Prologue

JOOP HARTOG AND HENRIËTTE MAASSEN VAN DEN BRINK

HUMAN capital theory was born some four decades ago, under the strong and inspiring leadership of Theodore Schultz, Gary Becker and Jacob Mincer. It has been flourishing ever since, with many new theoretical and empirical developments. Human capital is now a familiar concept, used daily in public debates, and a favourite phrase of many politicians who want to stress the relevance of developing and disseminating new knowledge for maintaining high levels of welfare.

Research on human capital, both theoretical and empirical, is often very technical and therefore not easily accessible to those who want to use the insights in applied work, in developing government policies, human resource policies in organizations and in contributions to social debates. The same holds for students with different types of education. In many curricula, students should attain an understanding of concepts, issues and approaches without digging into all the technical details.

This book aims to be an interface between the technical research in the workshop and applications in government, education and business organizations. The book is written by staff of SCHOLAR (an acronym for Schooling, Labour Market and Economic Development), a research institute at the University of Amsterdam focusing on the economic relation between education and the labour market. SCHOLAR was founded in 1997 with a grant from the Dutch science foundation NWO. Its mission was to undertake original academic research on important issues in this area, and to disseminate the results to a wider audience than just academic specialists.

In this book, we highlight our research findings in a non-technical way, focusing on key results and implications for understanding the role of education in the labour market, and on policy implications. At a time when everybody talks about 'the knowledge economy' and the prime importance of education (including on-the-job training), these are obviously interesting issues. We present the results in thirteen

chapters, in a fixed framework: introduction, existing knowledge, new findings and implications. The brief summary of the literature in each chapter (plus references for further reading) adds the element of a reference book, but the focus is on an accessible account of new research findings. These features, we hope, will also make the book useful as course reading in the economics of education, complementary to a standard textbook.

The book is based on original research on human capital that has been undertaken because the questions and approaches were seen as relevant, interesting and promising. As such it is the fruit of a fairly recent research agenda. It covers all the core issues on which active research is going on at present.

A strong methodological undercurrent connects many contributions in this book. *It ain't what you think it is*. Empirical work is about measuring the strength of relationships and thereby testing theories that predict how variables are interrelated, thus being able to make sensible judgements about the effects of policy interventions. Recent empirical work in economics is drenched in the awareness that reliable estimates of the strength of relationships are not easily obtained. Selective instead of random observations, endogenous rather than exogenous explanatory variables and measurement errors all undermine the classical method of ordinary least squares to estimate coefficients in regression equations. With an economy full of agents that seek their best alternative in the myriad of choices they have to make, it is not easy to find samples where individuals have been randomly assigned to one situation or another. Increasingly, researchers are made responsible for the quality of the data they employ. Thus, they may make the special effort to create a dataset from deliberate random assignment of cases to alternatives, as in medical experiments where patients are randomly divided between the group that gets the new pill and the group that has the placebo. Or they look for datasets where nature has taken care of the assignment, as if a boat had sunk and the new pills had washed ashore on one island but not on the next. As a last resort they may restrict themselves to work with datasets that allow econometric correction, thereby remaining closest to the econometric tradition.

The impact of econometric methodology is prominent in many chapters of this book. It is a key issue in the chapters on measuring returns to education, on the effect of parental background, on

educational achievement and on the effects of policy interventions. The methodological innovations have substantial consequences. The methodological concerns have high policy relevance. If one really aims for true effects of policy interventions, rather than just demonstrating an activist attitude, one should be seriously interested in the reliable estimation of these effects. This would imply the desire to accompany policy interventions by investigating the impact right from the beginning and to design testing procedures in tandem with designing the policy intervention itself. And it would imply interest in and awareness of the methodological pitfalls, not necessarily in the full technical details, but certainly in the conceptual issues and their implications. The contributions in this book illustrate quite vividly what is at stake here.

The density of research varies strongly between issues. For some questions there are a large number of studies to base conclusions on; for other questions the field has just been opened up. Right from the invention of the human capital model there has been wide interest in estimating the rate of return to education, and this means that by now there are an enormous number of estimates. So we have a good picture of the crude, average return to an average year of education. New information can be presented and interpreted against the backdrop of all these earlier studies. Hence, in chapters 1 and 3, we can document the development of the private rate of return to education and training in the Netherlands over several decades in this perspective, in chapter 8 we can draw on these estimates to document variability of returns, as a background to assessing the risk of investment in schooling, and in chapter 4 the novel research findings on return to schooling accruing to entrepreneurs can be contrasted with the massive evidence on returns for employees. The same holds for our contributions to the issues of overeducation. In fact, in this case we use the amassed evidence for a meta-analysis to detect structure in the estimated returns to over- and undereducation. Our analyses of the impact of parental background on children's schooling (chapter 6) also stand in a long tradition of the nature–nurture discussion.

In some fields very little is known, and we contribute to ploughing new fields. New experimental evidence in chapter 8 shows that hold-up in firms is much less of a problem than it has been predicted to be. The role of risk in human capital issues (chapter 9) is empirically heavily under-researched. Incentive systems for secondary school teachers (chapter 12) have not frequently been studied. Non-monetary returns

to education (chapter 5) are routinely acknowledged but empirical evidence is not abundant. Chapter 5 explores the effects of education on health. What exactly in education affects health and how can we impart health benefits through education? Social returns to education (external effects) is the argument always invoked to justify policy interventions (chapter 2) without solid empirical foundation; in general we claim the social return is not much different from the private return.

The case for government intervention ultimately rests largely on cost-benefit analysis, quasi-experiments and equity arguments. (Quasi-) experiments and equity arguments are extensively and carefully analysed in chapters 10 and 13. The key innovation is the joint analysis of several types of taxes and subsidies, with the prime result that deadweight welfare losses that are always stressed in separate analyses of one kind of tax or subsidy can be reduced substantially by a balanced combination of tax–subsidy instruments. In particular, the conclusion that subsidies to education are an instrument to counter efficiency losses from equity-based income taxes puts a new perspective on an old debate.

Some questions remain open. Old fields need maintenance and upkeep, to fight the ever-returning weeds. We know a lot about crude average returns to education, very little about specific returns to specific types of programmes, schools or students. We have many studies on returns to training, yet little is known about the mechanism that produces the returns and how it varies with circumstances and specifications. The basic model of human capital is well developed, but we know little of investments under uncertainty. And just in case anyone doubts that there are still interesting questions waiting to be explored, each chapter concludes with a list of suggestions for further work.

Research is like an addiction. The more you have used it, the more you want. Human capital, its theory and applications remain a growth industry, as they have been for the last forty years.

PART I

Measuring the benefits from human capital

1 What should you know about the private returns to education?

JOOP HARTOG AND HESSEL OOSTERBEEK

1.1 Basic schooling model

In this chapter, we focus on schooling as an investment in human capital. We present the core model in its most basic specification and derive implications for interpreting wage differentials by education as reflecting returns on the schooling investment. We briefly survey international evidence on estimated private rates of return and summarize our own contributions to that literature.

The basic human capital model of schooling envisages two options: (1) go to school for s years and earn an income Y_s every year after leaving school, or (2) go to work right away and earn annual income Y_0 (see figure 1.1). This makes the choice for schooling an investment problem. While in school, the student has forgone earnings of Y_0 for every year in school and direct outlays for tuition, books, etc. of K per year. After leaving school the individual has benefits: in every working year, earnings are Y_s rather than Y_0. The gap in annual earnings is the dividend flowing on his investments.

The internal rate of return is the discount rate that equates the present values of the two lifetime earnings flows. But as the above suggests, we can also take it as the dividend rate $Y_s - Y_0$ relative to the investment cost, composed of forgone earnings Y_0 and direct outlays K for every year in school. To calculate the rate of return, one may follow the instructions implicit in the definition above by tabulating earnings for comparable individuals with and without a particular education at every age and then solve for the internal rate of return. This is indeed how some early researchers did it.

Jacob Mincer (1974) has simplified the estimation of rates of return from cross-sections with an elegant formula. Mincer's formula derives straightforwardly from equating the present value of two earnings streams, each consisting of constant annual earnings, but only differing in the time when they start flowing: Y_0 starts right now, Y_s only starts

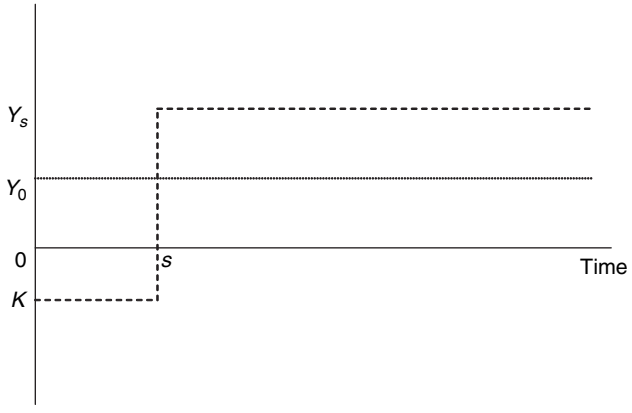

Figure 1.1. Education as an investment

after *s* years. The model predicts that for every year in school earnings are augmented by the discount rate, multiplicatively. With a discount rate of 5%, an extra year of schooling raises annual earnings by 5%, basically as compensation for postponing earnings.[1] Applying this formula in reverse, we may estimate the rate of return as the coefficient of schooling years in a cross-section regression for individual earnings. Thus, all one needs is an earnings survey of individuals with different educations (and work experience). The regression coefficient of earnings on education is interpreted as the return to education. Following Mincer, the effect of experience on earnings is estimated using a parabola (i.e. using experience and experience squared). The experience effect is supposed to be the same for all education levels.

There is an abundant literature on estimated rates of return to education based on Mincer's approach. Generally, these returns are estimated to be somewhere between 5 and 15%. Psacharopoulos (1985) has collected many of these studies and drawn some general conclusions. He concludes that returns are higher in developing countries than in developed countries, that highest returns accrue to primary education, and that returns to university education may be higher than those for secondary education. While these results certainly make sense, we should note that they have been derived by straightforward averaging of very diverse studies, without any adjustment for differences in data or methodology.

A recent attempt to estimate comparable estimates of Mincer rates of return across Europe from comparable datasets and a uniform

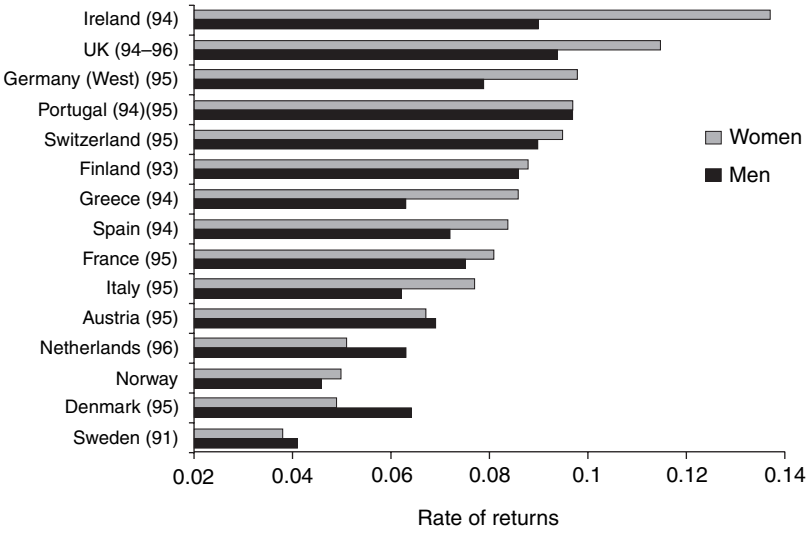

Figure 1.2. Returns to schooling in Europe, men and women (year closest to 1995)
Source: Harmon, Walker and Westergaard-Nielsen (2001)

methodology finds that minimum rates over the sample period (the 1990s) varied between countries from 4.0 to 10.7%, while maximum rates are between 6.2 and 11.5%. Returns estimated in or around 1995 are shown in figure 1.2 (from Harmon, Walker and Westergaard-Nielsen, 2001). Trostel, Walker and Woolley (2002) use data from twenty-eight countries covering the period 1985–95, from a common questionnaire applied in all countries. Averaged over the twenty-eight separate country estimates, the mean return is 5.8% for men, with an unweighted standard deviation of 3.5%. For women, the mean return is 6.8%, with standard deviation 3.9%. Returns in the United States are markedly higher than in Europe. Heckman, Lochner and Todd (2003) estimate returns between 10 and 13% for white men and between 9 and 15% for black men in the 1940–90 period. In recent research attention is focused on an increase in the rate of return that has been observed in the United States but not generally elsewhere (see Trostel, Walker and Woolley, 2002). The increase is linked to lower demand for the poorly educated, due to relocating low-skilled work to developing countries, and increased demand for the more highly educated, due to knowledge-intense new technologies.

