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The Economics of Education:
Unkept Promises?

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THE ECONOMICS OF EDUCATION: UNKEPT PROMISES?

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In the introduction of the *Handbook of Health Economics*, Anthony Cuyler and Joseph Newhouse (2000) have contended that the economics of education was not very successful as a field and that it was comparatively lagging behind health economics. The latter had been much more active and able to accumulate much firmer results. Indeed, “whereas the economics of education seems to have atrophied, however, health economics has flourished and provided practical answers to practical questions as well as developing its own distinctive theoretical modes. Education economists have largely failed to resolve their own research agenda (the determination of earnings differentials, the contribution of education to economic growth, the social rate of return to training and education, the optimal size of schools and classes, the use of primitive outcome measures...). Blaug (1998, p. S66) comments that ‘virtually all of the 100 articles in the 1985 International Encyclopaedia of Education devoted to the economics of education could just as well have been written in 1970 or even 1960’ (Cuyler and Newhouse, 2000, p. 3). Is it a provocative stance, or does it embody at least some elements of truth? The objective of this special issue of the *Brussels Economic Review* is to present a series of pieces of research, both theoretical and applied, even policy-oriented, in order to let the reader judge by himself. In this very short introduction, we would like to remind the history of the field of economics of education, and then situate the various contributions in this context.

A rapid survey of the evolution of economics of education

The beginning: the concept of Human Capital

The intuitions behind the economics of education (mainly the concept of human capital) are rather old and date back to William Petty (1699), proposing to quantify the value of human life by multiplying by 20 the annual earnings, or to compute the loss of wealth implied by the death of soldiers abroad (as soon as 1676). But it is with Adam Smith (1776) that the very concept of human capital was clearly articulated: “it consists of the acquired and useful abilities of all the inhabitants or members of the society. The acquisition of such talents, by the maintenance of the acquirer during his education, study, or apprenticeship, always costs a real expense which is a capital fixed and realised, as it were, in his person. Those talents, as they make a part of his fortune, so do they likewise of that of the society to which he belongs” (Smith, 1776, rééd. 1952, pp. 119-120).

If the ideas of human capital and of the link between its amount and the level of wages as well as with the level of economic development were not new, one had to await the end of the 50s-beginning 60s to witness the blossoming of the idea within the formalised framework of economics. Schultz (1961), by putting the emphasis on the importance of the quality of the labour force in the process of economic development, and mostly Becker (1964) have developed the key concept of investment in human capital as analogous to investment in physical capital. Human capital may be defined as the whole set of productive skills and competencies of individual workers, acquired either through formal education or through on the job experience (one adds the difference between general, transferable and non-

transferable, firm-specific human capital). These skills and competencies are assumed to increase individual productivity, and therefore wages (on competitive markets). By aggregation, they contribute to growth. Human capital was therefore a tool in order to explain some stylised facts in labour economics (determinants of wages, hierarchy of wages, concave age-earnings profile, personal income distribution; see Mincer, 1958; Ben-Porath, 1967) and in growth theory. The first contributions were made in order to account for the behaviour of the rational man in terms of human capital accumulation, given the constraints on the individual (his/her ability, available time, life length...). For example, Ben-Porath (1967) developed a life-cycle model where he showed (using optimal control techniques) that it is rational to spend the earlier phase of one's life on full time education (i.e. human capital accumulation), then sharing his time between production (paid labour) and human capital accumulation (e.g. in the form of on the job training) and last to cease human capital accumulation when approaching the retirement period. This research also highlighted the rationale behind the observed concave age-earnings profile (one the most stable empirical results of economics, following Siebert, 1985).

Besides these researches in labour economics, there was also the development of the analysis of the link between human capital and growth (see Schultz, 1961). Besides theoretical approaches (Arrow, 1962; Uzawa, 1965; Nelson and Phelps, 1966) there were a lot of more empirical approaches as the growth-accounting literature testifies (initiated by Denison, 1962). This line of research tried to measure the role of various factors of production in accounting for economic growth. Besides the growth in physical capital and labour stocks, these researches put forward the importance of residual factors, and among them technological progress and education. This approach (used for a long time, see Denison, 1967; Jorgenson and Griliches, 1967; Jorgenson and Fraumeni, 1992) has largely contributed to the belief that investing in education was one of the key precondition for rapid economic growth.

