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IS LITTLE BROTHER
NOTHING BUT
TROUBLE?:
Educational Attainment,
Returns to Schooling
and Sibling Structure

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Abstract: Family effects on an individual's labor market success have been studied by economists and sociologists. The consensus is that background matters to educational and labor market performance, but it is not clear how and why. I look at indicators of family background and sibling structure, analyzing their effect on educational attainment and earnings. Parental income, schooling and other characteristics are amongst the main determinants of schooling. Also, sibling structure and density affect education, but have no effect on earnings. Sibling density and sex composition are tested as instruments for schooling. With the IV-strategy, estimated return to schooling decreases from 9 to 7 percent for men, but increases to 11-14 percent for women.

Key words: Family, siblings, education, earnings

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Tiivistelmä: Perhetaustan vaikutus yksilön menestykseen työmarkkinoilla on kiinnostanut sekä taloustieteilijöitä että sosiologeja. Tutkimuksissa on selvinnyt, että perhetaustalla on voimakas vaikutus yksilön menestykseen, mutta vaikutusten syyt ja välittymismekanismit eivät ole yksiselitteisiä. Tässä tutkimuksessa tarkastellaan lukuisia erilaisia perhetaustatekijöitä sekä sisaruskuvaavia mittareita, ja analysoidaan näiden vaikutusta yksilön koulutukseen ja ansioihin. Vanhempien tulotaso, koulutus ja muut ominaisuudet ovat tärkeitä selittäjiä lasten koulutuksen hankkimiselle. Myös sisarusparven rakenne ja lasten ikävälit vaikuttavat koulutukseen, mutta eivät vaikuta lasten myöhempään ansioihin. Lopuksi mallinnetaan ekonometrisin menetelmin koulutuksen tuottoja yksilötasolla, käyttäen instrumentteina lasten ikävälejä ja sisarusten sukupuolta. Tällä ns. instrumenttimenetelmällä saadut tulokset poikkeavat jonkin verran ns. estimointien tuloksista. Koulutuksen tuotto laskee miehillä yhdeksästä seitsemään prosenttiin, kun se taas naisilla kasvaa noin 11-14 prosenttiin.

Asiasanat: Perhe, sisarukset, koulutus, ansiot

Yhteenveto

Tausta

Perheellä on suuri merkitys yksilön kehityksen ja menestymisen kannalta. Jo pelkästään se, että lapset viettävät paljon aikaa vanhempiensa ja sisarustensa kanssa vaikuttaa erilaisten asenteiden ja taipumusten muodostumiseen. Ominaisuudet periytyvät osittain myös geneettisesti sukupolvelta toiselle. Huolimatta yhteiskunnan takaamasta perustoimeentulosta, perheen tulotaso vaikuttaa siihen missä määrin vanhemmat pystyvät investoimaan lastensa inhimilliseen pääomaan. Perheen taloustiede onkin viime aikoina herättänyt runsaasti kiinnostusta kun on tutkittu kuinka perhetausta vaikuttaa yksilön koulutukseen, ansioihin ja menestykseen työmarkkinoilla. Taloustieteilijät ovat yhtä mieltä siitä, että perheellä on voimakas vaikutus taloudelliseen menestykseen, mutta vaikutusten syyt ja välitysmekanismit puhuttavat edelleen.

Becker ja Tomes (1976, 1979) sekä Behrman ym. (1982) ovat esittäneet varsin yleisesti hyväksytyyn näkemyksen, jonka mukaan perheellä on hallinnassaan rajallinen määrä resursseja, joiden käytöstä vanhemmat päättävät. Vanhemmat ”investoivat” aikaa ja rahaa lastensa inhimillisen pääoman kehitykseen, jota lapset puolestaan myöhemmin käyttävät ansaitakseen elantonsa. Lapsella on jo syntyessään tietty varanto inhimillistä pääomaan (kyvykkyyttä), joka vaikuttaa vanhempien investointipäätöksiin sekä lapsen myöhempiin ansioihin. Koska perheen resurssit ovat rajalliset, vaikuttaa kunkin lapsen asemaan perheen koko, rakenne ja se kuinka lähellä toisiaan sisarukset ovat syntyneet.

Empiirinen tutkimus aiheesta on keskittynyt lähinnä Yhdysvaltojen aineistoihin. On havaittu, että sisarukset vaikuttavat lapsen koulutukseen monin tavoin. Esimerkiksi sisarusten lukumäärän, sukupuolijakauman ja syntymäväliden on väitetty olevan merkityksellisiä. Usein kuitenkin löydökset pohjautuvat pieniin otoksiin ja tulokset vaihtelevat voimakkaasti tutkimuksesta toiseen. Eurooppalaisia tutkimuksia perhevaikutuksista on melko vähän, ja niistä useimmat keskittyvät koulutuksen tai ammatin periytymiseen vanhemmilta lapsille. Tässä tutkimuksessa perehdytään perhetaustan vaikutuksiin Suomessa, käyttäen laajaa joukkoa indikaattoreita perheen rakenteesta ja inhimillisestä pääomasta. Onkin kiinnostava nähdä millaisia perhevaikutukset ovat maassa, jossa sosiaaliturva on paljon kattavampi kuin esimerkiksi Yhdysvalloissa.

