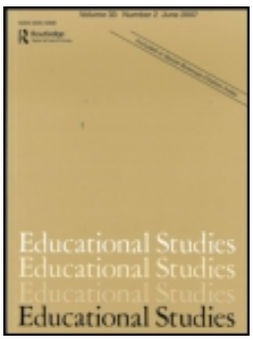

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Economics of Education. The Need to go Beyond Human Capital Theory and Production-Function Analysis

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SUMMARY *Human capital theory takes for granted that an individual's demand of education will automatically be transformed into real human capital: there is no supply constraint or, said differently, educational systems can be assimilated to 'neutral' black boxes mechanically transforming input into output. This optimistic view of human capital production was rapidly abandoned. In the late 1960s some economists began to revise the assumption that the black box's functioning was neutral with regard to human capital production. Supply-side economics of education appeared first under the form of production-function analysis. It was initially believed that the information delivered by such input/output approach would help policy makers and administrators choose the most productive 'mix' of inputs. But the major conclusion of this line of research is that there is apparently no clear and undeniable relation between both expenditure per student and the specific resources they can buy (teachers' degrees and experience, smaller student–teacher ratios) on the one hand, and student achievement on the other hand. This probably means that further conceptual development is necessary to overcome the current analytical—and also political—deadlock. This paper argues that one promising way consists of introducing organisational assets as well as non-monetary inputs into the production function paradigm.*

Introduction

Originally, economists neglected the analysis of co-ordination problems inside the educational sector. Human capital theory—the first contribution to the economics of educational issues—had almost nothing to say about educational systems and the way they function. It was solely concerned with the individual demand for education. In its first version (Becker, 1964), human capital theory presented a cost-benefit analysis carried out by individuals. Education amounts to an investment that generates a particular form of capital: human capital. But

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education policy can no longer be solely based on human capital theory. The reason for this is two-fold. From a purely logical point of view, the economic analysis of education is bound to incorporate the supply side in its analysis of human capital production that was previously totally centred on the demand side. But there are also empirical reasons to this necessity to renew the economic analysis of education.

The Theoretical Factor

Human capital theory essentially develops a 'black box' approach to production of education issues. The implicit vision conveyed by this model is that educational systems mechanically respond to their—private or public—clients [1]. One could argue that human capital theory is excessively based on the implicit assumption that schools and teachers do not have objectives of their own. As a result educational institutions are supposed to be passive and not submitted to any constraints.

More and more observers (Gravot, 1993; Jarousse, 1991) consider today that individuals or governments investing in the educational system will not automatically get 'the best value for money'. Production of education services is exposed to asymmetry of information problems, quality control challenges and non trivial co-ordination strains. Human capital accumulation is more than individual effort accomplished by pupils and students who expect some financial return on their investment during the rest of their life cycle. Both the demand side and the supply side have to be taken into account and be seen as a source of regulatory difficulties. A positive economic analysis of education should at least focus on the outcome of supply and demand interaction. Similarly, a more normative analysis ought to conceive educational policy instruments aimed at co-ordinating both categories of actors.

The Empirical Factors

Human capital theory is optimistic. It promotes the idea that education is a very powerful individual and social lever. Better educated people and nations will earn more and prosper at a faster rate. Public investment in education can reduce income inequality and eradicate poverty. But education did not keep all its promises over the last two decades. In addition, the public finances' crisis has progressively persuaded decision makers that each dollar or franc of tax receipt ought to be spent more efficiently. Quite logically, those factors (and others) led most observers to the conclusion that supply-side factors deserved greater attention than in the past.

Several socio-economic trends during the late 1970s and the 1980s have invalidated human capital theory's claims in its aggregate version. The automatic connection between the aggregate level of education and economic growth showed its weakness when growth rates and productivity gains began to decline. Income inequality exploded dramatically (Murphy & Welch, 1992,

1993) although educational achievement differentials—measured by the highest grade completed—considerably shrank during the same period (Hanushek, 1992). Economists and other social scientists also viewed education as the solution to many social challenges including productivity, inequality, health status, over-population and unemployment (Levin & Kelly, 1994). But again, expected results did not show up.

It is true that extra-school parameters have simultaneously favoured earnings inequality. One of them is the skilled-biased technological progress which tends to be particularly detrimental to individuals with lower skills (Kremer, 1993; Piketty, 1994). Yet educational outcome *per se* measured by standardised test-score differentials also revealed disappointing. Some elementary school programs specially designed for 'at risk' children for example generated encouraging results but those gains vanish rapidly when these children enter higher levels of the educational process (Glazer, 1986). Other empirical studies, centred on the educational system's internal performance, contributed to alter the human capital optimistic prophecy. Hanushek (1986) highlighted a relative decline in US pupils' standardised test scores: the famous SAT scores. The drop began in 1967 and lasted until the mid-1980s [2]. More astonishingly, this reversal coincided with a substantial rise of per pupil expenditure which was essentially owing to a significant reduction of the average class size (Hanushek & Rivkin, 1994).

