

# 1. Introduction

Social bias in the recruitment to higher education in Sweden is a well-established phenomenon. One of the main factors that influence whether an individual takes part in higher education or not is the parents' level of education.<sup>1</sup> According to Statistics Sweden (2010, pp. 1), 45 per cent of all the individuals aged 25 in Sweden in the year 2010 had initiated some sort of higher education. However, the higher education participation for the individuals whose parents only has compulsory school or less are 21 per cent, while the fraction is 83 per cent for those whose parents have post-graduate education. In a greater part of the economic literature on the subject since Becker (1964), the individuals demand for higher education is treated as an investment decision, making rates of return and risk of major interest. Further, the importance of (imperfect) credit markets is also called attention to (see e.g. Kodde and Ritzen, 1988). In deciding whether or not to invest in a higher education the expected return to the investment is of major importance, and so is the way in which these expectations are formed. With imperfect information about the return on investment in human capital the individual may make inaccurate predictions about future returns, which in turn affect the decision to invest in higher education.

One possibility is that the individual under imperfect information observes its parents' educational background and present income status, and on the basis on that observation forms expectations about the returns to investments in human capital. Hence, the individual's expected return to the investment might not reflect the actual return from higher education. The purpose of this paper is to study empirically the impact of the interaction effect between parental education and parental income on the educational choice made by the young individual. The main hypothesis is that the individual forms its expectations of future returns from an investment in higher education by observing its parents, and that these expectations in turn determine the individuals choice to invest or not to invest in a higher education. The empirical analysis uses data on the educational choices made by Swedish individuals born in 1973 along with the relevant variables reflecting their parents' educational background and income level.

---

<sup>1</sup> See e.g. Bilaga 8 till Långtidsutredningen 2008 and Ranehill (2002) for an overview. Related concepts used in the economic literature are intergenerational income mobility and intergenerational educational mobility, often measured as correlations over generations. See e.g. Österberg (2000) for a study on Swedish data.

Much of the previous studies made in this field are done mainly in the disciplines of sociology and economics. The sociological research often focuses on the socioeconomic background as a determinant to the individual's educational level. Erikson and Jonsson (1993) give a broad review of the bias in recruitment to higher education in Sweden from a sociological perspective. They conclude that social standing, level of education and economic situation in the family that the individual grows up in all determine the social bias in educational participation in Sweden. However, the educational level in the family turns out to be the most dominant factor that determines the individual's participation in higher education. In another study by Erikson and Jonsson (2002), the effect of the family background on the individual's educational level is divided into a primary and a secondary effect. The primary effect means that the children of higher social standing tend to perform better in school. The secondary effect means that, given the same academic performance, the children from higher social standing tend to choose to continue to higher education to a greater extent relative to those of lower social standing. The primary effect, they conclude, seems to stem from the interaction and socialization between child and parents, where the child receives certain qualities from the parents. The secondary effect on the other hand, has to do with the choices made by the child (and the parents), choices that are determined by the social background. The main concern of this paper is the secondary effect.

The economic literature in the field often analyses the individual's choice of higher education from the perspective of human capital theory. From the perspective of the rational and utility maximizing individual, education is treated as an investment decision. Cost, returns to investment and risk therefore become key variables to analyze, together with imperfect information and possible credit restrictions. In contrast to the sociological perspective there is no clear social standings perspective, but bias in recruitment to higher education must be explained using differences in the way these variables are perceived and assessed by the rational individual. Edin and Holmlund (1993) and Fredriksson (1997) are examples of studies where the wage premium from higher education are linked to the demand for higher education in Sweden. Both studies conclude that the demand for higher education is sensitive to the wage premium, and that this wage premium from university education was declining in Sweden during the 1970's and beginning of the 1980's. Gustavsson (2004) further conclude that the wage premium has increased noticeably in Sweden between 1992 and 2001.

This paper contributes to the empirical literature by analyzing the role of expectations of returns to higher education in determining demand for higher education using Swedish data. No previous study has been found that analyses the interaction between parental education and parental income on the educational choice made by young individuals in Sweden.<sup>2</sup> Publicly funded institutions and a relatively extensive financial study support characterize the Swedish education system, making the Swedish setting somewhat different from others. Further, the data allows for the observation of the actual educational choices made by young individuals and the labor market outcomes over time.

The main finding in this paper is that interaction between parental education and parental labor income does not influence the educational choice made by the young individual for the data used. Rather, the evidence could suggest that the individuals are relatively well informed when making their investment decisions. The results from this paper also show that there is considerable bias in the recruitment to higher education, with respect to parental educational background.

The paper is organized as follows. Section 2 contains a short review of the economic literature on expectations from future returns on education. Section 3 will present the analytical framework and section 4 the empirical model. The data and variables used in the model are described in section 5 and the results from the empirical analysis are presented in section 6. Lastly, section 7 summarizes and concludes the findings of the paper.