Aineisto

Aineistona tutkimuksessa on väestölaskennan- ja työssäkäynnin pitkäaikaistiedosto vuosilta 1970-99. Otoksena on vuoden 1970 lapsiperheet ja niihin syntyneet uudet lapset vuosina 1971-80. Varsinaisessa aineistossa olevat lapset ovat syntyneet välillä 1949-70 ja analyysi kohdistuu pääosin vuosiin 1985-99. Aineiston laajuus ja tietosisällön runsaus mahdollistavat sisarusvaikutusten löytämisen, mikäli

näitä vaikutuksia on ylipäättään havaittavissa. Toisaalta perhe- ja sisarusvaikutukset saattavat olla hyödyllisiä estimoitaessa koulutuksen tuottoja.

Tulokset

Suomessa koulutusta on perinteisesti pidetty suurella arvossa, ja koulutussektorin julkisia menoja on kasvatettu voimakkaasti aina 1960- ja 1970-luvulta lähtien. Tämän tuloksena koulujen, opiskelupaikkojen ja valmistuneiden lukumäärät ovat olleet voimakkaassa kasvussa. 1970-luvulta lähtien koulutettujen työntekijöiden määrä on jatkuvasti lisääntynyt. Kiinnostavaa on, että koulutuksen tuotto (eli sen tuottama ansioiden lisäys) laski melko voimakkaasti 1970-luvulla, mutta on pysynyt kohtuullisen vakaana sen jälkeen.

Tämän tutkimuksen tulokset osoittavat, että koulutuksen hankkiminen vaihtelee perhetyypin ja sisarusparven rakenteen mukaan. Tärkeimmät koulutukseen vaikuttavat tekijät ovat vanhempien tulotaso ja koulutus, vanhempien työmarkkina-asema ja perheen pysyvyys erityisesti lapsuuden ja varhais-nuoruuden aikana. Jos perheeseen on kohdistunut voimakkaita muutoksia (vanhemman kuolema, vanhempien ero tai perheen muutto) lapsen koulutus kärsii. Myös yksinhuoltajaperheessä kasvaminen ja vanhemman alkoholiongelma vaikuttavat koulutukseen negatiivisesti, kun taas äidin työssäkäynnillä on positiivinen vaikutus ainakin poikiin. Perheen koolla on negatiivinen vaikutus koulutukseen, mutta sisarusten sukupuolijakaumalla ei havaittu olevan merkitystä. Yleensäkin sisarusvaikutukset ovat varsin pieniä kooltaan. Monet perhetekijät vaikuttavat myöhemmässä vaiheessa myös lasten ansioihin, joskin vaikutus on pienempi kuin koulutuksen kohdalla.

Lasten myöhempään ansioihin vaikuttaa edelleen perheen tulotaso, joka on osoitus siitä että taloudellinen asema on osittain periytyvä. Muita ansioihin vaikuttavia tekijöitä ovat mm. vanhempien työttömyys ja yksinhuoltajaperheessä kasvaminen, jotka vaikuttavat negatiivisesti. Työille havaittiin, että äidin työssäkäynnillä on positiivinen vaikutus. Sisarusten sukupuolijakaumalla ja syntymäväleillä ei havaittu olevan vaikutusta ansioihin, joten niitä käytettiin instrumentteina estimoitaessa koulutuksen tuottoja. Yksi lisävuosi koulutusta nostaa miesten tulotasoa noin 7 prosenttia ja naisten tulotasoa noin 11 prosenttia.

Johtopäätökset

Tutkimuksen perusteella voidaan todeta, että perhetaustalla on varsin voimakas vaikutus lasten koulutuksen hankkimiseen. Vaikka Suomessa onkin kattava sosiaaliturvajärjestelmä ja periaatteessa yhtäläinen mahdollisuus hankkia koulutusta, näyttäisi heikon perhetaustan aiheuttaman negatiivisen vaikutuksen alentaminen olevan hankalaa. Yksi syy tähän on se, että vaikutukset syntyvät jo varsin nuorena iässä (ennen 16. ikävuotta), eikä vasta siinä vaiheessa kun lukioon tai yliopistoon hakeutumisesta päätetään. Mahdollisten toimenpiteiden

pitäisikin kohdistua heikommassa asemassa oleviin perheisiin jo varsin aikaisessa vaiheessa. Koulutuksen saatavuuden lisääminen ei välttämättä ole järkevä ratkaisu, koska, erilaisista syistä johtuen, jotkut lapset eivät ole halukkaita tai kykeneviä ottamaan vastaan tarjottua mahdollisuutta. Uusimmat tutkimukset (Wolf, 2002) ovat myös ilmaisseet huolen siitä, että koulutuksen liiallinen kasvu saattaa heikentää koulutuksen tuottoja ja työmarkkinamenestys saattaa tulla riippuvaiseksi muista kyvykkyyttä signaloivista tekijöistä (kuten vanhempien liikeym. suhteet). Koulutuksen määrän lisääminen ei siis välttämättä paranna heikommassa asemassa olevien lasten tilannetta.

