tzannatos, 1992). The policy implication is that a Ministry of Education in a developing country where primary education is not universal, should promote schools for girls.

Beyond the quantity of schooling (the perennial *S* in the economics of education literature), quality is of course important. The problem is that the field has been very sluggish in documenting this dimension. Initially, school quality was measured by means of inputs, e.g. spending per student. But as it has been amply demonstrated, throwing money to schools is not a sufficient condition for better learning (Hanushek 1981). Better is to measure school quality by means of the schooling output, and this is cognitive learning or achievement. An important empirical finding in this respect is that the so-called software inputs, such as reading and writing materials, are most cost-effective in raising student achievement, relative to school buildings and classrooms (Harbison and Hanushek, 1992).

Institutions. The emergence of institutional economics (North 1990), has of course spilled into the economics of education. The education act does not take place in a vacuum. Its success depends on the kind of institutions within which education takes place.

The best example in this respect is the relationship between student achievement and the centralization of education decisions. As evidenced from OECD's (2001) PISA results, the more decentralized the education system, the higher is student achievement (see Figure 3). On the contrary, the more education decisions depend on the Ministry of Education, rather than the local headmaster, the lower student achievement (see also Woessmann 2002).

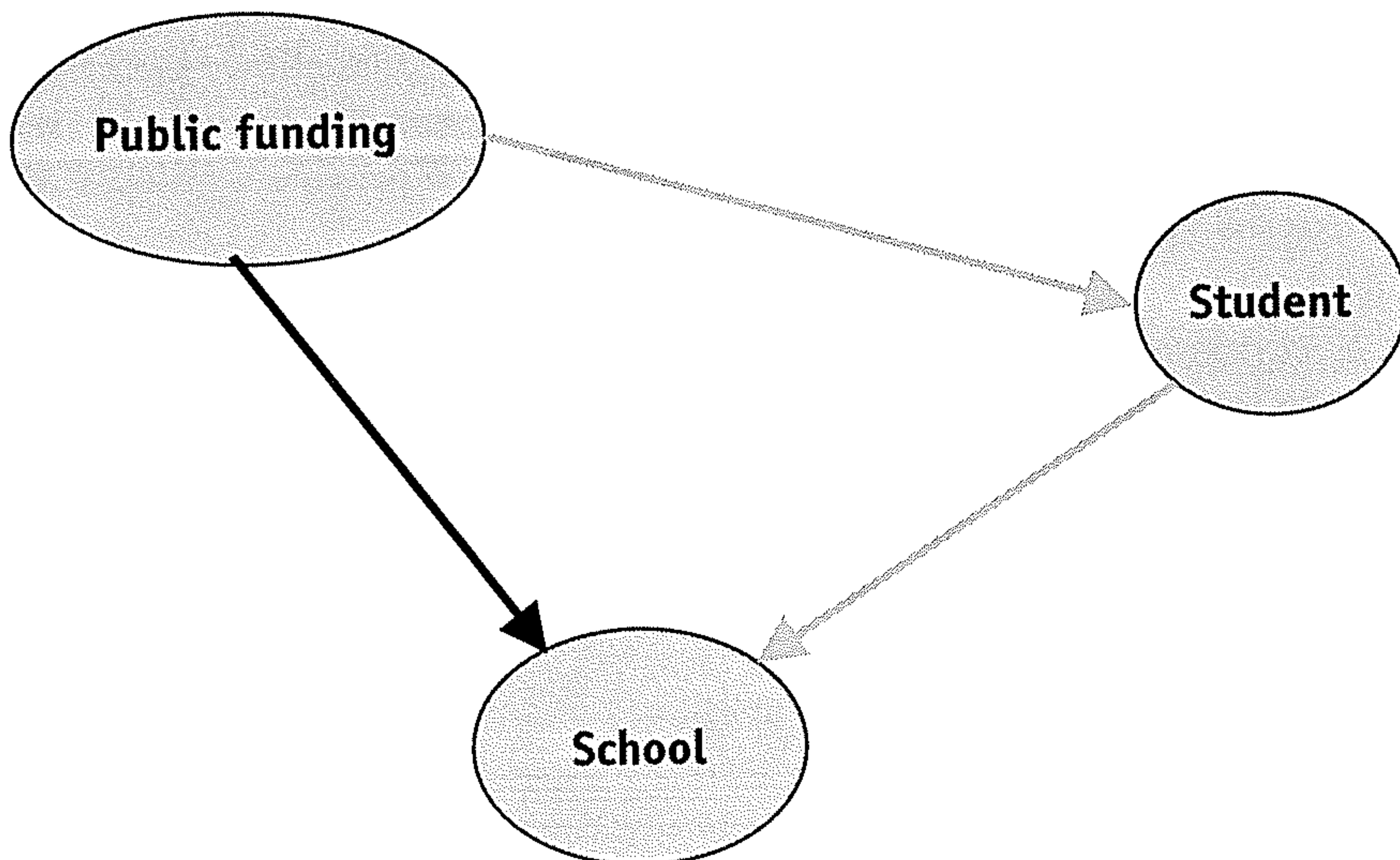
FIGURE 3. CENTRAL EDUCATION DECISION MAKING AND MATH ACHIEVEMENT (PISA)