## **2. Expectations on Future Returns from Education**

This section presents a short review of the economic literature that analyses the role of expectations of the wage premiums from education, i.e. returns to investments in human capital.

In a study of schooling decisions in the Dominican Republic, Robert Jensen (2010) shows that it is the perceived returns to schooling, rather than the actual returns, that matters. In a setting where these decisions are made under limited or imperfect information the perceived returns to education may be inaccurate. The study finds that the perceptions of the returns made by eight-grade boys turn out to be extremely

---

<sup>2</sup> Two examples of similar studies with Swedish data are Eliasson (2006) and Tasiran and Tezic (2006).

low relative to the actual measured rates of return from earnings data. In an experimental intervention, the individuals, chosen randomly, that were given information on actual returns to education, completed on average 20 per cent more schooling over the following four years relative to those who did not receive any information. However, one must note that this study is done in the setting of a low-income country, where scarce and expensive information and incomplete credit markets may influence the results. In a study for the United States, Betts (1995) conclude that although information on future wages is far from complete, the acquisition of information on returns to education in order to make an optimal choice is a process of learning over time. Smith and Powell (1990) also use data for the United States to examine income expectations and they conclude that college students had relatively well informed expectations about the earnings of other students. However, there is a tendency for the individuals to self-enhance their own future earnings.

One important and relevant result from the study by Smith and Powell (1990) is that given equal levels of income, individuals whose fathers are relatively low educated tend to expect higher incomes from their own investment in college. Students whose fathers achieved a high income with relatively little formal education may have greater expectations in their own returns from college. However, this study concerns college seniors, who are at the end of their educational careers, i.e. they have already chosen to invest in a college education. Jensen (2010) also explores a hypothesis that income segregation along with residential mobility may be a potential explanation to why some students underestimate the returns to education. If young individuals are only able to observe and form expectations from workers who live in a low-income neighborhood, selection of these workers by education and income may influence the expectations. Streufert (2000) also models underclass social isolation and the loss of high-income role models as determinants of the level of schooling chosen by underclass youth. However, in a study of the expectations of the returns from post-secondary education in the United States, Rouse (2004) finds no direct evidence that income expectations of lower income minority students are different from those of higher income white students.

### **3. Analytical Framework**

The theoretical foundation for this paper and the analysis of the individual's decision to invest in a higher education is the human capital theory. Following the work of

Becker (1964) and Mincer (1974) the individual's educational choice is viewed as an investment in human capital, where the rational individual compares the present value of the different investment alternatives available to her. The costs and returns from the investment may be monetary as well as non-monetary. In the most simplified case, an individual deciding whether to invest in higher education or not faces two alternatives. Assume that alternative  $E$  is the net earnings when taking part in higher education and alternative  $NE$  is the net earnings when not taking part in higher education, i.e. working instead of studying in the initial period. Assume further that education only takes place in the initial period. The cost of education can therefore be viewed as the difference in net earnings in the initial period, and the return to education is the difference between net earnings in all later periods except the initial one. The gain from choosing alternative  $E$  may then be written,

$$\sum_{j=1}^n \frac{k_j}{(1+i)^j} - C$$

where  $C = NE_0 - E_0$ ,  $k_j = E_j - NE_j$ ,  $j = 1, \dots, n$

The internal rate of return to the investment in higher education is the discount rate,  $i$ , which equates the present value of the stream of earnings following the different alternatives. Thus, the internal rate of return to the investment is defined implicitly by the equality,

$$C = \sum_{j=1}^n \frac{k_j}{(1+r)^j}$$

where  $r$  is the internal rate of return to the investment in higher education.

From the perspective of the utility maximizing individual higher education is profitable as long as the present value of future earnings is larger than the alternative cost of education together with the direct costs of taking part in the education. Further, Becker (1964, pp. 49 ff.) identifies some factors that determine the incentive for a rational individual to invest in higher education. *The number of periods* under which the individual is able to collect returns from the investment is one such factor. Younger people, because of their relatively longer period of potential pay-off from investments in higher education, would therefore be more willing to invest in human capital, ceteris paribus. By the same reasoning the mortality rate affects the rate of return to investments in human capital. *Wage differentials* are also an important determinant of the returns to an investment in education and thus the incentives to

invest therein. Higher earnings for the well educated relative to those with lower education means, *ceteris paribus*, a higher rate of return to an investment in education. Equivalently, a reduction in the costs of investment, direct or indirect, would tend to increase the rate of return. *Risk and liquidity* also influences the incentives to invest. Much uncertainty is associated with the rate of return to an investment in human capital, e.g. uncertainty about own ability, length of life, timing of return etc. The specific preference towards risk by the individual would then determine the incentive. Becker further concludes that as human capital is an especially illiquid asset, a liquidity premium of some size would have to be associated with it. The difficulty to offer human capital as collateral also suggests the importance of the functioning of *capital markets* in order to finance the investment. The difficulties of financing the investment would make internal financing more common, e.g. by wealthier families, but also by public spending on student financial aid etc.