Tulokset myös osoittivat, että vaikka perheen tulotasolla oli tärkeä merkitys lasten koulutukselle ja ansioille, on myös tulolähteellä vaikutusta. Tulotason positiivinen vaikutus syrjäytyi ainakin osin vanhempien työttömyydellä. Näin ollen työttömyyskorvaukset ja sosiaalietuisuudet eivät hyödytä lapsia siinä määrin kuin vastaavan suuruiset vanhempien ansiotulot. Tämän perusteella kannattaisikin kannustaa vanhempia työskentelemään kodin ulkopuolella. On huomattava, että 1990-luvun laman aikana syntynyt korkea työttömyys on voinut muuttaa vanhemman työttömyyden vaikutusta. Koska kuitenkin tiedetään, että etenkin vähemmän koulutetut kärsivät työttömyydestä laman aikana ja myös työttömyys on osittain periytyvää (Virmasalo, 2002), on mahdollista että vaikutusten suuruus on kasvanut.

Kolmanneksi voidaan todeta, että erityisesti tytöt hyötyisivät työssäkäyvän äidin tarjoamasta roolimallista korkeampien ansioiden muodossa. Myös poikien koulutukseen äidin työssäkäynti vaikutti positiivisesti. Tähän liittyen kannattaa pohtia sitä kuinka yksinhuoltajien tulotasoa (etenkin ansiotulojen osalta) voitaisiin nostaa. Tutkimus toi esille myös sen, että lasten koulutus selvästi kärsii perheeseen kohdistuneista voimakkaista muutoksista. Varsinkin viimeaikaisen lasten ”pahoinvoinnista” käydyn keskustelun valossa tulisi harkita kuinka näiden muutosten vaikutuksia lapsiin voitaisiin lieventää mm. neuvonnan avulla.

Contents

1. Introduction	1
2. Parental investment in human capital and sibling structure	3
2.1 What do families do?	3
2.2 Why family effects?	4
2.3 Which instruments?	5
3. Description of the data and Finland in 1970-1999	7
4. Sibling structure and educational attainment	10
5. Returns to schooling	14
6. Conclusions	16
References	19
Tables	24
Figures	34

1. Introduction

We know that the family plays a crucial role in shaping our views, establishing our aspirations and supporting our development. There are several practical reasons for these family effects. First of all, the sheer amount of time spent with parents, sisters and brothers is certainly a big influence on our aptitudes later in life. Secondly, families share certain genetic traits that parents pass on, at least to some extent, to their children from generation to generation. And finally, despite the influence of various social security programs, the level of family income and wealth is an important determinant of the type and amount of investment parents are able to afford for their offspring. It is no wonder that the economics of the family have received such a great deal of interest recently in explaining how individual background affects educational attainment, earnings and overall success in life. Economists now agree that family background has a great influence on an individual's career, and several ideas exist as to how the influence is transmitted.

The most widely accepted view is that presented by Becker and Tomes (1976, 1979) and Behrman et al. (1982). According to this theory, the family has a limited set of resources, the use of which is controlled by the parents. Parents invest money and time in the human capital of their offspring that they use later to generate earnings. Each child is born with an "endowment" that affects their earnings, and parents can either reinforce or compensate for the endowment differences. Hence, if parents are limited by their resources, each child's position depends on the size, composition and density of its sibling set.

Empirical literature on family effects is extensive in the USA. It has been found that siblings affect individual education in a number of ways. Some studies report that the sibship-effect varies by sex while others do not (Butcher and Case, 1994; Kastner, 1997; Hauser and Kuo, 1998; Conley, 2000). Still further studies find that it is the size of the family that matters (Steelman and Powell, 1985; Zajonc, 1976; Hauser and Kuo, 1998; Behrman et al., 1994), while a number posit the spacing of births to be important (Rosenzweig, 1986; Behrman and Taubman, 1986; Powell and Steelman, 1990). The fact that the results differ so widely across studies may, at least in part, be due to small sample sizes as the family-effects are typically small and thus difficult to uncover. Other reasons for the discrepancies are the possible endogeneity of family variables and the unrepresentative samples used. European studies on family effects are scarcer and mainly concentrate on the inheritance of education, occupation or socio-economic status. Indeed, there have been few studies on sibling effects in countries with a more extensive social system than that of the US. The present study tries to fill that gap, and uses a very large, rich and unique data set of Finnish families.