Growing concern about the actual return of educational public expenditure has also to do with the crisis of the public finances. The mid-1970s coincided with the first big public finances' crisis since the end of World War II. Keynesian economic policies which were implemented during the late 1970s and the early 1980s, combined with the economic growth slow-down and the rise of real interest rates, led to an explosion of public deficits and gave birth to large public debts. Between 1970 and 1994, most advanced and industrialised Western nations (G7 countries) doubled their public debt/GDP ratio: from an average of 40%, the latter inflated to 70% (*The Economist*, 1995). In addition, as the population is growing old in most Western countries, retirement costs and health costs are bound to rise significantly over the next decades (Wolfe, 1994). Especially in Europe, this means growing transfers from active population towards elderly people. It will thus become more and more difficult to increase the part of the budget devoted to educational investment (Shoven *et al.*, 1994) unless there are spectacular growth rates and productivity gains.

Inside the Black Box First—production function analysis

Limitations of the human capital theory and dramatic shifts in the political and economic context have significantly contributed to a renewal in the economics of education. Supply-side economics of education appeared first under the form of production-function analysis (Cohn & Geske, 1990). The basic idea underlying this field of research was the 'production possibility frontier' commonly exposed in every undergraduate micro-economics textbook.

Production Function—the concept

Most of these studies—surveyed by Hanushek (1986) and Monk (1992)—are based on a very simple assumption: education corresponds to some technology which has to be identified and then efficiently used. Identification necessitates input/output cross-section empirical analysis. Correlation coefficients between all sorts of educational inputs (teacher salaries, class size, capital expenditure) and outputs (typically standardised test scores) are computed on a nationwide scale. Econometric results are supposed to provide a significant basis for educational decision making. Using the information delivered by the production function analysis, education policy makers and administrators can supposedly choose the most productive 'mix' of inputs. Complementary to human capital theory focusing on the demand side, the production-function stream of work represents thus a first step towards a better understanding of the supply side of the educational process.

Results

The first well-known empirical study exploiting the production function idea was carried out by Coleman *et al.* (1966) [3]. Its most striking result was that a child's educational attainment appears essentially correlated to his socio-economic origin. Additional explanatory variables—essentially schools' monetary resources—seem to be of little statistical significance. Coleman and his colleagues did not find the expected positive connection between expenditure per pupil or average class size and educational outcome generally measured by standardised test scores, controlling for initial human capital endowment (i.e. value-added measures). This very controversial result triggered off an impressive number of similar studies. In his 1986 survey, Hanushek references more than 147 papers containing education production-function results over the last two decades [4]. His discussion tends to temper Coleman's very distinct conclusion. Yet, the same central idea remains. The idea of socio-economic determinism is restated by Hanushek: a child's socio-economic background is of central importance to predict his level of educational attainment. Children whose parents are well-off or better educated get—on average—better academic results. Contrary to Coleman, Hanushek does not question the idea that school matters. Indeed, he concludes that 'some' schools and teachers are systematically more productive than others. Nonetheless he heavily insists on the fact that this observation is not statistically related to the level of inputs with a monetary expression, particularly the per-pupil expenditure.

This striking result is as controversial as Coleman's initial statement about the absence of 'school effect'. Since 1986, new estimations have been carried out. Methodological considerations have come to light and have challenged Hanushek's meta-analysis approach (a census-like study). Greenwald *et al.* (1994) dispute his way of interpreting successive production-function analyses and conclude that monetary inputs 'might' have some influence on educational

achievements. They basically use a null test hypothesis argument to reject Hanushek's point. They argue that the 147 production-function empirical analyses must be interpreted as a set of data randomly sampled. A relatively small proportion of positive and significant coefficients does not represent a sufficient condition to reject the null hypothesis [5].

Card & Krueger (1992) examined further Hanushek's perplexing conclusion. In their cross-states empirical study, they regressed post-graduation wages (earnings) on per-pupil educational expenditure in the state of origin. Contrary to Hanushek, they conclude that higher public expenditure (a proxy for school quality) does matter: it is synonymous with higher remuneration at adult age. Their statistical models show a positive relation between average per-pupil school expenditure in the state and later earnings. But recent theoretical work (Hanushek *et al.*, 1996) stresses the potential upward bias affecting regression coefficients when the level of aggregation becomes higher. Card & Krueger (1992) typically use very aggregated data to create their per-pupil expenditure variable. This theoretical point finds some echo in empirical studies using less aggregated data, i.e. data collected at school and district levels. Attempts to replicate Card & Krueger's (1992) results at that level have not shown similar patterns (Betts, 1995).