Erikson and Jonsson (2002) provide a link between the human capital theory and the sociological literature in the field. Children growing up in well-educated homes tend to acquire certain abilities that make them more successful in school. Also, well-educated parents are more informed about the education system, making them more able to guide and aid their children in their educational struggles. It may also be the case that the parents' educational background determines the level of educational aspiration that the individual have. This may have the effect that the relative value of different educational paths differs, and thus the subjective rate of return from different educational choices. Further, they conclude, the costs and thus risks, associated with education may be different depending on social background.

The main interest of this paper is the way in which expectations about the rate of return from an investment in higher education is formed. The main hypothesis is that the expected rate of return for an individual is, *ceteris paribus*, a function of the specific composition of educational and income characteristics of the parents. In a setting where information about future returns is incomplete, the individual forms her expectations about the returns to higher education by observing her parents. These perceived rates of return, rather than the actual rates of return, would then determine the demand for higher education. We may write this hypothesis simply as,

$$E_i(r) = f(\text{parents\_inc\_educ}_i)$$

where  $E_i(r)$  is the expected rate of return to an educational investment for individual  $i$ ,  $\text{parents\_inc\_educ}_i$  is the specific combination of income and educational background of the parents of individual  $i$ .

## 4. Data and Variables

The empirical analysis is based on data obtained from Statistics Sweden and the Swedish National Agency for Education. The main database used is LISA<sup>3</sup> and the sample describes the cohort of individuals born in 1973. The study sample consists of approximately 113 000 individuals. In order to perform the empirical analysis a range of variables are used and for which descriptive statistics are presented in *Table 1*.

The empirical model has a bivariate setting in which the individual chooses to invest in a higher education or not. The dependent variable is labeled *Post upper secondary* in *Table 1* and takes the value one if the individual's observed level of education in the year 2003 is post upper secondary. The descriptive statistics are presented for the whole sample as well as for the different values of the dependent variable. 41 per cent of the individuals in the whole sample had a post upper secondary education in 2003.

Following the theoretical underpinnings presented earlier the independent variables are assumed to influence the investment decision made by the young individual. These independent variables are presented in *Table 1* in four different categories.

The first category describes the individual's background characteristics. The variable *Male* takes the value 1 for a male individual. *Both parents* and *Second generation* takes the value 1 for an individual with at least one parent born abroad from the Nordic countries and who lives with both parents in 1991. The last variable in this category is the individual's average grade point from the 9<sup>th</sup> grade. This variable is important in relation to the theoretical model presented earlier; it can be thought of as (in some way) measuring the ability or overall productivity of the individual, thus influencing future returns on investment in human capital as well as the probability of study success. From *Table 1* it is clear that the individuals who had a post upper secondary education in 2003 also tend to have had a higher grade average in the 9<sup>th</sup> grade. Also, the individuals with at least one parent born abroad are overrepresented in the sample with no post upper secondary education.

The second category consists of variables that describe the household's level of income. The labor income variables are expressed as mean income over the years 1990-1992 and the asset income variables as mean income over the years 1991-1992. Included are also variables that describe the labor income in relation to the median of

---

<sup>3</sup> Integrated Database for Labour Market Research

mean incomes earned by parents with a positive labor income in the sample<sup>4</sup>. These variables are chosen to reflect family wealth; in the literature (see e.g. Erikson and Jonsson, 1993) wealth is an important explanatory variable in similar settings. Following the reasoning by Becker (1964) and Kodde and Ritzen (1988), family wealth may become an important way of financing investments in higher education in the presence of imperfect capital markets. The descriptive statistics found in *Table 1* show that the incomes received by either parent are higher for the sample of individuals that had a post upper secondary education in 2003.

The third category of independent variables describes the educational level of the individual's household.<sup>5</sup> These variables are identified in the literature as major determinants of educational attainment (see e.g. Erikson and Jonsson, 1993). *Table 1* provides descriptive statistics for five levels of household education, ranging from elementary school or less, to three years of post upper secondary education or longer. Also, the separate educational backgrounds of each parent are provided. A striking result from the descriptive statistics is that the individuals with well-educated parents are heavily over represented in the sample with post upper secondary education. For example, in the latter case 34 per cent had at least one parent with three years or more post upper secondary education as compared to 19 per cent for the whole sample.

Lastly, the fourth category consists of key variables that are directly linked to the purpose of this paper; these variables test the hypothesis that interaction between parental education and income level influence the expectations on future returns from an investment in higher education and thus the demand for higher education made by the young individual. There are three different types of independent variables in this category, which will be presented in the text below.

---

<sup>4</sup> Hence, the median used here is not representative of the median of all incomes in the economy, rather the median for incomes earned by parents with children born in 1973. Further, the median for each parent refers to the median of incomes for each gender

<sup>5</sup> The household's education level is defined as the highest level of education for either parent in 1992.