One example of a study in which including family effects may be very useful is the analysis of returns to education. Because educational attainment tends to be partly inherited and is heavily affected by family background, it is necessary to control for the background in order to estimate the true effect of schooling on earnings. However, the present study recognizes that while some sibling variables affect both educational attainment and earnings, there may be others that affect earnings only through schooling. Such variables could be used as instruments for education in order to derive the returns to schooling. We have at our disposal a very large data set from the Finnish longitudinal population census from 1970-1999 (around 100 000 individuals, and 1 million individual-year observations). A random sample of child-families in 1970 is taken (also adding the children born to those families between 1971-1980), and the children are followed until 1999. The census includes detailed information on schooling, labor market performance, family formation and other individual characteristics of both children and their parents. In our view, this rich data set offers enough information to uncover the possible family effects, if any actually exist. Hence this study represents a test of the validity of many earlier empirical studies.

In Finland, education has been considered as a major factor behind the nations' economic growth. Public expenditure on education has expanded enormously since the 1960s and 1970s. As a result, the number of schools, study places and college graduates has grown considerably, particularly in the 1970s. Since the 1970s the supply of skilled workers has experienced a steady rise. The returns to education fell in the 1970s, but have remained rather stable thereafter. Our empirical results on determinants of educational attainment indicate that, firstly, schooling differs by family type and sibling composition. The most important determinants of schooling include parental education and family income, parental activity, family size and the stability of family life during childhood. If the child has been subject to any shocks (parental death, separation, alcohol problems in the family or location change), schooling will be adversely affected. Sibling composition has small but significant effects on educational attainment. Secondly, while some indicators of background also affect children's adult earnings, the sibling variables do not. Hence they can be tested as possible instruments for schooling in the earnings regression, and some actually perform well. Finally, the returns to schooling are found to decrease slightly as a result of the IV-procedure for men, but to increase for women.

The paper is organized as follows. The second section presents the theory of the family and the effect of siblings on the educational attainment of children. The data are introduced in the third section. The fourth section studies the sibling effect and the fifth section the returns to schooling. The last section concludes the paper.

2. Parental investment in human capital and sibling structure

2.1 What do families do?

In this section we discuss the theory of the family in terms of the effects of “parental investment choices” on the education and income of their offspring. A short review of previous empirical findings will also be presented. Parental investment choices, as defined by Haveman and Wolfe (1995), include a variety of family characteristics that are under the control of the parents, e.g. parental income and education, family size and structure, and geographic location. The family is seen as a decision-making unit striving to produce utility for its members out of a set of real inputs such as time and money (Becker, 1967 and 1981; Becker and Tomes, 1979 and 1986). Economists like to think that a family has either a single utility function or that parents act as dictators in their decision making. Parents do care about the utility (i.e. success) of their offspring and can affect it by investing in their human capital, i.e. schooling. In the basic model all parental investment is assumed to work via schooling, yet it is possible to allow for possible bequests after parental death. Children also inherit part of their capabilities from parents according to the degree of heritability. This framework can best be characterized by the following three-equation system (Leibowitz, 1974; Haveman and Wolfe, 1995):

- (1) Children’s ability = $f_1(\text{Genetic factors, Home investment})$
- (2) Children’s schooling = $f_2(\text{Children’s ability, Home investment, Family income})$
- (3) Children’s income = $f_3(\text{Home investment, Children’s schooling, Post-school investment, Children’s ability, Family income})$

The central variable in the above framework is schooling, which is the major determinant of income and earnings in the third equation. The standard model for estimating the returns to schooling has been used profusely in empirical studies. In its simplest form the model states that earnings are determined by experience and years of schooling, and we can use the log-linear approximation (Mincer, 1974):

$$(4) \quad \log w = \alpha + \beta_1 S + \beta_2 X + \beta_3 X^2 + \varepsilon,$$

where S is the years of completed schooling, X represents the years of (potential) work experience and ε is the residual. We know that the estimated returns to schooling are biased because of omitted ability and because of measurement

error in education (Griliches, 1977 and 1979). If the ability bias is corrected using an IV-technique, the proper choice of instruments is crucial. If instruments are weak and even a small correlation exists between the instruments and earnings, the resulting estimates may be even more biased than the OLS estimates (Bound et al., 1995). Moreover, an omitted variables bias will exist if important background variables are not included (Hauser and Sewell, 1986; Corcoran et al., 1990; Lam and Schoeni, 1993). On the other hand, the inclusion of background information may exacerbate the measurement error bias (Welch, 1975; Griliches, 1977). Hence, there are several concerns to be addressed when estimating the returns to schooling in the context of family background effects.

2.2 Why family effects?

A number of studies have demonstrated that family investments, understood as a broad concept, significantly influence children's attainments. A very good survey is provided by Haveman and Wolfe (1995), and thus we will not discuss individual studies in detail here. Although the theory of the family suggests that the most important determinants of parental investment are family income and family size (Becker and Tomes, 1986), several other factors are likely to affect both the level and quality of investments. Moreover, the structure of the family itself is bound to affect the attitudes and aspirations of the children as well as the distribution of family resources among its members. Non-economic theories explain how parents and older siblings may act as role models or how certain stressful events during childhood can detach an individual from his otherwise stable path of development (Elder, 1974; Jencks and Meyer, 1990; Selzer, 1994). Economists, on the other hand, explain how birth order, birth intervals, sibship sex composition and sex ordering may affect the degree to which each child is able to benefit from family resources (Lindert, 1977; Behrman and Taubman, 1986; Rosenzweig, 1986; Powell and Steelman, 1990; Butcher and Case, 1994). According to the economic theory, sibling composition affects education only if families face borrowing constraints or parents dislike earnings inequality among their children (Becker, 1991; Behrman et al., 1986; Butcher and Case, 1994).