Influence of these ideas on the social and economic policies of the 60s

These theoretical and empirical works (as well as the competition with the Soviets, see the impact of Sputnik, 1958, and the sudden awareness of the importance of a widespread technological education for promoting growth and technological innovation) on the link between human capital and growth have helped in creating a kind of consensus among policy makers in favour of the massive expansion of higher education enrolments during the 60s, and for funding it through taxes. It is indeed clear that besides more political arguments (as responding to the social demands of the families, see the British Robbins Report of 1963; democratisation of the society), a key argument for allowing for this expansion was the belief that a sustained economic growth needed an increasingly skilled manpower. The level of public expenditure devoted to this expansion as well as the number (and percentage) of youngsters reaching higher levels of education were steadily on the rise during the 60s.

The scepticism of the 70s

However, a new scepticism regarding the benefits of this massive expansion arose as soon as the beginning of the 70s, both in terms of the contribution of education to economic growth as in terms of tools to promote a greater degree of social equality. The extraordinary quantitative development of education (both in developed and developing countries) did not prevent the strong decrease in economic growth following the first oil shock of October 1973. Growth rates were halved despite the massive investments in education during the 60s. Some

doubts were cast regarding the economic relevance of the massive investments in education made during the last decade. The empirical analyses realised by Psacharopoulos at the World Bank on the private and social rates of return to education showed that the latter consistently exceeded the former (Psacharopoulos, 1980, 1981, 1985). Doubts also appear in the pure economic theory. Growth theories faced a kind of a slowdown, reappearing only at the end of the 80s while new theories were developed that did not support the idea of a strong role of education in promoting growth, on the contrary. Echoing the credentialist thesis in sociology, Arrow (1973) formalised the idea of education as a screening device, while Spence (1973, 1974) developed the idea that education was merely acting as a signal of a (pre-existing) higher productivity. For Arrow, education would mainly be a tool for allocating the right persons at the right place within the enterprise, paying therefore as much an informational than a productive role. Spence (1973) has, in this sense, analysed the strategic behaviour between employers and employees in a context of asymmetric information. If the employee knows that the employer will use the education signal to infer his/her productivity, a game arises and can end up in an informational equilibrium, where a higher level of education could be desired even if it does not increase at all the individual productivity. Education brings here private benefits but no social ones (at least in terms of a higher productivity), and can nevertheless be demanded. While economists tried to show that education can be demanded even if its social benefits could be meagre, sociologists have raised some criticism regarding the capacity of education as a way to reduce the social inequalities (Bourdieu and Passeron, 1970; Boudon, 1972). As far as the labour market is concerned, the development of a massive unemployment in the 1970s, also among graduates, led economists to think about a possible problem of over-education (see Freeman, 1976). Freeman developed cobweb models to account for the cyclical pattern of wages on the labour market of graduates as a consequence of a recursive structure where youngsters choose their studies on the basis of expected (relative) future earnings. The delay between the decision to invest and the graduation itself (and the entry on the labour market), coupled with the role of the specific nature of the expectations, led to cyclical patterns (cycles of excess supply and excess demand). In this sense, Freeman shows that if the degree explained the earnings (see Mincer, 1958), expected earnings also explains educational choices.

The seventies were therefore a period of increasing scepticism regarding the social benefits of education.

The late 80s: socio-economic perspectives and the revival of growth theories

A softened methodological individualist perspective: the French School of Human Capital

The human capital theory was refined in order to account for the sociological (sometimes marxist, see Bowles and Gintis, 1975) critiques regarding the constraining role of the environment on the individual decision-making process. A French school of economists of education (Mingat and Eicher, 1982) tried to refine the framework of human capital theory by embodying the various constraints (financing of the investment, role of the environment: economic, social and educational level of the parents and other elements of the environment), following the pioneering work of Becker (see the Woytinsky Lecture, 1967). These reflections were influenced by the French context where despite diminishing rates of returns to higher education, youngsters persistently choose for a university education, and very often for orientations that were not so demanded on the labour market. The latter element leads us to question the degree of economic rationality embodied in student choices, and therefore the suitability of a *laissez faire* system. If some authors tended to stress an arbitrage made by the