**Table 1.** Descriptive statistics

	All Sample (n=112920)		Post upper secondary educ. (n=44554)		Upper secondary educ. or below (n=63887)	
	mean	std. dev.	mean	std. dev.	mean	std. dev.
<b>Individual</b>						
Male	0.510	0.500	0.47	0.499	0.58	0.493
Both parents <sup>a</sup>	0.697	0.460	0.987	0.114	0.979	0.143
Second generation	0.133	0.339	0.108	0.310	0.133	0.340
Grade average	3.190	0.734	3.691	0.534	2.911	0.615
Post upper secondary <sup>b</sup>	0.411	0.492				
<b>Household income</b>						
Mothers labor income <sup>c</sup>	986.530	515.095	1105.106	524.830	912.385	455.876
Fathers labor income <sup>c</sup>	1577.125	941.683	1834.498	1035.066	1441.612	744.683
Mothers asset income <sup>c</sup>	-19.234	1665.236	12.269	2174.757	-33.433	875.578
Fathers asset income <sup>c</sup>	-186.438	1604.041	-177.779	1832.488	-211.635	1309.203
Deviance from mean income, mother <sup>d</sup>	0.000	0.323	-0.0080	0.446	0.0056	0.176
Deviance from mean income, father <sup>d</sup>	0.000	0.330	-0.0062	0.411	0.0068	0.183

<sup>a</sup>Refers to the family situation in 1991.

<sup>b</sup>Refers to education completed in 2003.

<sup>c</sup>Labor income averaged over 1990-1992 and asset income averaged over 1991-1992. In hundreds of SEK per year.

<sup>d</sup>Refers only to parents with post upper secondary education (three years or longer), otherwise 0. In terms of standard deviations for that educational group of a specific gender.

**Table 1.** Descriptive statistics (continued)

	All Sample (n=112920)		Post upper secondary educ. (n=44554)		Upper secondary or below (n=63887)	
	mean	std. dev.	mean	std. dev.	mean	std. dev.
<b>Household education<sup>d</sup></b>						
Post upper secondary (three years or longer), household	0.185	0.388	0.335	0.472	0.0916	0.288
Post upper secondary (less than three years), household	0.147	0.354	0.192	0.394	0.128	0.334
Upper secondary, household	0.147	0.355	0.164	0.370	0.163	0.369
Vocational school, household	0.334	0.472	0.230	0.421	0.406	0.491
Elementary school or less, household	0.187	0.390	0.0801	0.272	0.212	0.409
Post upper secondary (three years or longer), mother	0.124	0.329	0.215	0.411	0.0511	0.220
Post upper secondary (less than three years), mother	0.131	0.338	0.184	0.387	0.0904	0.287
Upper secondary, mother	0.0782	0.289	0.0919	0.289	0.0603	0.251
Vocational school, mother	0.383	0.486	0.333	0.471	0.430	0.495
Elementary school or less, mother	0.283	0.451	0.176	0.381	0.362	0.480
Post upper secondary (three years or longer), father	0.145	0.352	0.246	0.431	0.0591	0.236
Post upper secondary (less than three years), father	0.0921	0.289	0.121	0.326	0.0711	0.257
Upper secondary, father	0.174	0.379	0.202	0.401	0.155	0.362
Vocational school, father	0.249	0.432	0.205	0.403	0.283	0.450
Elementary school or less, father	0.340	0.474	0.226	0.418	0.432	0.0.495
<b>Household income-education discrepancy</b>						
Discrepancy between parents	0.0310	0.173	0.0629	0.243	0.0237	0.152

<sup>d</sup>Refers to the highest level of education in 1992.

First, there is a variable that takes the value 1 if the individual grew up in a two-parent household where one parent had a post upper secondary education of three years or longer while the other parent had not, but where the relatively high educated parent had a lower mean labor income than the less educated counterpart in the household. This variable is labeled *Discrepancy within household* in *Table 1* and is directly linked to the main hypothesis of this paper; individuals from these specific types of households would from observing their parents have, *ceteris paribus*, lower hypothesized expectations on future returns from education. These lower expectations would, from theory, make these individuals less likely to invest in a higher education. However, the descriptive statistics reveal that a higher proportion of individuals with discrepancies between parental education and labor income are found in the sub sample of individuals who had a post upper secondary education in 2003.

Second, there is a pair of independent variables that measures the deviance from the mean income in terms of standard deviations, for the parents who have a post upper secondary education of three years or longer. For other parental educational groups it takes the value zero. Further, the mean incomes are restricted to those exceeding 80 000 SEK. This is done in order to avoid labor supply effects and to better approximate the true wage earned by the parent. For more details, see Antelius and Björklund (2000). These variables are labeled *Deviance from mean income* for mother and father respectively in *Table 1*.