Of course one form of decentralization *par excellence* is private schooling. Many studies have found that, even after controlling for socio-economic background, achievement in private schools exceeds that in public schools (e.g., see Psacharopoulos and Tasoulas 2004). At the extreme, Milton Friedman (1997) has argued that public schools should be private.

Another institutional arrangement affecting the quality of education is the way public resources are channeled to schools – directly, or indirectly (see Figure 4). Where experiments with education vouchers have taken place, the achievement of minority groups has been increased by means of choice of school they attend (New York Times 2000, Rouse 1998).

FIGURE 4. DIRECT VS. INDIRECT FUNDING



Equity. The effect of education provision on equity is a double-edged knife – it depends on the educational level at which expansion takes place. Thus promotion of primary education moves the earnings of a class of otherwise illiterate people closer to the mean, hence it reduces income inequality. On the contrary, provision of higher education accentuates earnings differences and increases income inequality (see Marin and Psacharopoulos, 1976).

Another way of assessing the effect of education on equity is by means of the incidence of public expenditure on education. All studies show that the public provision of education is regressive, i.e., the poor pay for the education of the rich. (See Castro-Leal, Dayton and Mehra 1999, and Tsakloglou and Antoninis 1999).

Methodology. Historically, there are basic two ways by means of which issues in the economics of education have been investigated -- micro and macro. For example, rate of return studies have been based on micro data, i.e., individual earnings by level of education and age within a given country. On the other hand, the contribution of education to economic growth has been based on national accounts macro data. The macro approach could be applied to data within a given country (e.g., Denison, 1967), or pooled cross-country time-series (e.g., Barro 1991).

For the sake of exposition, Table 2 presents an oversimplified history of the way education entered in macro growth accounting. The kick off was Solow's (1956, 1957) technical change (T) as a determinant of long term growth in an aggregate production function. This was followed soon by Schultz' (1961b) substitution of investment in education for the unexplained residual in economic growth, and Denison's (1967) alternative specifications of education in the same implicit aggregate production function.

But the real shake up in macro growth accounting came much later with the work of Lucas (1988) and Romer (1990) regarding endogenous growth. The production function now is a two step simultaneous process, in which resources are used to produce education, and education enters the production process in a way that allows increasing returns to scale. Such specification, in theory at least, can explain the divergence (rather than convergence) of growth trajectories across countries, and provide a glimpse at the holy grail of externalities.