1.2 More recent developments

A key problem with the return estimates just described is the assumption that someone with s years of education would have earned the same Y_0 as someone with 0 years of education if s/he had also chosen 0 years of education. And vice versa it is assumed that someone who chose to follow 0 years of education would have earned the same Y_s as someone who actually chose s years of education if s/he had chosen s years of education. This is an example of the basic evaluation problem. To evaluate the effects of an intervention one ideally needs to compare two outcomes, only one of which is actually observed, while the other – the counterfactual – has to be inferred. Taking the earnings of those who chose the other level of education as counterfactual generally gives a biased estimate of the return to education. The bias occurs when individuals who choose different levels of education differ systematically in unobserved characteristics that affect their earnings. Differences in relevant dimensions of ability and motivation are obvious candidates for such characteristics. The problem of unobserved heterogeneity does not disappear if one adds measurable characteristics, such as IQ scores or parental background. Datasets are limited and one cannot pretend to measure all the relevant variables.

To properly identify the counterfactual one either wants to randomly assign individuals to different levels of education, or to clone individuals so that identical individuals can attend different levels of education. During the past fifteen years, different researchers have come up with approaches that mimic these two ideal identification strategies. In the approach that mimics random assignment, researchers have looked for situations or events that treat otherwise identical persons very differently in a way that affects their education decisions but not their later earnings. Such situations or events are referred to as natural experiments and in statistical terms create instrumental variables. This idea was developed and first applied by Angrist and Krueger (1991), mimicking the random assignment obtained from US compulsory school laws. They imply that individuals born in different quarters of the year have different amounts of schooling if they start school on the first day that they are required to do so and stop the first day they are allowed to do so. The quarter of birth thus creates differences in the amount of schooling among individuals that is as good as random. The identifying assumption is then that the quarter of birth has no direct effect on earnings. Others have

followed Angrist and Krueger's example using different natural experiments, like proximity to college, gender composition of a girl's siblings and changes in compulsory school laws. Almost without exception these studies find returns to education that are at least as high as the returns obtained with a Mincer regression.

The approach that mimics cloning of people uses information from (identical) twins. The underlying idea is that identical twins share the same genetic and social characteristics so that there will be no systematic difference in their earnings when they obtain the same level of education. Consequently, if they have acquired different levels of education, any observed earnings difference can be attributed to this education difference. Twin studies of the returns to schooling have been conducted for the United States, the United Kingdom, Sweden and Australia. The results by and large confirm the findings from the natural experiment studies that the return is at least as high as the returns obtained with a Mincer regression. An important contribution in this line of research is the paper by Ashenfelter and Krueger (1994) who ask each twin the level of education of his/her twin brother/sister so that they can deal more satisfactory with the problem of measurement error in education.

The finding that the corrected return to education was at least as high – and sometimes even much higher – than the Mincer return came somewhat as a surprise. It was believed that the Mincer return was biased upwards because it also captures the earnings effects of unobserved ability and motivation. Studies that include an ability measure like IQ indeed tend to find a reduction in the rate of return, on average by about one-third. In explaining this counterintuitive result it was realized that the various situations that have been used as natural experiments might have had an impact on specific groups. Changes in compulsory school laws, for instance, affect in particular those individuals who want to stay in school as short a time as possible, and are unlikely to affect individuals who would in any case pursue a higher education. This insight makes clear that there is no such thing as 'the' return to education. The effect of an additional year in school may be very different for different individuals (some may benefit more from the same intervention than others) and may be very different depending on whether the extra year is the fourth year or the tenth year. Moreover, the effect of an extra year will depend on the exact curriculum that is taught during the extra year.