A vast number of empirical studies on the effects of family background on children's educational attainment and labor earnings have been conducted, using data from the US and other developed countries as well as some developing countries. Table 2 presents a review of the main findings from this literature. Note that we do not include the large literature on intergenerational (income) mobility here, but instead concentrate on studies with a wider scope on family background.¹ Neither do we consider the literature with a pure schooling interest,

¹ A large number of studies have estimated the correlation between father's and son's earnings or incomes in a simple model. Examples of this literature include Behrman and Taubman (1985), Solon (1992) and Zimmerman (1992).

but only include studies that have at least some economic orientation. Parental education, family income, how intact the family has remained and the number of siblings are found to be the most consistent family level determinants of schooling. Similarly, the greatest impact on earnings is caused by family income. The effect of parental education varies greatly from study to study, and few of the family variables have any consistent impact on earnings. Some variables have been found to be significant in only a very limited number of studies or only for certain groups of the population. In our opinion this may be due, at least in part, to the rather small samples used in previous studies (in most cases sample sizes range between a few hundred to a couple of thousands observations) and in some cases the samples have clearly been overly homogenous. If indeed any sibship effects exist, they are likely to be relatively modest in magnitude and a very large sample is necessary to uncover them, given the multicollinearity and other biases connected with the estimation of family effects. On the other hand, given a large enough data set it seems possible that certain background variables have a direct effect on schooling but not on earnings, and could hence be used as an instrument for schooling in the earnings equation.

2.3 Which instruments?

The Beckerian theory of the family states that parental investment in their children is made either via schooling or bequests. If this were true many of the measures of family background should have no direct effect on earnings, and could thus be utilized as instruments for schooling. In theory there are several such possible instrumental variables. Becker and Tomes (1976) demonstrate that investment in the quantity and quality of children in the family depends on the level of family income. Parents are likely to invest more human capital in their highly endowed children and more non-human capital in their less endowed children. Ideally, we would like to have some information on quality, i.e. the initial endowments, of children. Rosenzweig (1986) suggests that birth spacing is likely to reveal something about the quality of previously born children. According to him, the existence and proximity of a second child is a positive function of the quality of the first born. And similarly, the existence and spacing of further children is related to the birth outcomes (quality) of previously born children in the family, given their sex composition and ordering. Griliches (1979) also supports the idea that birth spacing can explain sibling differences in schooling. Behrman and Taubman (1986) argue that birth order affects schooling but may not influence earnings.

Reasons for birth order effects include the following. First born children have an advantage over later born siblings because parents spend more time with them alone, the mother is younger at birth (less birth defects etc.) and financial resources in low-income households may be less strained at childhood while there is only one child in the family. On the other hand, with longer birth

intervals younger siblings in resource constrained families may be better off as parents are probably closer to the peak of their earnings and there is less competition for the scarce resources. Oldest children do have an advantage over only children because the existence of further children is an indicator of the quality of the first born (Zajonc, 1976; Behrman and Taubman, 1986). Finally, sibling sex composition may affect the educational attainment of children in the family if parents allocate resources differently between boys and girls due, for example, to differential returns to education between males and females (Kaestner, 1997).

On the whole, the argument for sex composition effects is mainly based on psychological and educational literature. Thomas (1994) argues that parents tend to have gender-specific preferences and invest more time and other resources in children of their own sex. Many argue that especially male children may be treated preferentially (Behrman et al., 1986; Powell and Steelman, 1990). In a similar vein, the sex minority hypothesis states that opposite sex sibs are worse for you as there are returns to scale for gender-specific investments and the needs of the minority sex may not be taken into account (Rosenberg, 1965). The confluence model agrees that same sex sibs are better, especially for boys, as the tests for males are standardized and younger brothers are likely to benefit from the experience of their older brothers (Powell and Steelman, 1984). Conversely, the spill-over model argues that girls with older brothers will obtain more education than girls with older sisters, assuming that educational attainment is a masculine trait (Koch, 1955; Brim, 1958).

Other background characteristics may also offer possible instruments. One supply-side source of variation in schooling is the geographic proximity of schools (Card, 1995; Kane and Rouse, 1993). The presence of a college in the region of residence at the age of college entry can be argued to be (nearly) uncorrelated with ability once family background is otherwise controlled for (since families who live in college towns tend to have different characteristics compared with other families). Finally, it is typical to use interactions of the instrumental variables as further instruments. This may reduce the standard errors of the IV improving the precision of the estimates, but often at the expense of worsening the small-sample bias (Bound et al., 1995). As this discussion shows, the multitude of hypotheses concerning the sex composition and family background effects makes finding and choosing a possible instrument among them mainly an empirical matter.