TABLE 2. ALTERNATIVE SPECIFICATIONS OF THE CONTRIBUTION OF EDUCATION TO ECONOMIC GROWTH

Exogenous	$Y=f(K, L, T)$ $Y=f(K, L, S)$	Solow Schultz, Denison
Endogenous	$Y=S f(K, L)$ $S'= g(Y)$	Lucas, Romer

There have been parallel developments in the micro approach of assessing the benefits of education. In my reading the most important ones are the Heckman correction for selectivity bias (Heckman, Ichimura, Smith and Todd, 1998), the instrumental variables technique (Card, 1998, 2001), and above all the fast growing literature on *quasi* natural experiments (see LaLonde, 1986).

To date, the micro and macro strands of research have not been well reconciled. E.g., micro data may indicate a “high” rate of return to investment in education in a given country, although macro data could not detect a significant contribution of education to economic growth (see Pritchett, 2001).

In my reading of the literature, I would place more faith in the micro relative to the macro evidence. The reason is that I consider micro data coming from a specific questionnaire in a specific survey much more reliable than national accounts data.

The issue is even more complicated when countries are used as points of observation (*a la* Barro, 1991). In my opinion, this adds insult to injury, in the sense that countries differ in many other respects (e.g., culture) that one can ever control for in a multiple regression.

What I consider methodologically more robust in the economics of education literature, is the use of natural experiments that originated with the work of Orley Ashenfelter and his colleagues at Princeton University (e.g., Ashenfelter and Krueger, 1994; Ashenfelter and Rouse, 1998). Thus, I would rely more heavily on a result from this literature, rather than from a pooled time-series regression. The reason is that experimental studies come nearer to establishing causality, rather than a simple correlation between education and income.

International statistics. Beyond the micro and macro data discussed above, there are also “international statistics” used in the economics of education literature. Initially, these were found only in the popular “*Unesco Statistical Yearbook*”, and more lately in UNDP’s, “*Human Development Report*”, OECD’s “*Education at a Glance*” and the World Bank’s “*Development Indicators*”, and especially its Living Standard Surveys (LSMS). I wish surveys of this nature were available for OECD countries.

All these data bases are good for giving an initial feel on the education conditions in a given country, but they have their defects. For example, the most basic indicators of net enrollment ratios, private enrollment and private education financing are missing from most international data bases. OECD’s (2003) *Education at a Glance* has been a breakthrough, in the sense that by the PISA study, it has brought to the forefront an output/quality measure of education systems (see OECD 2001).

2. PRACTICE

Let us now turn to see if, and how, the above theoretical developments and empirical findings in the economics of education have been translated into practice.

Table 3 shows the historical evolution in this respect.

TABLE 3. FROM EDUCATIONAL PLANNING TO EDUCATIONAL POLICY

-
- Educational planning (1960’s)
 - . Social demand (Robbins 1963)
 - . Manpower forecasting (Parnes 1964)

 - Educational policy (1990’s)
 - . Vouchers (Friedman 1955)
 - . Charter schools (Geske, Davis and Hingle 1997)
-

The 1960’s have been dominated by an urge for “educational planning”, in direct imitation to economic planning following World War II. Practically every Ministry of Education around the world established an education planning unit. Unesco established the International Institute for Educational Planning – still operating today.

Although such development happened along side the emergence of the economics of education, education planning activities had absolutely nothing to do with the economics of education. Educational planners proceeded as if economics of education did not exist.

The two most popular models that have been used in planning an educational system reflected two very different philosophies. In England, the Robbins (1963) Committee adopted the so-called social demand model for the expansion of the tertiary education system, i.e., the state should provide so many university places as there were candidates

passing two A-levels. But most other countries followed the so-called manpower requirements approach, i.e. they tried to tune the educational system to the projected demand for manpower by the various sectors of the economy. (See Psacharopoulos, 1985).

In fact, practically every country in the world, both industrial and developing, followed the manpower forecasting model. This is a purely engineering approach, having nothing to do with economics. Application of such model led to manpower forecasting errors of thousands per cent (see Ahamad and Blaug, 1973), and to a disastrous policy of establishing red brick universities in Africa in the midst of illiteracy. Had educational planners followed the rudimentary findings of the economics of education that were available at the time, they would have pushed instead primary education in poor countries, and today we might have a less dismal picture regarding world illiteracy.