students in terms of the time devoted to studying per se (and not solely in terms of going or not to the university, see Lévy-Garboua, 1976), others point out to the necessity of integrating equity and efficiency considerations in order to properly evaluate the students behaviors. The inefficiencies observed on the educational and subsequently labour markets (mismatches between the skill supply and the market needs) should not be so hastily attributed to the irrationality of the students. Indeed, the students might at the same time be perfectly rational and nevertheless decide to choose apparently low-return orientations (as Humanities, Arts or Education in continental Europe¹). The weight of the social background of the students, in other words equity considerations, can partly explain apparently such "bad" orientation choices. In a pioneering paper, Mingat and Eicher (1982), drawing from the insights of the CAPM financial theory, assumed that students operate a trade-off between the risk and return components of the orientation choice. If one assumes that orientations with a higher rate of return (i.e. which are in demand on the labour market) are also more difficult, and that students coming from poorer socio-economic background (Mingat and Eicher, 1982) are also more risk-averse (i.e. they give a heavier weight to the risk component in their computations than wealthier students), then one should observe that less privileged students will choose less risky (i.e. less difficult or shorter) and therefore also less remunerative orientations². The inefficiencies observed on the labour markets could then be compatible with a rational individual behaviour (Oosterbeek and Weddink, 1997)³. The econometric testing of such ideas is still a very vivid field of the economics of education, benefitting from the advances in microeconomic tools as well as of the existence of large individual data sets.

The come-back of growth theories

One had to await the end of the 80s to witness a revival of the growth theories, and a renewed emphasis put on the importance of education and training in the wealth creation process. Relatively descriptive analyses on the complementarity between education and other economic mechanisms, as the R&D process (see Dean, 1984), were soon followed by new theoretical developments of the so-called endogenous growth theory (even if it was grounded on earlier works as Nelson and Phelps, 1966, but also Arrow, 1962 and Uzawa, 1965). The greatest achievement of these theories was that if during the 60s the study of the contribution of human capital to economic growth and the study of the economic motivations for accumulating such a capital were largely disconnected, they were now explicitly integrated in a single theoretical framework. One can grossly distinguish between two philosophies of endogenous growth models, depending upon the stress given either to the *stock* of human capital in the innovation process, and therefore in the process of growth (see Romer, 1986, 1990; such an approach is sometimes labelled neo-schumpeterian, see Aghion and Howitt, 1998), or to the *accumulation* of human capital in explaining growth (see Lucas, 1988).

¹ One should keep in mind that employers in some countries (UK, Japan) rely much more on the relative reputation of institutions rather than on the precise subject chosen by the student when evaluating prospective applicants for a job. In such a context, it might be better to get a degree in arts from a well-known institution than an engineering degree from a second-class university.

² Besides Mingat and Eicher (1982), recent important contributions were made by Mortenson (1990) and Altonji (1993). Mortenson (1990) notes, that low-income families may be more risk-averse and that the latter could explain their reluctance to use loans to finance college. Altonji (1993) explores theoretically the extent to which students make sequential decisions about whether to attend college, and once there, what field in which to major, and whether to drop out, based on uncertainties related to labor market returns, personal tastes, and abilities.

³ Mingat and Eicher (1982) give some descriptive statistics on France confirming partly their assumptions. However, they provide no thorough econometric analysis. For an attempt, see De Meulemeester and Rochat (2001).

The stock of human capital perspective, or the role of technological innovation

The pioneering article in this perspective is Nelson and Phelps (1966). They view growth as driven by the stock of human capital, that affects the innovation capabilities of a country. The growth rate of the economy depends on the rate of innovation, “and hence the level, rather than the growth rate, of human capital” (Aghion and Howitt, 1998, p. 354). This intuition came back to the fore in the mid-80s. Romer (1986, 1990) gave to knowledge a key role. In his model (1990), he distinguishes between two components among the knowledge useful for economic purposes. There is on the one side human capital, i.e. all the skills and competencies possessed and incorporated by physical persons. One immediately sees the rivalrous nature of human capital (its use by one firm precludes its use by others) and on the other side the different character of technology. The latter has indeed a nonrivalry feature, and is available for everybody. Romer (1990) considers that both human capital and technology are produced by a purposeful effort, but he assumes for simplicity a fixed (inelastic) supply of human capital. He assumes that the total available amount of skills (knowledge) in a society is spread between a direct productive use and another devolved to the accumulation of technology. To increase the technology (research activity), one uses both human capital and the current state of the technology. Romer (1990) demonstrates that the steady state growth rate is directly linked with the stock of human capital (skills) possessed by a society.