Third, there is a set of interaction terms that will be included in the analysis. These variables describe the interaction between high parental education and the mean labor income earned by that parent. They are constructed using the mean labor income for each parent, together with the variable that indicates if the parent has reached the highest level of education, as presented above. The interaction terms are labeled *Interaction income/high education* for the mother and father respectively in the further analysis.

Summing up, the descriptive statistics reveal that individuals in the sample that had a post upper secondary education in 2003 on average had wealthier and better-educated parents, as compared to those individuals who did not have a post upper secondary education. In addition, they also tended to have a higher grade average when leaving compulsory school.

## 5. Empirical Model

The purpose of the empirical analysis is to model the probability that an individual chooses to invest in a higher education, i.e. the probability that the individual chooses to continue beyond upper secondary level of education. Three separate binary logit models are fitted to the sample data in order to estimate the effects of the independent variables described earlier. The models differ in what independent variables that are included and each model tests a different aspect of the main purpose of this paper, i.e. the interaction effect between parental education and parental income. *Model 1* includes the independent variable titled *Discrepancy between parents*, while *Model 2* includes the variables labeled *Deviance from mean income* in *Table 2* for the mother and father respectively. *Model 3* includes the interaction term between mean labor income and education for the mother and father respectively, labeled *Interaction income/education* in *Table 2*. Except from these key variables the independent variables are the same in all three models.

Following Greene's (2008, Chapter 23) presentation of the binary logit model, the individual's decision to continue to post upper secondary education is modeled in a binary setting. Assuming the dependent variable  $Y$ , the response is either to attend higher education ( $y=1$ ) or not to attend ( $y=0$ ). Further, the independent variables that are expected to explain the individual's decision are gathered in a vector  $\mathbf{x}$ . The probability that the dependent variable  $Y$  takes either value is therefore,

$$Prob(y_i = 1|\mathbf{x}_{ij}) = F(\mathbf{x}_{ij}, \boldsymbol{\beta}_j)$$

$$Prob(y_i = 0|\mathbf{x}_{ij}) = 1 - F(\mathbf{x}_{ij}, \boldsymbol{\beta}_j)$$

for individual  $i=1, \dots, n$  in model  $j=1, 2, 3$ .

The probability that individual  $i$  continues to post upper secondary education in a given model is a function of the vector  $\mathbf{x}_i$  and a set of parameters  $\boldsymbol{\beta}$  that reflects the impact of changes in the independent variables on the probability that  $y_i=1$ .

If we assume a logistic distribution for the cumulative distribution function  $F(\mathbf{x}_i, \boldsymbol{\beta})$  we write,

$$Prob(y_i = 1|\mathbf{x}_{ij}) = F(\mathbf{x}_{ij}, \boldsymbol{\beta}_j) = \frac{e^{\mathbf{x}_{ij}'\boldsymbol{\beta}_j + \varepsilon_{ij}}}{1 + e^{\mathbf{x}_{ij}'\boldsymbol{\beta}_j + \varepsilon_{ij}}}$$

which is the binomial logit model with a stochastic error term  $\varepsilon_{ij}$ .

The log-likelihood function for this model can be written,

$$\ln L_j = \sum_{y_i=1}^n \ln F(\mathbf{x}'_{ij} \boldsymbol{\beta}_j) + \sum_{y_i=0}^n \ln 1 - F(\mathbf{x}'_{ij} \boldsymbol{\beta}_j)$$

where the parameters  $\boldsymbol{\beta}_j$  are estimated by maximizing  $\ln L_j$ .

## 6. Empirical Results

The maximum likelihood estimates of the three binary-logit models for post upper secondary education are presented in *Table 2*. Also, the odds ratio estimates for the significant estimates are presented in *Table 2b*. Since the estimates for the common parameters are robust for the three models, these estimates will be commented and interpreted collectively below. Furthermore, results from separate regressions are presented in Appendix A. The purpose of these estimates is to test the robustness of the models and will not be commented in this section, but left to be discussed in the concluding section.

One important result from the empirical model is the statistical insignificance of all the key independent variables and interaction terms used to test the main hypothesis of this paper. Rather, the signs of the estimates for *Deviance from mean income* and *Interaction income/high education, father* are opposite of the hypothesized direction. *Discrepancy within household* and *Interaction income/high education, mother* are signed in the hypothesized direction. However, because of the statistical insignificance these ambivalent results will not be interpreted further.

The results reveal that parental education is both a statistically significant and a positive determinant for the individual's decision to invest in a higher education. Also, *Table 2* and *Table 2b* shows that the impact of parental education tends to increase with the level of education, as compared to a parental education-level of elementary school or less. For example, from the odds-ratio estimates, an individual whose father had a post upper secondary education of three years or longer where around 2.4 times as likely to have a post upper secondary education herself, as compared to those whose father did not have a post upper secondary education.