But ideas and findings are slow in creeping into the heads of bureaucrats. It took about twenty years of research in the economics of education for Ministries of Education to start listening to different signals regarding priorities in education. Gradually a major change took place. People stopped talking of “educational planning”, a notion conveying the failure of Soviet central planning, and the key word became “educational policy”. Educational policy means a less grandiose approach to establishing priorities in education. It means just providing the right incentives for the users and producers of education to act at the margin in a way conducive to the country’s wellbeing.

A snapshot of the state of education in a given country represents the reduced form or intersection of demand and supply conditions set by individuals, families and actions of the state. Actually, Becker’s (1967) elegant treatment of the subject abstracts from the state. Today, the state plays a heavy hand in the educational system in practically all countries in the world, although more in some and less in others.

Individuals respond to perceived incentives to invest in a given level and type of education. The state acts on paternalistic reasons, allegedly to protect the uninformed user of educational services or, to put it more elegantly, to correct for external and distributive effects.

In the ideal world dreamed by the educational planners of the 1960s, the state would regulate what education uninformed and irresponsible citizens should be good for them and their children, and for ensuring full employment of graduates of various disciplines by means of manpower forecasting. (Parnes, 1964). The state would also increase the supply of technical and vocational education, allegedly because this is the type of education that leads to modernization and economic development.

Of course, forty years of experience show that things have not worked the way thought by the Platonic educational planner. Suffice is to mention to case of the former Soviet Union, the educational system of which (and especially the vocational part) was the envy of many countries. The quantity and type of education supplied by the state did not translate to economic growth.

In today's world we observe a spectrum of educational systems ranging from full centralization of educational decision making by the state, to more open systems delegating educational decisions to local authorities or the private sector. Even within OECD countries, such range is enormous (see Figure 3, above).

Two types of educational policies exemplify such trend. First, the use of vouchers for education, i.e. allowing the user of education to choose between different schools what is self-perceived to be good for him or her (Angrist, Bettinger, Bloom, King and Kremer 2001). And second, charter schools that split the financing from the provision of education (Geske, Davis and Hingle, 1997).

What Ministries do. Does this change in policy trend mean that today we live in a better world relative to the 1960's? Alas, this is far from the truth. Although there is wide recognition and acceptance of the economics of education key findings presented above, most Education Ministries in the world today continue to do sinister things. The explanation of such contrast is simple in terms of the political economy, rent seeking and vote behavior (Psacharopoulos, 2003).

Table 4 presents a compilation of what Education Ministries are doing, more or less, around the world, often supported by international organizations.

TABLE 4. WHAT MOST EDUCATION MINISTRIES DO

-
- Free provision of education, while lowering its quality;
 - Heavier subsidization of higher education, benefiting the rich;
 - Limited offering of student loans, the most efficient and equitable way of financing higher education;
 - Prohibition of private schools and/or regulation of their fees;
 - Prohibition of vouchers;
 - Regulation of university places;
 - Central control of the school curriculum and books;
 - Underpayment of teachers and professors;
 - Concern for quantity rather than quality;
 - Doubtful training programs for the unemployed;
 - Education budgeting by inertia;
 - Fear of competition (GATS).
-

But there are some encouraging news. Many Ministries of Education do not do as much what was common practice in the 1970s, i.e. having someone or a whole unit, often financed by the World Bank or the ILO, trying to forecast manpower requirements 25 years ahead, and translating these into school and university places the country should have. Even the World Bank and the ILO have stopped encouraging this activity. But I bet such practice must continue in some Ministries today.

The role of international organizations. International organizations have played a heavy hand in terms of influencing education policy, although some more than others.

Unesco. In spite of its international mandate, Unesco has never been influential on educational developments in a given country. Its role has been diffused to the publication of the Statistical Yearbook mentioned above, and general publications of the type “Learning to Be”. In my opinion, Unesco has never absorbed the messages and findings of the economics of education. A typical failure has been the 1960 Addis Ababa conference of the African Ministers of Education stating that there would be universal primary education enrollment by 1970, without even asking how such massive expansion would be financed, or what would be the quality implications (Psacharopoulos 1989b).