The accumulation of human capital perspective

The article written by Lucas in 1988 illustrates this perspective. Human capital is here treated just as another factor of production. The decisions of investment in human capital determine the evolution of the stock of human capital and by the way the growth rate of the economy. Moreover, Lucas (1988) stresses the social effects of education by assuming that the average level of human capital exerts positive spillovers on the productivity of the individuals. The average level of human capital in the society is included in the production function of every firm. The intuition is that the production is made easier where the population is literate and in a good health, and where many modern enterprises have already been attracted. This led to increasing returns linked with this externality while keeping decreasing returns on each of the production factors.

The empirical tests of endogenous growth theories

This theoretical advances have led to a series of more empirical works. A regression approach was developed by Barro (see the survey by Barro and Sala-I-Martin, 1995). On the basis of a large dataset containing information on a large amount of countries (both developed and developing) Barro regressed the average growth rate observed on the period 1965-1985 on several macroeconomic variables observed at the beginning of the period, among them the initial level of education (measured by the average length of schooling, with no correction for quality) and the public expenditures on education as a percentage of GDP. It appeared that both the initial levels of education and public expenditures on education had a significant impact on growth. Some authors (Diebolt and Monteils, 2001; De Meulemeester and Rochat, 1995) were nevertheless sceptical regarding the short time span taken into consideration and the variety of dynamics of growth for the whole set of countries considered, and considered to analysed less countries on a larger time span (see the cliometric approaches). More recently, Benhabib and Spiegel (1994) have shown that the stock of human capital (measured by past educational attainment) seems uncorrelated with the growth rate, in a model where it is just

like any other factor of production in the aggregate production function. But on the other side this correlation appears positive in a conceptual framework à la Nelson and Phelps (1966) where growth is influenced by the level of technological innovation and the rate of diffusion or adoption of existing innovations (Aghion and Howitt, 1998, p. 328). The stock of human capital indeed affects these rates, suggesting the importance of more qualified graduates (engineers, higher education graduates...).

The 90s: quality versus quantity? The role of institutions

Both in terms of the analysis of the impact of schooling and education on earnings (the labour economic perspective) as well as of its impact on economic growth, a greater stress was put on the institutional side and on a more qualitative dimension.

The analysis of success at school and on the labour market: the importance of quality

Following the aforementioned works on the influence of the environmental characteristics of the student of his/her choice behaviour, there has been an intense work carried out by economists on the determinants of success and failure of children/students while at school/universities. There has been a growing body of research in the social sciences devoted to the processes underlying students' achievement. This issue was mostly intensively explored by sociologists but as of the eighties it also received more attention from economists (see Haveman and Wolfe, 1995 for an excellent survey of this literature). The main advantage of the economic approach lies in its attempt to integrate factual evidence into a systematic theoretical (and formal) framework. Economists very often consider that the same (rather than different) kind of variables explain academic success all along the schooling career path. Student achievement can be seen as part of the wider field of the analysis of the determinants of children's attainments which, in turn, is one of the aspects of the economic theory of family behaviour (see Becker and Tomes, 1986; Browning, 1992 for surveys). The family is considered as a production unit which uses up real inputs in order to generate utility for its members. Decision-makers within the family decide what amount of resources to generate (through supply of labour) and how to use it. Resources devoted to improve human capital of children is just a part of this decision process. The latter parental decision influences the probability of success. Students' achievements can therefore be seen as the result of the amount of family resources allocated to them during childhood, as well as the nature of these resources and the timing of their distribution. Hanushek points out the trade-off between quantity and quality of children (see Hanushek, 1992).