The debate about education production functions is particularly complex. A first reason is that researchers do not use the same proxy of educational achievement. Some researchers, such as Hanushek, focus on test results while others, like Card & Krueger, exclusively refer to wages. It is true that human capital theory predicts some connection between education achievement, productivity and individual wages. Yet, we know that labour market mechanisms—be they internal or external to firms—have their own rules and interfere with the outcomes of the educational sector. The second source of difficulty is simply that successive empirical studies come to opposite conclusions despite their relative homogeneity in terms of data and methodology.

Conclusion

There is apparently no clear and undeniable relation between expenditure per student and for example student achievement. The only well established result is that socio-economic origin is decisive (Glennerster, 1991). Schools differ dramatically in 'quality' but this fact cannot be connected statistically or econometrically to rudimentary factors that many researchers have examined. Differences in quality do not seem to reflect only variations in expenditure, class size, or other commonly measured attributes of schools and teachers. Instead, they appear to result from differences between teachers' skills that defy detailed description and empirical causal analysis (Hanushek, 1986). We believe that this is partly because production-function research relies upon a too simple conception of the educational black box. Regression techniques are more and more sophisticated but the conceptual background is still very similar to the technological conception of production conveyed by micro-economics textbooks.

Because of data availability too, most regressions still focus on ratios of outcome proxies (test scores or wages) to monetary input.

Inside the Black Box Second—the need for an enriched conception of education production

The list of variables that can help us re-conceptualise schooling is rather large. We shall focus here on those that have been recently explored either empirically or conceptually, that relate somehow to the aforementioned co-ordination problem and are non-monetary by nature, i.e. cannot be purchased on the market place.

Intra-school Organisational Efficiency or x-Efficiency

Several case studies (Monk, 1992), but also nationwide empirical research (Hanushek, 1986, 1992) tend to confirm the critical role played by intra-organisational attributes. The technological relation between inputs and outputs could be conditional to the presence of organisational assets: the so-called x-efficiency (Leibenstein, 1966; Levin, 1997). These cannot be directly related to the amount of monetary resources made available by the public authority and cannot be purchased on the market place like a teacher with a certain degree or some formal qualification, facilities, textbooks or computers. Although organisation seems to be very important, its clear comprehension and control appears problematic. At least two questions must be answered. The first one relates to the nature of organisation. The second corresponds to its production and diffusion system-wide.

The nature of school organisation: co-ordinating professionals. Schools, like firms or government agencies, require a certain level of co-ordination. This diagnosis seems reinforced by the fact that education is a joint-product (i.e. produced by several teachers). In addition, student learning is a process which occurs over time in a multi-level structure (Bryk *et al.*, 1990). Of course, the importance of external (e.g. bureaucratic) control can considerably limit the intra-school organisation problem. But in any case at least some residual organisational responsibility is given to schools. Intra-school co-ordination—typically the school head's responsibility—supposes some administration: information must be communicated to teachers and pupils, resources must be allocated ... . He must also establish a certain number of rules that decrease school disruption, increase students' safety or protect teachers from excessive parental interference (Bidwell, 1965). Beyond administration, mediation or 'buffering', school organisation essentially amounts to curricular arrangement and teaching. The process of learning is actually central to a school's life. It is quite invariably organised by age and grade level. Contrary to primary education, secondary education also means subject specialisation. This rather specialised learning process is carried

out by teachers. All this highlights the necessity of some co-ordination of individual decisions.

But teachers like to consider themselves as professionals (Weiss, 1990; Maroy, 1992). The work teachers do is like that of other professionals (doctors, lawyers ...): it is intellectual, cannot be standardised or reduced to routines, and requires preparation through advanced training. This professional component of school life generates a situation where teachers expect to have broad control of their daily task in the classroom. Weiss (1990) judiciously indicates that several crucial domains of educational decisions are left virtually undisturbed by other control mechanisms in schools. The day-to-day practices of instruction, evaluation of pupil performance and maintenance of order are usually left in the hands of individual teachers. This observation raises questions about the scope of the school organisation idea. Maroy (1992) insists on the fact that schools are generally characterised by a certain level of 'structural looseness'. Co-ordination attempts—be they internal or external—are always a priori limited in magnitude by the presence of professionals who tend to fight to preserve their independence.