3. Description of the data and Finland in 1970-1999

We use a very large Finnish data set on families in the longitudinal population census data file compiled by Statistics Finland. The census covers the whole population of Finland and at our disposal we have a 10 percent random sample of households. The longitudinal census file holds very rich information on individuals' educational attainment, labor market performance, earnings and other income, family characteristics and other variables at five-year intervals from 1970-85 and annually from 1987-99. Importantly, for each individual we know the number, age and gender of his/her siblings along with a large number of other family background indicators. We have connected the members of around 65 000 families in 1970 plus the additional children born in 1971-80, and have followed all family members through 1999. Altogether we have information on more than 120 000 children aged 0-21 in 1970, and their parents, for 17 years (-70, -75, -80, -85, -87-99), bringing the total size of the data set to over 1 million observations. The average number of children in the 1970 families is 2.5. Table 1 presents information on the variable means and dispersions according to gender for the sample used in this study. The sample for estimations includes men and women born in 1949-70. During the estimation period (1985-99), these individuals are aged 15 to 50, although only those aged 25-50 in each year are actually used to avoid using observations on those who have not completed their education. Also, we use the children born in 1971-80 only to calculate the sibling composition variables, but leave them out of actual estimations.

An attractive feature of the schooling information in the Finnish census data is its very high reliability, i.e. there is little (upward) measurement error involved. The census is based on registers and schooling is reported from the central education register. The only problem is posed by students who start but do not finish their degree, as unfinished degrees are not reported in the census. This is a problem with university students of certain fields in particular. We also tried to correct for the measurement error by calculating (for university students who never finished their degree) the years of schooling by adding together the numbers of years spent as a college student starting from the first year when the student was registered in the university, but not letting the sum exceed the number of years required to finish the lowest university degree. This correction did not seem to significantly affect the results, however.

In the 1970s, Finnish child-families were larger than they are now but the share of single-parent families has hardly changed at all. The average number of children was 2.5 in 1970 and is now about 1.8. Most (about 80 per cent) of the single-parent families in 1970 were headed by single mothers. Table 3 presents some descriptive statistics of Finnish families in 1970. It is evident that the parents of two-parent families are more educated and have a higher income than single parents. The average taxable income (1970-85) of a two-parent family is

more than twice of that of a single-parent family. The average number of children in single-parent families is only a little smaller, however. Also, the mother of a two-parent family stays more frequently at home looking after children. Most Finnish families, especially two-parent families, live in owned accommodation.

The educational system has been the pride of Finland for several decades. Building a modern welfare state was the main political aim after the 2nd World War, and one key component of this strategy in the 1960s and thereafter was the educational policy. The expansion of publicly provided education already started in the 1950s and more funds were increasingly being directed towards the education sector. The objective of the system was to provide equal access to quality schooling for all children, regardless of family background, thus improving social mobility and equality. During the period examined here the trend continued: the amount of public investment in education soared during 1970-1999 (Figure 1). According to the OECD (1998), public expenditure in education in 1998 measured as a percentage of GDP was 6.6% in Finland, well above the OECD average and that of the USA (5%). However, if both public and private expenditure are taken into account, total educational investment in Finland is at the same level as in the USA (6.6% and 6.7% of GDP, respectively). In Finland, government financial aid to students has also increased markedly ever since the new study grant scheme was introduced in 1969. In the new system, all *college students* were eligible for a student grant, and *all students* over 18 (including vocational education) became eligible in the 1980s.

Due to extensive public funding, private expenditure on education has traditionally been rather modest in Finland. Nevertheless, simultaneously with the expansion of public spending, private investment in education grew from 150 to 1900 million Finnish marks between 1975 and 1999 (both in 1999 value). It includes university and other school fees (around USD 100 per year), continuing or adult education, courses in folk schools and other education services. Study materials, personal computers etc. are not included. The outcome of all the public and private investments was a rising level of education, and the number of high-school and university graduates has constantly increased. The share of the population aged over 15 with a college degree went up from less than 10% in 1970 to 23% in 1999. The share of high-school education increased from less than 20% to 36%.

It seems that the large expansion of educational participation was caused mainly by a greater availability of schooling rather than a greater pay-off. Indeed, the returns to education have fallen significantly, both for men and women, possibly due to the large influx of college graduates to the labor market in the 1970s and 1980s. Similarly, the college-high-school wage ratio has fallen both for men and women. Figure 2 displays the “return” and the supply of new college graduates. A similar development has been observed in other OECD countries. Currently, the educational wage differences in Finland are at around the same level as in the

USA (OECD, 1998). Earlier Finnish studies have concentrated mainly on the 1980s and 1990s, with particular attention on the manufacturing sector. Asplund (1999) estimates steady returns in the manufacturing sector for most of the 1980s, growing only during the economic boom at the end of the 80s. Thereafter, returns have remained almost unchanged. Uusitalo (1999), on the other hand, shows that average returns in all sectors fell somewhat in the 1990s both for men and women.