One has also to take into account both genetic and cultural endowment transmitted by natural parents. Becker (1967, 1991) and Becker and Tomes (1979, 1986) tend to consider that "on average, parents with levels of educational attainment above the mean will produce children who attain high levels of schooling but not so high relative to the mean as those of the parents" (Haveman and Wolfe, 1995, p. 1833). The problem with the Becker and Tomes approach is that it is difficult to test as the empirical counterparts that can be drawn from it are rather limited. Another modelling approach has been suggested by Leibowitz (1974). The starting point of this theory lies in parents' abilities, which translate into parental education. Parental ability is partially transmitted to children by heredity. On the other hand, parental education partially determines family income, which both determine the general climate in the family (cultural environment) and the financial constraints. Parental education and ability influence also the duration and the quality of home investment on children. The children's total ability is determined both by heredity and parental investment in their children. The latter explains final schooling level of children: "Children's ability and the levels of parental

income and home investments in time and goods determine the schooling attained by children, and, through schooling, the level of post-school investment - e.g. work experience." (Haveman and Wolfe, 1995, p. 1834).

Besides the socio-economic background of the family, there has been an increasing concern among economists on the role of the institution themselves, i.e. the quality of schools. Both in France (see Duru Bellat and Mingat 1993) as in the US, assessing educational practices as well as the broader institutional framework (e.g. the relative efficiency of private versus public schools) receive considerable attention, sometimes in connection with funding issue (see the debate over vouchers in education, in order to increase the scope of parental choice and introducing a degree of competition among schools, a kind of quasi-market, that should promote overall efficiency. See Bartlett and Le Grand, 1993). From the sociological point of view of the 70s one slowly evolves towards a more institutional perspective, either on the characteristics of the schools themselves or towards the overall institutional framework. The analysis was not solely internal (measuring efficiency of the schooling systems, i.e. increasing the performance of youngsters while at school at minimum cost) but also external by trying to measure for example the economic return to school quality (see the famous paper by Card and Krueger, 1996).

The neo-institutional approach to economic growth (North, 1990)

The neo-classical and endogenous growth theories presented here above are mainly supply-side theories, that stress the very long run (asymptotic properties, hence the problem of testing) and the technology (key role of the characteristics of the production functions). Another school, even if neo-classical, stresses the role of the institutions. At the difference of many other economists, North (1990) stresses the role of "path dependency" or "lock-in" implied by initial institutional settings (see also Paul David about the technological devices and norms). For him, history matters: past choices condition the space of future choices. He developed a conceptual framework in order to account for the strong economic development of some countries and the stagnation of others, linking the institutional patterns to the dynamics implied by individual choices (constrained by this institutional framework).

North (1990) considers of utmost importance for understanding the proper working of economies to account for institutions (more properly, the "institutional framework") in which the economic relations take place. These institutions should be understood more as "rules of the game" than in the usual sense of firms, political parties, educational institutions, etc... (the latter being labelled "organisations" by North). They make up a set of basic rules, both formal (the law, the language...) and informal (social customs, culture...), that were established at the beginning of the social interaction in order to facilitate it by reducing transaction costs and uncertainty (homogenisation of the significance of social practices, common languages; and by the way: trust). This is a rather abstract concept. The actual forms, manifestations of these institutions may vary from one country to another, they nevertheless constitute a response to a very same problem: facilitating social and economic interaction (exchange, cooperation and the benefits that outflow from that). One should note that institutions have been established in the past to solve a static problem, with no conscious account for the long run impact of their specific forms.

The link with economic growth comes from the incentives that this very specific institutional framework introduced. The initial institutional setting had indeed introduced incentives favouring some types of actions and skills relative to others. In the long run, this will prove or not favourable to economic growth, depending upon the types of activities favoured by these incentives (rent-seeking activities or wealth-enhancing activities). In some societies, characterised at the onset by some very precise institutional characteristics, purely religious,