Unicef. Unicef has followed well its mandate of being an advocate for the world’s children. Its *Innocenti* publications have certainly sensitized public opinion regarding illiteracy and child labor (see <http://www.unicef-icdc.org/publications/>). Yet its operational arm has been weak.

UNDP. The UNDP has played a more distinct role in affecting educational development, mainly in terms of supporting project preparation studies. The UNDP has heavily supported manpower planning activities around the world. And its relatively recent “*Human Resources Report*” provides a decent forum for ideas and data regarding educational development.

World Bank. Of course, this has been the institution *par excellence* that has played the most prominent role among all international organizations regarding educational development. But it is a great pity it took the Bank nearly twenty years to start applying some of the findings of the economics of education. Between the start of its operations in education in 1962 and the late 1980’s, the Bank financed almost exclusively vocational and tertiary education projects – both against the grain of economics of education findings that were available at the time. It took the institution a very long time to absorb basic messages from the economics of education and change its policy away from vocational and tertiary education towards primary education.

Even so, one has to observe a combined failure of the World Bank, UNICEF and the UNDP in setting realistic priorities in basic education. The 1990 Jomtien conference

sponsored by the three institutions pledged universal primary education by the year 2000 – an exopragmatic statement given the available finances -- a target that does not seem to be feasible in the foreseeable future.

ILO. Although its mandate is on training rather than on education, the ILO has played a heavy hand in financing manpower forecasting around the world. Such activity has now clearly subsided, and the organization has turned its attention to issues of child labor – a mirror image of basic education coverage. It is unfortunate that the main policy focus of the ILO to combat child labor is through labor standards legislation, rather than creating the incentives to parents for keeping children in school.

OECD. The club of the rich has been a very good clearing house and forum of educational policy discussions. In its advisory role, it has been catalytic in terms of pushing the Ministers agenda towards real issues, rather than generalities. The recently established “*Education at a Glance*”, and especially the PISA program of measuring educational achievement have been very influential in shaping policy in member states.

European Commission. Alas, one could not say the same regarding the European Commission. It is true that by the *dictum* of the Treaty of Rome, each country is responsible for its own education policy. Yet continuous efforts have been made to circumvent such *dictum* and shape EU-wide education policy. Examples are the Bologna and Lisbon declarations, as well as the various communiqués of the meetings of the EU Ministers of Education. However, such talks and pronouncements could have been translated faster into concrete action. Lifelong education has been espoused, without asking how it would be financed. In their communiqué following the May 2001 Prague meeting, the EU Ministers of Education “...supported the idea that higher education should be considered a public good and is and will remain a public responsibility”. Beyond the wrong use of the term “public good”, if such thinking dominates among EU Education Ministers, Europe will fall even more behind the United States, Canada, Australia and New Zealand regarding excellence in education.

CONCLUSION

The world is far from perfect. There is a lot of inertia governing what Ministries of Education do in their *bona fide* effort to improve education. The power of inertia is often stronger than any scientific evidence coming from the economics of education or any other related discipline.

In spite of great progress in the economics of education there are still many open research questions. On my list these are the micro-macro reconciliation and the measurement of externalities using *quasi* experimental designs (*a la* Miller Mulvey and Martin, 1995; Rouse, 1999).

Given the state of the art, perhaps decentralization of education decision-making and the separation of the financing from the provision of education seem to be the strongest policy changes a country could make. But such changes require a political will that more than often is lacking.