Hence, organisational efficiency in the educational sector implies quite invariably that rulers find the right balance between co-ordination requirements and professional autonomy. Schools where such a balance was successfully implemented apparently exist. The whole question is to determine whether these schools are ruled by outstanding, but quite uncommon, principals or whether they present distinct organisational—structural—features, combined in a very specific and identifiable manner which ensure a certain efficiency, no matter the personality of the staff in charge.

Hanushek (1992) seems to support the first assumption. In his words 'organisation defies both description and prescription'. Cousin (1993) brings in nuances. Efficient organisational practices can be identified. What is at stake is essentially the capacity to induce a significant proportion of the staff to partly abandon the grade–classroom–subject reference and structure their work by reference to the whole school. But Cousin concludes that factors permitting this kind of mobilisation are still relatively unknown.

Levin (1994) is more optimistic. He argues that necessary conditions for a good educational organisation largely correspond to the conditions defining efficient firms. In brief, the more 'productive' schools Hanushek (1986) presented as 'outliers', could be viewed as schools that have managed to combine some of the five organisational attributes. First, schools must be clear about what they are attempting to achieve. This supposes that there is a widespread acceptance and agreement by all participants. This objective must be associated with measurable outcomes in order to appraise what the school is doing. Second, teachers and principals must get incentives tied to student success. Incentives can be intrinsic (e.g. a sense of accomplishment) or extrinsic (e.g. financial reward or recognition either by hierarchy or peers). They can be individual or collective but their very purpose is to stimulate effort and increase accountability. Third, information must be made available concerning existing

pedagogical possibilities, test scores and their evolution. The absence of rapid feedback can also prevent the implementation of a trial and error innovation strategy. Fourth, schools evolve in a changing environment and must constantly adapt to meet new individual and social demands. Adaptability is thus of great importance to achieve organisational efficiency. Fifth, schools must be able to adopt the most productive teaching technology consistent with budgetary constraints.

How to diffuse efficient organisational arrangements? To define and implement the appropriate balance between professional autonomy and co-ordination procedures *à la Levin* for example in a particular school is a non-negligible challenge. But its reproduction and dissemination system-wide is even more complicated. In the US, several school renovation programs for at-risk pupils are currently experimented. There is the accelerated schools project promoted by Professor Levin from Stanford or the one sponsored by the John Hopkins University (Slavin *et al.*, 1990). These programs aim at a gradual dissemination of educational practices that have proved particularly adapted to at-risk pupils' needs. First results seem very promising. However, the key point is to appreciate the 'survival' prospect of those results once their very enthusiastic, skilled and dynamic advocates disappear or are forced to delegate because, almost by definition, their capacity to control their project is limited beyond a certain level of development.

Traditionally, economists argue that the generalisation of 'good' organisational features heavily depends on a nexus of external incentive and co-ordination mechanisms (Laffont & Tirole, 1993; Milgrom & Roberts, 1992). In other words, a regulatory principle is necessary to organise individual actions and orient independent decision makers towards a certain end. Information circulation is important but most economists apparently believe that 'incentives' are more important. The new theories of regulation (Baron, 1989) tend to focus on 'effort' incentive problems. Several external incentive mechanisms are studied by this literature. Some rely on output-based remuneration or promotion schemes defined by the regulator. Other regulatory approaches are more of the market type.

Many analysts (Chubb & Moe, 1990; Lankford & Wyckoff, 1992) believe that school choice is crucial to improve the overall efficiency of education systems but the empirical evidence regarding the impact is still contrasted suggesting that further work is necessary. Glenn (1989) claims, at the end of his multi-country investigation (France, Belgium, the Netherlands, Canada, UK and Germany), that the case for choice-driven efficiency is weak. In his view, the danger of extended segregation dominates any other benefit. He underlines the crucial role played by some regulatory requirements in order to limit the propensity of choice to generate segregation. Hoxby (1994) by contrast concludes that more school choice *causes* better educational achievement with no increased sorting or segregation. Those results are interesting but problematic because the US have no real 'voucher' or quasi-market system [6]. Voucher

plans have not yet been adopted on a state-wide scale in the US. Hoxby argues that it is already possible to estimate the effect of easier parental choice. Indeed, variation in the ease of choosing among public schools already exists because metropolitan areas differ greatly in their public school enrolment concentration. But this sort of choice is very much constrained. Some parents must live in a particular district simply because their employer is there. School choice through residential mobility is also heavily influenced by real estate markets. Educational choice in the US is thus wealth-contingent.

Peer Effects

We have argued above that intra-school organisation potentially enhances the productivity of monetary inputs. A lot of work is still necessary to identify the mechanisms through which organisational assets can emerge and be disseminated system-wide. The point we put forth here is that organisation and money cannot accomplish everything. A large body of recent research stresses the importance of social interactions. The latter, if properly mobilised, can considerably buttress human capital production and usefully complement monetary input and organisation.

Peer effects: the idea. In the school context, these social interactions are called 'peer' effects—some people also use the term 'contextual' effects. The underlying idea is that the knowledge a child assimilates during a school year depends directly on the characteristics or actions of his comrades. In other words, education is characterised by social spillovers. Note that the concept is far from being specific to educational problems. Recent empirical evidence, highlighting the importance of social interaction, has developed in several contexts: teenager pregnancy, drug addiction, inter-generation and ghetto poverty (Jencks & Meyer, 1987; Corcoran *et al.*, 1990; Dynarski *et al.*, 1989; Evans *et al.*, 1992). Case & Katz (1991) provide evidence that the probability of social ills in one neighbourhood increases with the prevalence of the same ills in adjacent neighbourhoods.

In the educational context, Coleman *et al.* (1966) were the first to defend the social interaction idea. Most observers retained their controversial conclusion that objective attributes (monetary inputs) of schools have little impact on achievement. The latter's most significant determinant is simply the student's socio-economic background. It is less known that Coleman and his co-authors also insisted on the importance of peer characteristics. Since Coleman, several empirical studies have come to the same conclusion: the quality of social interactions heavily influences educational achievement (Summers & Wolfe, 1977; Henderson *et al.*, 1978; Duncan, 1994; Dynarski *et al.*, 1989).

Peer effects: conceptual status and regulatory implications. Conceptual and political challenges raised by the idea of peer effects should not be underestimated. From a theoretical standpoint, peer effects amount to externalities (spillovers). This

notion was already present in the human capital theory: the more educated a worker, an employee or a staff member, the higher his productivity and his colleagues' productivity. In most public finance textbooks, education is also synonymous with richer social, cultural and political life, better public health, less crime (OECD-CERI, 1998).

Yet, the peer effect concept bears some innovation with regard to the concept of externalities as it has been traditionally presented and exploited by human capital theory. First, peer effect is an externality that operates *during* the production of human capital and not only later, when individuals as adults get involved in socio-economic life. Second, and more essentially, peer effects are *local.* This means that the basic co-ordination problem is to control the allocation of individuals between schools. Social interaction is a local phenomenon and takes place in bounded entities (schools) that are separated from each other. Individuals attending classes somewhere in the educational system possess different human capital endowments. Some originate from well-off families while others come from poor families, have parents with no or poor educational records. When grouped in a particular school or classroom, what level of externality do they benefit from? The question would be senseless in a world of permanent and boundless social interaction. In that very unrealistic situation, each individual would permanently be exposed to the sum of externalities dispersed by the rest of mankind. Real life is slightly different. A 'rich' individual attending a school and generating some (positive) externality in that particular school is 'lost' for the other schools. Externalities conveyed by individuals are almost by definition spatially limited. Their diffusion is not universal. In most situations, it is limited by the size of the entities they choose (or are obliged) to live in.

Consequently, allocation of heterogeneous individuals between strictly delimited entities thus becomes a critical issue (Vandenberghe, 1996, 1998). Educational policy must bring some answer to at least two problems. The first one is to identify the optimal allocation of individuals across schools. The second problem is to get the individuals (the pupils and their parents) to accept this allocation.

Should individuals be sorted between homogeneous entities (i.e. schools wherein all pupils have the same ability) or should they be placed in heterogeneous ones (i.e. schools mixing ability levels)? Allocation of heterogeneous individuals relates here to 'productive' efficiency problems: the production of human capital is directly affected by the way heterogeneous individuals are allocated. A social objective consisting of maximising the average level of human capital can be compromised if individuals are inappropriately allocated among schools. The same is true with an egalitarian objective aiming at equalising educational achievement. The cost of this policy is potentially influenced by the way peer effects are allocated among schools (Vandenberghe, 1996).

In addition, a social planner who would want to mobilise peer effects in a certain way (segregation or mixing) could be confronted with a preference-incompatibility problem among pupils and parents. If individuals are sensitive to

peer effects (i.e. are aware of their importance), they are also sensitive to the allocation of relevant human characteristics among schools. For example, the desire of 'rich' individuals to segregate from the 'poor' in order to maintain the peer effect component at its highest level can be challenged by the desire of 'poor' people to benefit from this social input. Some co-ordinating mechanism must exist to ensure minimal compatibility between conflicting individual preferences. This raises a co-ordination problem that basically consists of finding ways to make sure that decentralised decision makers (schools, teachers, parents in the school context) properly 'internalise' the existence of peer effects. Correspondence between social priorities and each individual decision maker cannot be taken for granted.