**Table 2.** Binary-logit estimates of the probability of post upper secondary education

	Model 1		Model 2		Model 3	
Constant	-8.943**	(0.105)	-8.943**	(0.105)	-8.955**	(0.104)
Male	-0.005	(0.019)	-0.005	(0.019)	-0.005	(0.019)
Both parents	0.215**	(0.074)	0.202**	(0.075)	0.214**	(0.074)
Second generation	-0.088**	(0.033)	-0.084*	(0.033)	-0.088*	(0.033)
Grade average	2.325**	(0.020)	2.332**	(0.021)	2.325**	(0.020)
Mothers labor income	6.62E-5**	(2.39E-5)	6.67E-5**	(2.40E-5)	8.18E-5**	(2.20E-5)
Fathers labor income	9.74E-5**	(1.49E-5)	9.53E-5**	(1.50E-5)	9.73E-5**	(1.25E-5)
Mothers asset income	4.16E-6	(8.07E-6)	4.61E-6	(8.46E-6)	4.10E-6	(8.02E-6)
Fathers asset income	7.45E-6	(6.71E-6)	5.93E-6	(7.07E-6)	7.33E-6	(6.72E-6)
Post upper secondary (three years or longer), mother <sup>a</sup>	0.781**	(0.093)	0.969**	(0.043)	0.964**	(0.045)
Post upper secondary (less than three years), mother <sup>a</sup>	0.714**	(0.033)	0.716**	(0.033)	0.710**	(0.033)
Upper secondary, mother <sup>a</sup>	0.397**	(0.038)	0.397**	(0.038)	0.395**	(0.037)
Vocational school, mother <sup>a</sup>	0.251**	(0.024)	0.250**	(0.024)	0.249**	(0.024)
Post upper secondary (three years or longer), father <sup>a</sup>	0.857**	(0.066)	0.858**	(0.040)	0.851**	(0.037)
Post upper secondary (less than three years), father <sup>a</sup>	0.578**	(0.035)	0.575**	(0.035)	0.580**	(0.035)
Upper secondary, father <sup>a</sup>	0.432**	(0.028)	0.432**	(0.028)	0.433**	(0.028)
Vocational school, father <sup>a</sup>	0.152**	(0.025)	0.152**	(0.025)	0.151**	(0.025)
Interaction income/high education, mother	1.13E-4	(6.15E-5)				
Interaction income/high education, father	-3.04E-4	(2.70E-5)				
Deviance from mean income, mother			-0.035	(0.802)		
Deviance from mean income, father			-0.008	(0.038)		
Discrepancy within household					-0.073	(0.056)
-2logL	70322.491		69179.068		70324.201	

Notes: \*Significant at 5%; \*\*Significant at 1%. Standard errors in parentheses. Reference group for parental household education is *Elementary school or less*. <sup>a</sup>Refers to highest level of education.

**Table 2b.** Odds ratio estimates (for significant estimates from Table 2)

	Model 1	Model 2	Model 3
Both parents	1.239	1.224	1.239
Second generation	0.916	0.919	0.916
Grade average	10.223	10.293	10.225
Mothers labor income	1.000	1.000	1.000
Fathers labor income	1.000	1.000	1.000
Post upper secondary (three years or longer), mother	2.184	2.636	2.622
Post upper secondary (less than three years), mother	2.041	2.045	2.034
Upper secondary, mother	1.487	1.487	1.484
Vocational school, mother	1.285	1.284	1.283
Post upper secondary (three years or longer), father	2.356	2.358	2.342
Post upper secondary (less than three years), father	1.782	1.776	1.786
Upper secondary, father	1.541	1.540	1.542
Vocational school, father	1.164	1.284	1.164

Another important factor that determines the individual's educational choice is the grade average from the 9<sup>th</sup> grade; the estimate is both statistically significant and positive in sign. In all three models, the grade average is an influential factor. The estimated odds of the individual investing in a higher education increases by a factor 10 when the individual's grade average is increased by one unit.

Parental labor income also influences the probability that an individual invests in a higher education positively and this effect is statistically significant. Parental asset income on the other hand does not have a statistically significant effect.

Lastly, the results show that living with both parents in 1991 positively and statistically significantly influences the probability that the individual has a higher education in 2003. Having at least one parent of non-Nordic origin, on the other hand, decreases the probability. Gender does not seem to have a statistically significant effect.

In summary, the results are in line with theory and previous studies. Parental education and parental income are found to be influential factors in explaining the educational choice made by the young individual. Also, parental origin and number of parents in the household are statistically significant factors. These results are consistent with the findings in much of the sociological literature (see e.g. Erikson and Jonsson, 1993 and Dryler, 1998) as well as in economic studies (see e.g. Eliasson, 2006 and Tasiran and Tezic, 2006). The significance of the grade average is also as expected from economic theory. The statistical insignificance and ambivalence of the signs of the key variables, on the other hand, gives little support to the main hypothesis of this paper, i.e. that young individuals form their expectations on future returns on education by observing their parents. The result from this paper suggests that parental discrepancies regarding level of education and income do not influence the investment decision made by the young individual.