REFERENCES

- Acemoglu, D. and J. Angrist**, 2000. "How Large Are Human Capital Externalities? Evidence from Compulsory Schooling Laws", In Bernanke, B.S., Rogoff, K., eds. *NBER Macroeconomics Annual 2000*. Volume 15, Cambridge and London: MIT Press, 2001; 9-59.
- Ahamad, B. and M. Blaug**, 1973. *The Practice of Manpower Forecasting*. Elsevier.
- Angrist, J., E. Bettinger, E. Bloom, E. King and M. Kremer**, 2001. "Vouchers for private schooling in Colombia: Evidence from a randomized natural experiment", NBER Working Paper No. 8343.
- Arrow, K.**, 1973. "Higher education as a Filter", *Journal of Public Economics*, 2, July: 193-216.
- Ashenfelter, O. and A.B. Krueger**, 1994. "Estimates of the Economic Return to Schooling from a New Sample of Twins", *American Economic Review* 84(5): 1157-1173.
- Ashenfelter, O. and C.E. Rouse**, 1998. "Income, Schooling, and Ability: Evidence from a New Sample of Twins", *Quarterly Journal of Economics* 113: 253-284.
- Barro, R. J.**, 1991, "Economic growth in a cross-section of countries", *Quarterly Journal of Economics*, 106 (2), 407-44.
- Becker, G.S.**, 1964. *Human Capital: A Theoretical and Empirical Analysis*, New York: National Bureau of Economic Research.
- Becker, G.S.**, 1967. "Human capital and the personal distribution of income: An analytical approach", Woytinsky Lecture No. 1. University of Michigan.
- Blackburn, M.L.**, 1990. "What Can Explain the Increase in Earnings Inequality among Males?", *Industrial-Relations*, 29(3) 1990: 441-56.
- Blaug, M.**, 1965. "The rate of return on investment in education in Great Britain", *The Manchester School*, September, 205-262.
- Card, D.**, 1998. "The causal effect of education on earnings", in Orley Ashenfelter and David Card (eds), *Handbook of Labor Economics* (Volume III), Amsterdam: North-Holland.
- Card, D.**, 2001. "Estimating the return to schooling: progress on some persistent econometric problems", *Econometrica*, 69 (5), 1127-1160.
- Castro-Leal, F., J. Dayton and K. Mehra**, 1999. "Public social spending in Africa", *The World Bank Research Observer*, 14 (1), 49-72.
- Denison, E.F.**, 1967. *Why growth Rates Differ?* Brookings Institution.
- Friedman, M.**, 1955. "The role of government in education", in *Economics and the Public Interest*, ed. R.A. Solo, Rutgers University Press.
- Friedman, M.**, 1997. "Public schools: Make them private", *Education Economics*, 5 (3), 341-344.
- Geske, T., R. Davis, and P. Hingle**, 1997. "Charter schools: A viable public school choice option", *Economics of Education Review*, 16 (1), 15-23.
- Hanushek, E.**, 1981. "Throwing money at schools", *Journal of Policy Analysis and Management*, 1 (1), 19-41.
- Harbison, R. and E. Hanushek**, 1992. "Educational Performance of the Poor", *Oxford University Press*.

- Heckman, J., H. Ichimura, J. Smith and P. Todd**, 1998. "Characterizing selection bias using experimental data" *Econometrica*, 66, 1017-1098.
- LaLonde, R.**, 1986. "Evaluating the experimental evaluations of training programs with experimental data" *American Economic Review*, 76 (4), 604-620.
- Layard, R. and G. Psacharopoulos**, 1974. "The Screening Hypothesis and the Returns to Education", *Journal of Political Economy* 82, no. 5 (September-October), 985-98.
- Lucas, R.E.**, 1988. "On the Mechanics of Economic Development", *Journal of Monetary Economics* 22: 3-22.
- Marin, A. and G. Psacharopoulos**, 1976. "Schooling and income distribution", *The Review of Economics and Statistics* 58 (3), 332-38.
- Miller, P., C. Mulvey and N. Martin**, 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): 586-99.
- Mincer, J.**, 1974. *Schooling, Experience, and Earnings*. New York: National Bureau of Economic Research.
- New York Times**, 2000. "Study Finds Higher Test Scores Among Blacks With Vouchers", August 29.
- North, D.**, 1990. "Institutions, Institutional Change and Economic Performance", *Cambridge University Press*.
- OECD**, 2001. *Knowledge Skills for Life*. OECD.
- OECD**, 2003. *Education at a Glance: OECD Indicators, 2003*. Paris:OECD.
- Parnes, H.S.**, 1964. *Planning Education for Economic and Social Development*. OECD.
- Pritchett, L.**, 2001. "Where Has All the Education Gone?" *World Bank Economic Review* 15(3): 367-393.
- Psacharopoulos, G.**, 1985. "The Manpower Requirements Approach", In *International Encyclopedia of Education*, eds. T. Husen and N. Postlethwaite. Oxford: Pergamon Press, 3204-08.
- Psacharopoulos, G.**, 1987. "To Vocationalize or Not to Vocationalize? That is the Curriculum Question", *International Review of Education* 33 (2), 187-211.
- Psacharopoulos, G.**, 1989a. "Time Trends of the Returns to Education: Cross-National Evidence", *Economics of Education Review* 8, no. 3, 225-31.
- Psacharopoulos, G.**, 1989b. "Why Educational Reforms Fail? A Comparative Analysis", *International Review of Education* 35, no. 2, 179-95.
- Psacharopoulos, G. and P. Tzannatos**, 1992. *Women's Employment and Pay in Latin America: Overview and Methodology*. Washington, DC: The World Bank.
- Psacharopoulos, G.**, 2003. "The social cost of an outdated law: Article 16 of the Greek Constitution," *European Journal of Law and Economics*, 16 (3), 123-137.
- Psacharopoulos, G. and S. Tasoulas**, 2004. "Achievement at the higher education entry examinations in Greece: A Procrustean approach" *Higher Education*, 47(2), 241-252.
- Psacharopoulos, G. and A. Patrinos**, 2004. "Returns to investment in education: A further update," *Education Economics* 12, no. 2, 111-135.
- Robbins, L.**, 1963. *Higher Education – Report to the Committee*. Her Majesty's Stationary office.

- Romer, P.**, 1986. "Increasing Returns and Long-run Growth," *Journal of Political Economy* 94, 1002-1037.
- Romer, P.**, 1990. "Endogenous Technological Change," *Journal of Political Economy* 89(5), Part 2, October, S71-102.
- Rouse, C.E.**, 1998. "Private school vouchers and student achievement: An evaluation of the Milwaukee parental choice program," *Quarterly Journal of Economics*, 113, 553-602.
- Rouse, C.E.**, 1999. "Further Estimates of the Economic Return to Schooling from a New Sample of Twins", *Economics of Education Review* 18(2): 149-157.
- Schultz, T.W.**, 1961a. "Investment in Human Capital," *American Economic Review*, 51, 1-17.
- Schultz, T.W.**, 1961b. "Education and economic growth" in *Social Forces Influencing American Education*. National Society for the Study of Education.
- Solow, R.**, 1956. "A Contribution to the Theory of Economic Growth", *Quarterly Journal of Economics*, 70, 65-94.
- Solow, R.**, 1957. "Technical Change and the Aggregate Production Function", *Review of Economics and Statistics*, 39, 312-320.
- Spence, D.**, 1973. "Job market signaling", *Quarterly Journal of Economics*, 87, August, 355-374.
- Stiglitz, J.**, 1975. "The theory of 'screening', education and the distribution of income", *American Economic Review*, 65, 283-300.
- Tsakloglou, P. and M. Antoninis**, 1999. "On the distributional impact of public education: Evidence from Greece", *Economics of Education Review*, 18, 439-452.
- 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 (http://www.cpb.nl/eng/cpbreport/2000_1/s3_4.pdf).
- Woessmann, L.**, 2002. *Schooling and the Quality of Human Capital*. Kiel Studies 319, Springer.
- Wolfe, B. and S. Zuvekas**, 1997. "Non-Market Effects of Education", *International Journal of Education Research* 27(6), 491-502.