4. Sibling structure and educational attainment

In this section we look at the educational attainment of children born in 1949-70 and analyze the role of family structure and other characteristics. As generally observed, the correlation of schooling between parents and their children is fairly strong. In our data the son's education is more correlated with the education of both the mother (0.251) and the father (0.291) than the daughter's (0.236 and 0.239, respectively). The correlation of education between siblings is also high (around 0.32). In Finland there are no large gender gaps in the level of educational participation in favor of men. In fact, average years of schooling in 1999 were 13.09 years for men and 13.67 years for women. Some 70 percent of the men in our data set have acquired education after comprehensive school. Of these, 64 percent have secondary education (vocational training, high-school), 17 the lowest level of tertiary education (non-college), 8 the lowest college degree (BA), 9 the higher college degree (MA) and only 1 percent have a postgraduate degree (Licentiate or Ph.D.). The most common fields of education for men are technical (57%), business and social sciences (11%) and forestry/agriculture (9%). Finnish women are generally more eager to study after the basic level: 77 percent of women in our data have a secondary or higher degree. Again, of these, 55 percent have secondary education, 28 lowest tertiary education (non-college), 7 the lowest college degree (BA), 10 the higher college degree (MA) and less than 1 percent have a postgraduate degree. As one might expect, women's preferred fields of education are business and social sciences (26%), health and social work (23%) and services (20%). Thus the gender gap in education is present mainly in the chosen *field* rather than the *level* of schooling.

Educational attainment differs widely by family background. In our data those with basic or secondary education come more often from families with lower parental income and education than the average, and are raised by single- or unemployed parents. Their mothers are also less frequently working outside the home and they have more siblings than the average. By contrast, those with post-secondary and college education are more often from richer, more educated families and have less siblings than the average. Indeed, earlier studies show that education in Finland is largely "inherited", despite political efforts to ensure equal educational opportunities for everyone (Kivinen and Rinne, 1990 and 1995; Statistics Finland, 1972). We should hence control for background factors when estimating the returns to schooling. Otherwise, the schooling variable is likely to capture some of the positive family influences.

As the theoretical section explained, analyzing the effects of sibling structure on schooling can be rather complicated. The most significant effect is usually displayed by the size of the sibling set. Figure 3 and Tables 4a and 4b show that the mean years of schooling increase from one-child family to two-child families but decrease then with further children, as also found by Butcher and Case

(1994) and several other studies. The differences are significant at the 5% level. However, unlike Butcher and Case we can find no clear effect of sibling sex composition. For girls there is some evidence that the existence of brothers is detrimental for education, but the differences are rather small (Table 4b) and the effect does not show in families of all sizes. We do find that birth interval plays a role in terms of educational attainment, especially for boys (Tables 4a and 4b, lower panel). The average years of education of boys increases as the interval to the next child changes from one year to 2-4 years, but falls thereafter. In families with 3-4 children the average years of education of the older children decreases steadily with the birth interval to the next child. For the oldest girls in families the effects are somewhat less clear, and for all children (right panel) there is no marked trend. It should be noted, however, that all sibling variables are heavily correlated with other family background factors and hence we need to control for parental incomes, earnings etc. in order to discern the true effect of sibling structure.

Next we concentrate on analyzing the educational attainment of men and women aged 25 or more during 1985-99. As posited in (2), children's schooling depends on their own ability, home investment and parental income. The actual schooling equation includes a measure of family income (average over 1970-85), parental education, region of the country, an indicator of whether the individual was living in a university region at the age of 17-18, and a number of other family and sibship variables. Regression results for the years of schooling as the dependent variable are reported in Tables 5a and 5b. Columns display the OLS coefficients for various combinations of explanatory variables. The results indicate that both parental education and family income have a positive impact on children's educational attainment, as usual. As also expected, the size of the family has a negative impact, as do the single-parent dummies. Interestingly, living in a single-father family carries a much larger negative impact compared to single-mother families. The effect is particularly large for daughters. This would indicate the importance of having a role model of one's own gender.

Other interesting findings are the negative effect of location changes at an age of less than 16 and the small positive effect of residing in a university town at the age of college entry decision (17-18). The effect of parental death has been studied earlier by Lang and Zagorsky (2001), among others, but they found no significant impact on the child's educational attainment. We, however, find that death of the mother when the son is aged less than 16 does have a negative influence on the years of schooling, but the father's death has no significant effect. For girls the effects of parental death are in some models less significant. Parental separation has a significant negative impact for both sons and daughters, and the coefficient is especially large for daughters. Similarly, parental alcohol problems (as indicated by the whether a parent has at some point during 1970-99 died of an alcohol-related cause) also display a negative coefficient. Finally, the unemployment of a parent displays a large negative effect both for boys and

girls, and the effect of a mother working is positive for boys. This would suggest that while the level of family income is important, the source of that income is also relevant. In fact, the unemployment of a parent can even offset a very large increase in family income.