## **7. Summary and Conclusions**

The purpose of this paper has been to study empirically the impact of the interaction between parental education and parental income on the educational choice made by the young individual. The main hypothesis has been that the individual forms its expectations on future returns from an investment in higher education by observing its parents, and that these expectations in turn determine the individual's choice to invest or not. The empirical analysis refers to a dataset (LISA) consisting of approximately 113 000 individuals born in 1973 and residing in Sweden. To this data three binomial logit models are fitted in order to explain the individual's educational choice as it is observed in 2003. The empirical findings suggest that the interaction between parental education and parental labor income does not influence the individual's decision to invest in a higher education. Further, the findings reveal that there is considerable bias in the recruitment to higher education when considering the educational background of the parents in the data.

The results from this paper provides little evidence in support of the main hypothesis used; observations of parents does not seem to be a major determinant when expectations on future returns from education are formed (given that the individual actually considers future returns when making the investment decision). Rather, the empirical findings may be interpreted in support of an alternative hypothesis; the rational individual uses all available and relevant information when forming its expectations about future returns to investments in education. However, the data



used in this paper is not ideal for the acceptance or rejection of either hypothesis. Interaction between parental education and income does not seem to influence the investment decision per se, but it is unclear whether this is because of more informed expectations or of less informed investment decision where expectations is not considered at all. In order to investigate this more thoroughly, studies similar to Smith and Powell (1991) and Jensen (2010) must be considered in a Swedish setting. These studies use stated expectations about future returns to investments in education, and in the case of Jensen's study, actual outcomes of educational choices made.

Another possibility that is not considered in this paper is that the individual bases his expectations of future returns on other factors than wage differentials. One such factor could be the risk and uncertainty (actual or perceived) associated with different educational choices. It may also be the case that actual risk and/or risk aversion differs with social background. For example, Hammarström (1996) finds that children of lower social status more often states that an aversion towards debt to be a reason not to invest in a higher education. In this way, differences in risk aversion could potentially be an important factor in explaining the bias in recruitment to higher education observed in this paper and elsewhere. Further, it could be the case that the individual actually forms its expectations from observing her parents, but that she considers the risk of being unemployed in relation to the parent's education, instead of their relative income or wage. Hence, a study that uses relative risk of unemployment instead of relative income is a possible setting for further work on this subject.

Lastly, there is evidence from the literature (see e.g. Hammarstedt, 2003) to suggest that immigrants in Sweden are not only unemployed to a higher extent, but that they relatively often also tend to be employed in jobs that are below their formal education level. All three models that are estimated in this paper controls for origin of the parents, hence there is a possibility of confounding between parental origin and the interaction effects that are tested for in the models. In order to check the robustness of the models, Appendix A provides estimates of the models where parental origin are not controlled for. From Appendix A it is clear that the results in fact are robust, i.e. there does not seem to be any confounding between having foreign born parents and having parents with discrepancies between education and income.

## References

Angelov, N., Johansson, P., Kennerberg, L. [2008], "Välja fritt och välja rätt. Drivkrafter för rationella utbildningsval", Bilaga 8, Långtidsutredningen 2008, Fritzes, Stockholm.

Antelius, J., Björklund, A. (2000), How Reliable are Register Data for Studies of the Return on Schooling? An examination of Swedish data, *Scandinavian Journal of Educational Research*, vol. 44, no. 4, pp. 341-355.

Becker, G. (1964) , *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, The University of Chicago Press, Chicago.

Betts, J R. (1995), *What do Students Know about Wages? Evidence from a Survey of Undergraduates*, Discussion Paper 95-07, Department of Economics, University of California, San Diego.

Dryler, H. (1998), "Educational Choice in Sweden: Studies on the Importance of Gender and Social Contexts", Swedish Institute for Social Research, Stockholm.

Edin, P-A., Holmlund, B. (1993), "Avkastning och efterfrågan på högre utbildning", *Ekonomisk Debatt*, vol. 21, no. 1, pp. 31-45.

Eliasson, K. (2006), *The Effects of Accessibility to University Education on Enrollment Decisions, Geographical Mobility, and Social Recruitment*, PhD. Thesis, Department of Economics, Umeå University.

Erikson, R., Jonsson, J O. (2002), "Varför består den sociala snedrekryteringen", *Pedagogisk forskning i Sverige*, vol. 7, no. 3, pp. 210-217.

Erikson, R., Jonsson, J O. [1993], "*Ursprung och utbildning. Social snedrekrytering till högre studier*", SOU1993: 85, Fritzes, Stockholm.

Fredriksson, P. (1997), "Economic Incentives and the Demand for Higher Education", *Scandinavian Journal of Economics*, vol. 99, pp. 129-142.

Gustavsson, M. (2004), *Changes in Educational Wage Premiums in Sweden: 1992-2001*, Working Paper 2004:10, Department of Economics, Uppsala University.

Greene, W., (2008), *Econometric Analysis*, Pearson Education, USA.

Hammarstedt, M. (2003), Income From Work Among Immigrants in Sweden, *Review of Income and Wealth*, vol. 49, no. 2, pp. 185-203.

Hammarström, M. (1996), Varför inte högskola? En longitudinell studie av olika faktorerers betydelse för studiebegåvade ungdomars utbildningskarriär, Ph. D. Thesis, Department of Educational Science, Göteborg University.

Jensen, R. (2010), "The (Perceived) Returns to Education and the Demand for Schooling", *The Quarterly Journal of Economics*, May 2010, pp. 515-548.

Kodde, D., Ritzen, J. (1988), "Direct and Indirect Effects of Parental Education Level on the Demand for Higher Education", *The Journal of Human Resources*, vol. 23, pp. 356-371.

Mincer, J. (1974), *Schooling, Experience, and Earnings*, National Bureau of Economic Research and Columbia University Press, New York.

Ranehill, E. (2002), *Social snedrekrytering till högre studier. En litteraturöversikt*, Arbetsrapport 2002:10, Institutet för Framtidsstudier.

Rouse, C E. (2004), Low-Income Students and College Attendance: An Exploration of Income Expectations, *Social Science Quarterly*, vol. 85, no. 5, pp. 1299-1316.

Smith, H L., Powell, B. (1990), Variations in Income Expectations Among College Seniors, *Sociology of Education*, vol. 63, no. 3, pp. 194-207.

Streufert, P. (2000), The Effect of Social Isolation on Schooling Choice, *Journal of Public Economic Theory*, vol. 2, no. 4, pp. 461-482.

Statistics Sweden (2010), "Higher education. Level of parental education among university entrants 2009/10 and first time students at third circle studies 2008/09", Statistiska Meddelanden, SCB, Stockholm.

Tasiran, A., Tezic, K. (2006), Parental Income and Continuing Education of Second Generation Immigrants in Sweden, *International Review of Applied Economics*, vol. 20, no. 4, pp. 491-514.

Österberg, T. (2000), Economic perspectives on immigrants and intergenerational transmissions, Economic Studies 102. Ph.D Thesis, Göteborg University.

# Appendix

## Appendix A. Binary-logit estimates of the probability of post upper secondary education

	Model 1		Model 2		Model 3	
Constant	-8.963**	(0.104)	-8.971**	(0.106)	-8.974**	(0.104)
Male	-0.005	(0.019)	-0.003	(0.019)	-0.005	(0.019)
Both parents	0.216**	(0.074)	0.204**	(0.075)	0.216**	(0.074)
Second generation	-	-	-	-	-	-
Grade average	2.325**	(0.020)	2.332**	(0.021)	2.326**	(0.020)
Mothers labor income	6.91E-5**	(2.39E-5)	8.22E-5**	(2.31E-5)	8.45E-5**	(2.20E-5)
Fathers labor income	1.01E-4**	(1.48E-5)	9.86E-5**	(1.43E-5)	1.00E-4**	(1.24E-5)
Mothers asset income	4.32E-6	(8.18E-6)	4.25E-6	(8.13E-6)	4.26E-6	(8.11E-6)
Fathers asset income	7.45E-6	(6.71E-6)	7.27E-6	(6.71E-6)	7.33E-6	(6.72E-6)
Post upper secondary (three years or longer), mother <sup>a</sup>	0.782**	(0.093)	0.969**	(0.043)	0.963**	(0.045)
Post upper secondary (less than three years), mother <sup>a</sup>	0.715**	(0.033)	0.717**	(0.033)	0.712**	(0.033)
Upper secondary, mother <sup>a</sup>	0.397**	(0.038)	0.397**	(0.038)	0.395**	(0.037)
Vocational school, mother <sup>a</sup>	0.255**	(0.024)	0.254**	(0.024)	0.253**	(0.024)
Post upper secondary (three years or longer), father <sup>a</sup>	0.855**	(0.066)	0.850**	(0.040)	0.844**	(0.037)
Post upper secondary (less than three years), father <sup>a</sup>	0.574**	(0.035)	0.571**	(0.035)	0.577**	(0.035)
Upper secondary, father <sup>a</sup>	0.428**	(0.028)	0.428**	(0.028)	0.430**	(0.028)
Vocational school, father <sup>a</sup>	0.150**	(0.025)	0.151**	(0.025)	0.150**	(0.025)
Interaction income/high education, mother	1.12E-4	(6.16E-5)				
Interaction income/high education, father	-2.76E-4	(2.70E-5)				
Deviance from mean income, mother			-0.032	(0.039)		
Deviance from mean income, father			-0.004	(0.041)		
Discrepancy within household					-0.073	(0.056)
-2logL	70329.736		69185.473		70331.337	

Notes: \*Significant at 5%; \*\*Significant at 1%. Standard errors in parentheses. Reference group for parental household education is *Elementary school or less*. <sup>a</sup>Refers to highest level of education.