Conclusion

We essentially retain from this discussion that the supply side of the educational process can no longer be represented as a simple (and neutral) black box. Our survey of production-function analyses—a first attempt to overcome the black box assumption implicitly made by the human capital theory—has led to the conclusion that no clear and indisputable relation exists between both expenditure per student and specific resources they can buy, on the one hand, and student achievement, on the other hand. The only well established result is that socio-economic origin is decisive. Schools differ dramatically in 'quality' but this appears to result from differences between teachers' skills that defy detailed description and empirical causal analysis.

We have argued that the reason for this deadlock could be that traditional production function research in economics of education relies upon a too simple—actually too mechanical—conception of the production process. It is common to present production possibility frontiers as a purely technical relationship, void of any economic content. From our point of view, some conceptual development around the idea of human capital production is necessary to overcome the analytical—and also political—limitations illustrated for example by the endless 'school quality' debate in the US.

We have attempted to achieve this objective by focusing on two ideas: intra-school organisation or x-efficiency and social interaction synonymous with social and local spillover among pupils. Several case studies tend to confirm the critical role played by intra-organisational attributes. But internal organisation of schools is a very puzzling issue wherein numerous variables play a role (administration, curricular arrangements, scheduling, tracks ...). In addition, the generalisation of 'efficient' intra-school organisational attributes constitutes a rather uneasy task. Regarding this issue, one idea that gains in importance in the academic and political debate is the key role played by the governance structure in which schools are embedded, in particular a structure that incorporates market-oriented mechanisms (Glennerster, 1991; Vandenberghe, 1996).

The second idea we put forward is that intra-school organisation is only one face of the coin. The capacity to mobilise social input is probably as important.

In the school context, these social inputs amount to social interactions called 'peer' effects—some people also use the term 'contextual' effects. In other words, education is one of those numerous human activities characterised by social spillovers. This means the implementation of socially optimal education policy is conditional to the identification of the optimal allocation of individuals (by type or ability level) across schools. It also heavily depends on the ability of decision makers to get the individuals (the pupils and their parents) to accept this allocation.

NOTES

[1] This viewpoint is shared by other social scientists, mainly sociologists, who focus on social stratification, particularly the role of education in status attainment. The primary interest of these studies regards the consequences of schooling—the years of schooling being the key independent variable—for occupational and social mobility (Bryk *et al.*, 1990). In these contributions, the organisational structure of school is also conceived as a 'black box' whose internal organisation is not central to the analysis. Neither economists nor sociologists during the 1960s offered insight into how the process of schooling actually produces the observed (desirable or undesirable) outcomes.

[2] According to Peltzman (1993), the decline was remarkably pervasive, affecting many different types of students in most grades, in all regions of the US, in Catholic as well as public schools and even in Canadian schools. The drop was apparent in the results of different kinds of tests covering many subject areas. We have not come across information suggesting that a similar test-score decline has occurred in Europe or elsewhere in the world.

[3] Coleman is not the first to consider what goes on in schools in an input/output framework. British economists like Burkhead (1967) carried out production function estimation in the early 1960s. American literature also contains numerous studies on school effectiveness from the 1920s on, but these are not due to economists.

[4] It is worth stressing that cross-section production-function analyses are logically more frequent in the US than anywhere else in the world. The reason for this is two-fold. First, education is heavily decentralised. Expenditure per pupil, teacher salaries ... present substantial variance (Cohn & Geske, 1990). Thousands of American districts finance their educational systems with local property tax and this represents an impressive set of individual experiments that can be used by an econometrician to explore educational technology. Second, standardised test-score measures are available on a nationwide scale. Econometricians can thus use those results to create their dependent variables. In most European countries, education is financed centrally: teacher-to-pupil ratio, wage scales ... are determined centrally and this means that variance is extremely limited. Hence, econometric studies must necessarily be carried out at international level. But this raises other difficulties: data is not always available or standardised.

[5] For a response to this argument, see Hanushek (1994).

[6] More than 85% of US pupils attend public schools at elementary and secondary level. This figure is relatively constant since the end of World War II.

REFERENCES

BARON, D.P. (1989) Design of regulatory mechanisms and institutions, in: R. SCHMALENSEE & R.D. WILLIG (Eds) *Handbook of Industrial Organization* (Amsterdam, Elsevier Science Publishers).