Testing the various sibling hypotheses is not simple, because most of them are expected to hold only for a subset of children (e.g. the oldest child, those with older siblings etc.). When testing each of the sibship variables individually (not reported in the tables), we find that for boys the sex composition of siblings has no overall effect. However, this is because older and younger brothers actually have a different impact. Given the size of the sibling set, older brothers influence schooling negatively and younger brothers positively, whereas sisters have no significant effect. This also holds when the birth order is controlled for. For girls, brothers in general are bad, but only because of the negative effect of older brothers. Thus siblings of your own or the opposite sex are not necessarily bad for you: whether they are older or younger than you seems to matter more. Secondly, being of a minority sex in the family is detrimental for your schooling, both for boys and girls, as expected, whereas schooling attainment tends to be higher in families where all children are of the same sex. This suggests that gender-specific investments and scale returns to such investments may play a role in children's educational attainment. Most of the sibling variables have the same effect on boys and girls. For both sexes, being an only child displays a negative effect, whereas being the oldest child exerts a positive impact, just like living in a university region. The birth interval to next child has a negative coefficient, as expected. This lends support to the argument that a longer birth interval signals the lower quality of the first (or previously) born child. And finally, birth interval to the previous child has a positive effect, but contrary to the suggestion from theory there is no interaction with family income.

Testing various combinations (more than one variable at the same time) shows that most of the effects remain unchanged, although in some cases the statistical significance changes (Tables 5a and 5b). For example, the minority sex no longer displays a significant effect for sons, and remains only marginally significant for daughters. In general, the sex composition effect does not play a great role in terms of the educational attainment of boys, and has only a modest impact on girls. The birth interval variables continue to behave as expected for both boys and girls. Note that not all sibling variables can be included in the same model, because they need to be tested on different samples (e.g. younger children of the family, older children of the family, those with any sibs etc.). From the schooling models we conclude that family background and sibling composition do influence an individuals' schooling decisions. Interestingly, when including the sibship variables in the earnings equation none of them displays any significant effect if other background influences are controlled for. This suggests that they may be useful as instruments in the estimation of returns to schooling, as also

argued earlier in similar studies. However, careful statistical testing is needed to check their validity.

5. Returns to schooling

This study uses the basic semi-logarithmic Mincerian earnings equation, augmented with family background indicators. The earnings equation includes the three typical variables: years of schooling, age and age squared (Tables 6a and 6b). In addition, several background measures are included to control for potential influences that may otherwise be captured by the instruments, together with region and year dummies to remove the effects of business cycles and regional earnings differences. When family background is not controlled for, the OLS estimate for return to schooling is at the conventional 0.092 (0.001) level for men. With the background controls the OLS estimate falls somewhat to 0.089 (0.001). For women the OLS estimate without family controls is also 0.092 (0.001), and does not change at all when family controls are added. Card (1999 and 2000) surveys a number of papers using family background controls. Similar findings to ours were reported by Kane and Rouse (1995), Card (1995), and Ashenfelter and Zimmerman (1997), who noted that adding family characteristics causes the return to fall somewhat. Like here, controlling for family background in earlier Finnish studies has made little difference (Conneely and Uusitalo, 1997). Note that our estimates are slightly above the usual level, probably because we are using annual earnings, which do not account for the fact that those with more education also tend to work longer hours. Most background controls have little effect on earnings, or the effect disappears when moving to IV. Exceptions are family income (+), parental unemployment (-), a single parent (-) and location move (-) for men, and parental income (+) and a working mother (+) for women. The latter indicates that the role model aspect of a working mother is important for the daughter's labor market success, even though had no significant impact on educational attainment. Finally, parental education has a negative coefficient and, unexpectedly, father's death appears to have a positive effect on the earnings of both boys and girls, yet these effects are not always significant.

As noted above, many of the sibling variables could serve as potential instruments for the years of schooling. We are mainly interested in the birth interval, sex composition and university region indicators. Specification tests also lend support for these instruments. Tables 6a and 6b display the 2SLS IV estimates and tests. Many of the IV estimates for the returns to schooling are somewhat above the OLS estimate, as usual. However, for men most of the schooling coefficients are imprecise. For women the coefficient tends to vary more from model to model, in some cases more than doubling. Using various combinations of instrumental variables we test the suitability of sibship effects as instruments. Birth intervals and sibling sex composition are used in models II, III and V, with university region at the age of college entry added to model III. In addition, parental alcohol problems and separation were tested in model IV. The preferred specifications for men are IV and in particular III, where schooling is

instrumented by parental alcoholism and separation (model IV), or birth interval, minority sex plus university region residence at age 17-18 (model III). For women, specification IV is the most plausible. The F-test for the excluded instruments supports all models but has the highest value for models III and IV for both men and women. The test for over-identification does not reject any of the men's specifications at any conventional level of significance, but models II and III are rejected for women. The partial R² of the instruments in the first stage is fairly low for most models, but as the F-value is very high and the significance of the instruments is clear in the first stage regressions the estimates can be argued to be reasonable. In the preferred specifications schooling has a positive, significant effect on earnings: 0.071 for men and 0.116 for women.

Many studies have made similar discoveries. Using college proximity as an instrument, