The risk of investment in human capital
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Chapter 1

Introduction

The existence of risk has implications for schooling choices, for the impact of differences in curricula, and for the operation of the markets for educated labor.

For each additional year of schooling, there will be an increase in lifetime earnings. At the same there can be no doubt that schooling is a risky investment. Potential students face a number of uncertainties related with their future. Individuals deciding on schooling are imperfectly aware of their abilities (whether they will be able to fulfill the requirements (whether intellectual, or plain patience or the ability to withstand noise and heat) to complete any given programme), whether they will like their choice or not; of the demands of the school curriculum (they do not know what the programmes exactly entail); of the probability to succeed; of the nature of the job that may be obtained after completing an education and of the position within the post-school earnings distribution that may be attained. After graduating from some programme, the student faces a similar uncertainty in the labour market. Even being educated for some trade or profession, the individual may lack the ability or other requirements for success. Or, stated more generally, she does not know where in the distribution of occupational competence and earnings she will end up. There is also uncertainty about both the future position within a particular occupation and the future market value of the entire occupation itself. There may be cyclical fluctuations, such as associated with jobs moving to the world’s low-wage regions or the emergence of completely new jobs.

In this thesis we focus on five issues: the effects of human capital investment on the over-investment and on the inequality of earnings within educational levels, the dispersion in rates of return to education as a measure of risk, information on risk by education, risk compensation in wages and educational choice under risk.
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Here, the topics of the chapters are shortly summarized. In Chapter 2 we examine the higher educated labor market in Netherlands using a sample data of graduates from one large Dutch University. We study the determinants of over-education. Over-education became important as a major expansion in the proportion of the population acquiring educational qualifications, particularly but not exclusively at degree level took place in many countries. Furthermore, we investigate which impact the different forms of human capital and the labor market allocation have on wages. Although the data set has detailed information on the schools individuals attend before and after university, there is the inconvenience that we have only one cross-section and we cannot study the dynamics in the wages and individual profiles. Still, the estimates give a pretty good picture of the way the education and the market forces influence the earnings inequality within educational levels, in the particular case of an agricultural university in the Netherlands.

Chapter 3 looks at the dispersion in the rate of return to education. We develop a simulation model where, instead of given annual earnings for a given education, individuals face random lifetime earnings profiles for two levels of education (we extend a standard experience-earnings profile with annual random shocks). The model is simply the basic human capital investment model that compares two future earnings streams. We solve for the internal rate of return for each set of draws for lifetime earnings shocks, and repeat this 100,000 times. We calculate the standard deviation of the rate of return for different variances of the alternative earnings profiles and for the case when there is correlation in the shocks. In this way we augment information on average rates of return with information on its variance. For obvious reasons, a simulation model is the only feasible approach: there simply exist no direct observations on variances in the rate of return. Ex post variability in returns is not the same as ex ante risk. The distinction between the two is actually not relevant for the structure of our simulation model, as it can accommodate both foreseeable heterogeneity (variation between individuals) and risk. The distinction is mostly relevant when it comes to selecting the parameter values in the simulations. We take key parameters from a survey of the empirical literature, without paying much attention to this distinction. Only the correlation between shocks in the alternatives (school, no-school) is never observed and we simply assume it.

Chapter 4 analyses the earnings distributions by education. Earnings distributions by education can tell us whether schooling moves individuals to distributions with different variances. There are not many studies that deliberately focus on this issue, but often the information just happens to be available. In this chapter we survey such studies, without attempting to be exhaustive. We test for systematic patterns by estimating a general
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quadratic relationship of residual earnings variance (from a Mincer earnings equation) with education and age. Differences in patterns between countries might point to very different effects of education systems, through differences in school admission rules and curriculum structures (e.g. broad versus specialized educations). Differences within countries may point to the effects of policy changes, structural changes of the educational systems or simply regional or global socio-political and economical factors within a country, since we study cross-sections, usually over a large time span.

Chapter 5 investigates the market compensation for risk. With data for the 1980's and 1990's in the United States (the National Longitudinal Survey of Youth 1979), we reproduce the basic results of risk compensation literature. The respondents are categorized in two levels of education: medium-educated (high-school, or its equivalent, GED) and highly-educated (two, four year college or more). The measure for ability (the scholastic ability is measured by the Armed Forces Qualifying Test (AFQT), which is a composite score consisting of four tests: a mathematics test, a vocabulary test, an analytical test and a reading-comprehension test), is categorized into 10 deciles. We regress individual earnings on education, ability scores and other characteristics. Controlling for measured ability purges the residual of individual heterogeneity, as individuals will know their test scores and school degrees. We calculate the variance and the skewness of the residuals in a given education-ability cell. The variance is the measure of risk within that education-ability cell. Introducing skewness allows an interesting refinement of the analysis. Skewness is a measure of asymmetry in a distribution. By plugging the variance and the skewness in the earnings function we see if there is compensation for risk and skewness. The data also allow us to distinguish "permanent risk", associated with persistent differences between individuals, and "temporary risk", as the variance in earnings over time for given individuals. Thus conditioning on these variables, the heterogeneity, on which individuals are better informed than the econometrician, is picked up by the "permanent shocks". It is in fact a test on how much information the individual has before choosing his education. The variance and the skewness are also calculated directly from the actual log earnings distribution for the education-ability cells and then are plugged into the log-earnings equation. Estimates from the two procedures are compared. Since individuals are not randomly distributed over education levels, we use instrumental variable techniques to correct for self-selection.

Chapter 6 presents a model for educational choice under risk. The model makes use of the Real Option Theory. The individual has the option of leaving school now rather than waiting and keeping open the possibility of not leaving should the market wage fall. In our stochastic dynamic programming model, being in school has utility value, and the shadow
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wage, to be realised when leaving school, follows a Brownian motion. Once the student leaves school, his decision is irreversible and the shadow wage becomes the wage for the entire working life. The uncertainty and irreversibility imply an option value of waiting. The model studies the effect of risk on the schooling choice and the effect of major shocks probabilities (caused by uncertainty of the schooling process) on the decision to further invest in schooling.

Finally, Chapter 7 summarizes the main results in chapters 2 to 6. Furthermore, it elaborates on the omissions and on the policy recommendations.