BECKER, G.S. (1964) *Human Capital* (New York, Columbia University Press).

BETTS, J.R. (1995) Does school quality matter? Evidence from the National Longitudinal Survey of Youth, *The Review of Economics and Statistics*, 77(2), pp. 231–247.

BIDWELL, C.E. (1965) The school as a formal organization, in: J.G. MARCH (Ed.) *Handbook of Organizations* (Chicago, Rand McNally).

BRYK, A., LEE, V. & SMITH, J. (1990) High school organization and its effects on teachers and students, in: W.H. CLUNE & J.F. WITTE (Eds) *Choice and Control in American Education*, Vols 1 & 2 (London, The Stanford Series on Education & Public Policy, The Falmer Press).

BURKHEAD, J. (1967) *Input–Output in Large City High Schools* (Syracuse, NY, Syracuse University Press).

CARD, D. & KRUEGER, A.B. (1992) Does school quality matter? Return to education and the characteristics of public schools in the United States, *Journal of Public Economics*, 100(1), pp. 1–40.

CASE, A.C. & KATZ, L.F. (1991) The company you keep: The effects of family and neighborhood on disadvantaged families, *National Bureau of Economic Research Working Paper*, 3705 (Cambridge, MA).

CHUBB, J.E. & MOE, T.M. (1990) *Politics, Markets and America's Schools* (Washington D.C., The Brookings Institution).

COHN, E. & GESKE, T.G. (1990) *The Economics of Education* (Oxford, Pergamon Press).

COLEMAN, J.S., CAMPBELL, E.Q., HOBSON, C.F., MCPARTLAND, J., MOOD, A.M., WEIFELD, F.D. & YORK, R.L. (1966) *Equality of Educational Opportunity* (OE-38001, Washington, D.C., US Office of Education, US Department of Health, Education and Welfare).

CORCORAN, M., GORDON, R., LAREN, D. & SOLON, G. (1990) Effects of family community background on economic status, *American Economic Review*, 80(2), pp. 362–366.

COUSIN, O. (1993) L'effet établissement. Construction d'une problématique, *Revue française de sociologie*, 34, pp. 395–419.

DUNCAN, G.J. (1994) Families and neighbors as sources of disadvantage in the schooling decisions of white and black adolescents, *American Journal of Education*, 103, pp. 20–53.

DYNARSKI, M., SCHWAB, R. & ZAMPELLI, E. (1989) Local characteristics and public production: the case of education, *Journal of Urban Economics*, 26, pp. 250–263.

EVANS, W.N., OATES, W.E. & SCHWAB, R.M. (1992) Measuring peer group effects: a study of teenage behavior, *Journal of Political Economy*, 100(5), pp. 966–991.

GLAZER, N. (1986) (plus comments by JENCKS, C.) Education and training programs and poverty, in: S. DANZIGER & D.H. WEINBERG (Eds) *Fighting Poverty* (Washington, D.C., Madison's Institute for Research on Poverty and Department of Health and Human Services).

GLENN, C.L. (1989) *Choice of School in Six Nations: France, Netherlands, Belgium, UK, Canada, West-Germany* (Washington, D.C., US Department of Education).

GLENNERSTER, H. (1991) Quasi-markets for education? *Economic Journal*, 101, pp. 1268–1276.

GRAVOT, P. (1993) *Economie de l'Education* (Paris, Economica).

GREENWALD, R., HEDGES, L.V. & LAINE, R.D. (1994) When reinventing the wheel is not necessary: a case study in the use of meta-analysis in education finance, *Journal of Education Finance*, 20, pp. 1–20.

HANUSHEK, E. (1986) The economics of schooling: production and efficiency in public schools, *Journal of Economic Literature*, 24, pp. 1141–1177.

HANUSHEK, E. (1992) Improving educational outcomes while controlling costs, *Carnegie-Rochester Conference Series on Public Policy*, 37, December, pp. 205–238.

HANUSHEK, E. (1994) Money might matter somewhere: a response to Hedges, Laine, and Greenwald, *Educational Researcher*, 23(4), pp. 5–8.

HANUSHEK, E. & RIVKIN, S.G. (1994) Understanding the 20th century explosion in U.S. school costs, *Journal of Human Resources*, 32(1), pp. 35–68.

HANUSHEK, E., RIVKIN, S.G. & TAYLOR, L.L. (1996) Aggregation and the estimated effects of school resources, *Review of Economics and Statistics*, 78(4), pp. 611–627.

HENDERSON, V., MIESZKOWSKI, P. & SAUVAGEAU, Y. (1978) Peer group effects and educational production functions, *Journal of Public Economics*, 10(1), pp. 97–106.

HOXBY, C.M. (1994) Does competition between public schools benefit students and taxpayers? *National Bureau of Economic Research Working Paper*, 4978 (Cambridge, MA).

JAROUSSE, J.P. (1991) L'économie de l'éducation: du 'capital humain' à l'évaluation des processus et des systèmes éducatifs, *Repères Bibliographiques. Perspectives documentaires en éducation*, 23, pp. 79–101.

JENCKS, C. & MEYER, S.E. (1987) The social consequences of growing up in poor neighborhood, in: L.E. LYNN & M.G.H. MACGEARY (Eds) *Inner-City Poverty in the United States* (Washington, D.C., National Academy Press).

KREMER, M. (1993) The O-ring theory of economic development, *Quarterly Journal of Economics*, 108(3), 551–575.

LAFFONT, J.J. & TIROLE, J. (1993) *A Theory of Incentives in Procurement and Regulation* (Cambridge, MA, MIT Press).

LANKFORD, H.L. & WYCKOFF, J. (1992) Primary and secondary school choice among public and religious alternatives, *Economics of Education Review*, 11(4), pp. 317–337.

LEIBENSTEIN, H. (1966) Allocative efficiency and x-efficiency, *The American Economic Review*, 56, pp. 392–425.

LEVIN, H.M. (1994) Economics of school reform for at-risk students, in: HANUSHEK *et al.* (Eds) *Making Schools Work: Improving Performance and Controlling Costs* (Washington, D.C., The Brookings Institution).

LEVIN, H.M. (1997) Raising school productivity: an x-efficiency approach, *Economics of Education Review*, 16(3), pp. 303–311.

LEVIN, H.M. & KELLY, C. (1994) Can education do it alone? *Economics of Education Review*, 13(2), pp. 97–108.

MAROY, C. (1992) L'école à la lumière de la sociologie des organisations, *Etudes & Documents*, février (Louvain-la-Neuve, Unité de sociologie, UCL).

MILGROM, P. & ROBERTS, J. (1992) *Economics Organization and Management* (Englewood Cliffs, NJ, Prentice Hall).

MONK, D.H. (1992) Education productivity research: an update and assessment of its role in education financial reform, *Education Evaluation and Policy Analysis*, 14(4), pp. 307–332.

MURPHY, K.M. & WELCH, F. (1992) The structure of wages, *Quarterly Journal of Economics*, 152(1), pp. 285–326.

MURPHY, K.M. & WELCH, F. (1993) Inequality and relative wages, *American Economic Review*, 83(2), pp. 104–109.

PELTZMAN, S. (1993) The political economy of the decline of American public education, *Journal of Law & Economics*, 36, pp. 331–370.

PIKETTY, T. (1994) Inégalités et redistribution; développements théoriques récents, *Revue d'Economie politique*, 104(6), pp. 769–800.

SHOVEN, J.B., TOPPER, M.D. & WISE, D.A. (1994) The impact of demographic transition on government spending, in: D.A. WISE (Ed.) *Studies in the Economics of Ageing* (Chicago, The University of Chicago Press).

SLAVIN, R.E., MADDEN, N.A., KARWEIT, N.L., DOLAN, L. & WASIK, B.A. (1990) *Success for All* (Baltimore, MD, Center for Research on Effective Schooling for Disadvantaged Students, John Hopkins University).

SUMMERS, A.A. & WOLFE, B.L. (1977) Do schools make a difference? *American Economic Review*, 67(4), pp. 639–652.

The Economist (1995) 27 May–2 June, p. 17.

VANDENBERGHE, V. (1996) *Functioning and Regulation of Educational Quasi-Markets* (Louvain-la-Neuve, CIACO, Nouvelle série No 283).

VANDENBERGHE, V. (1998) Educational quasi-markets: the Belgian experience, in: W. BARTLETT, J.A. ROBERTS & J. LE GRAND (Eds) *A Revolution in Social Policy. Lessons from Developments of Quasi-Markets in the 1990s* (Bristol, The Policy Press).

WEISS, J. (1990) Control in school organizations: theoretical perspectives, in: W.H. CLUNE & J.F. WITTE (Eds) *Choice and Control in American Education*, Vols 1 & 2 (London, The Stanford Series on Education & Public Policy, The Falmer Press).

WOLFE, J.R. (1994) Review of the coming health crisis: who will pay for the aged in the twenty-first century? *Journal of Economic Literature*, 32(3), pp. 1254–1255.