administrative or intellectual activities will be favoured at the expense of the entrepreneurial activities, the reverse being true elsewhere. Following North, the former societies will stagnate whereas the latter will grow, due to incentives for acquiring the right skills for wealth accumulation. This demand for certain types of skills (implied by the very institutional framework) will also lead to the emergence of organisations in order to make a profit out of the offer of such competencies. For the economist of education, this means that the structure of supply of teaching and training will reflect the incentives built in the institutional framework. In this sense, the supply and demand of skills and competencies are not independent from the larger organisation of the society where they are embedded (Granovetter, 1985). By the way, an equilibrium between supply and demand of skills (human capital) is not at all the guarantee of an optimal situation in terms of contribution to economic growth. Such a situation may indeed conceal two very different situations. On the one hand, the larger institutional framework may indeed favour growth-enhancing activities. In such a framework, the supply and demand of skills are most likely to favour the economic development of the nation. North cites the American example. On the other hand, institutions could be “dynamically inefficient” (introducing incentives for rent-seeking activities) leading to a demand of skills not very compatible with the long run promotion of growth. Many currently LDC’s may have faced such a situation. In such countries, the incentives built in the institutional framework will lead to a relatively large proportion of students going to higher education in order to graduate in law or political sciences, in order to secure a remunerative (or powerful or prestigious) position in the administrative apparatus even if the requirements of economic growth would be better served by a larger provision of agronomists or engineers (but there are no private incentives to acquire such competencies) (Colclough, 1989; Murphy et al., 1991, 1993).

Empirical approaches linked with the neo-institutional perspective

Besides mere econometric testing (Murphy et al., 1991) there are other approaches of a more qualitative nature, dealing with a specified area during a specific period, but enlightened by the conceptual framework developed by North (1990). A series of economic and institutional historical works seems to confirm the intuitions of North concerning the existence of sub-optimal situations on the human capital market. Economic historians have analysed the slow emergence of engineering education in the United Kingdom during the last century and their difficult acceptance by the industrial world (Fox and Guagnini, 1993). These historical or more descriptive approaches have some limitations (even if they are “case studies” on contemporary situations, see Finegold and Soskice, 1988; Finegold, 1999), because they are contextualized by nature and therefore relevant only for a specific time and place. One can nevertheless infer some key conclusions from these historical or systemic analyses, namely the failure of reforms carried out only on the supply side of the skills equation, and the failure of laissez faire solutions in order to obtain an optimal match between the structure of teaching and training systems and the demands by the economy that would be dynamically efficient (ensuring long run growth) (see Sanderson, 1999, for the UK). Shortly stated, increasing the stock of human capital is not sufficient (the more so if the economy cannot employ it), and reforming the educational institutions in the sense of the expressed wills of the private sector representatives may not be sufficient (the latter being influenced by the larger institutional setting in which they are embedded, and the implied incentives that do not account for the long run effects, see North, 1990). One can very well imagine a situation where the economy is trapped in an equilibrium such that the expressed demands for human capital, even if met by the educational institutions, will not ensure the best conditions for future economic growth. The static equilibrium may be incompatible with the dynamic efficiency (see Finegold and

Soskice, 1988, on the analysis of the British case as “low-spec/low-skill” equilibrium, i.e. an economy producing standardized goods, with a only few characteristics, through a mass production system requiring a low-skilled manpower). In this sense, a proper education and training policy (the supply side of the skills equation) cannot be thought independently from the demand sides (the demand by the economy, requiring perhaps also to link education policy with an industrial policy) (Finegold, 1999). There is also a growing literature dealing with a comparative perspective (Diebolt, 2004).

The 2000’s: a short summary of the papers in this issue

The papers that have been selected for this special issue of the Brussels Economic Review are quite representative for the various fields of economics of education, and they are both theoretical and applied. They all have also a policy dimension.

The first 2 papers explicitly deal with these policy issues. George Psacharopoulos summarises the great strands of the economics of education literature (60s: education as an investment; 70s: education as a signal; 80s: growth literature) and how it translates (badly, following the author) in the policy discourse and practice, inter alia of the international organisations (mainly the World Bank). Lant Pritchett reminds us that the way the economists view the role of the government, as well as its motivations, are rather false (at least regarding the situation in the low developed countries). If in the textbook one can design models based upon the assumptions that a benevolent State tries to maximise the social welfare, this is actually more a normative than a positive statement. Using models based upon these premises does not help in understanding why the governments all over the world support the education systems the way they do (direct production at all levels). He tends to suggest that schools produce both skills and beliefs, but that the latter are unobservable, so that there is a possibility of collusion in instruction against the desires of the principal (the State), explaining the direct production of education as a solution to this problem.

The 2 following papers deal with the economics of the classroom, or around it (recruitment of teachers). Fuchs and Wössmann tend to strongly reject the conventional wisdom (and the discourse of both politicians and international organisation) concerning the assumed virtues of having computers at home and at schools in order to promote student achievement. If bivariate analyses tend indeed to confirm a positive correlation between student achievement and the availability of computers both at home and at schools, a deeper econometric analysis shows that things are not so simple. Actually, once controlling for family background and school characteristics, the relation between computers at home and student achievement becomes negative, and the one between computers at school and achievement becomes insignificant. However, measures of computer use for proper education and communication purposes show a positive conditional relation with student achievement for computer use at home, and an inverted U-shape for computers at school. The paper by Wolter and Denzler deals with the wage elasticity of the teacher supply in Switzerland (a country rather specific in the sense teachers tend to earn more than people with a similar education employed in other occupations). The elasticity found is substantially lower than the one found in the literature for other countries-mainly English-speaking countries where teachers earn relatively less than people with the same type of education working elsewhere. Anyway, the results showing that the expected wage differential between teaching and other occupations is larger for teachers than for non-teachers tend to suggest that university graduates choose their initial occupation on a rational basis and that they take monetary factors into consideration when making this decision.

The 3 following papers deal with the link between education and the labour market. The paper of Diebolt and El Murr develops a cobweb modelling strategy in order to account for the education-labour market relations, here concerning higher education graduates. This research is an extension of the seminal work of Freeman (1971). The paper here extends these earlier works by considering the general case of supply allocated to several markets. The paper by Giret and Lemistre is a rather interesting one, stressing the increased objective devaluation on the degrees obtained between 1992 and the 1998, coupled with a lower feeling of this devaluation, suggesting that students tend to compare their situations with the one of other students of the same generation rather than with the situation of similar graduates of earlier generations (who enjoy a higher status for the same level of education). Olivier Basdevant proposes a more macroeconomic analysis of the South African unemployment, using general equilibrium modelling. He proposes a simple theoretical framework to analyse the relations between reducing working time, unemployment, education and growth. He particularly analyses the impact of reducing working time on unemployment and growth. As South African workers have a rather low degree of risk aversion, reducing working time (aimed at reducing unemployment at a faster rate) may have a negative impact on growth, necessitating that such a measure is accompanied by measures aimed at promoting education (including higher education) and employment. The paper by Canals and Jaoul proposes an evaluation of the rate of return of education in France, with an emphasis on a disaggregate perspective, by gender, types of degrees and the sectors of employment. They show some interesting discrepancies in the ranking of the disciplines with the highest returns depending on the gender. The discipline chosen and the economic sector do play a role, and a quite different one depending on the sex, but ascriptive variables also exert some influence (profession of the parents).

The paper by Charlotte Lauer provides us with one of the first comparative analysis of the relation between education, gender and earnings in France and Germany. It estimates the impact of education not only on the expected earnings level but also on their dispersion (risk) while taking gender-specific selectivity into account. The results are quite interesting, showing that the completion of a minimum level of general instruction yields an earning premium that cannot be compensated by a vocational degree. Moreover, education also affects the dispersion of earnings: general qualifications increase the earnings risk, while vocational ones reduce it. More education, especially tertiary, yields a high earnings premium but with the highest earnings uncertainty. Women enjoy a higher earnings premium for education than men, and even if they face overall a higher earnings uncertainty, they can, more than men, reduce this risk by investing in their education. The paper by Sakellariou and Patrinos tries to evaluate the computer wage premiums in a low developed country, namely Vietnam. It shows that higher education graduates in this country enjoy substantial wage premiums for computer use. The paper analyses carefully this issue by estimating returns for each type of skill (word processing, data base skills...) as well as the probability of computer use (using English at work, the earnings of the worker and being in certain occupations are the most important determinants of computer use). Computers seem to make the more productive workers even more productive, but having computer skills before being given a computer is of no particular importance.

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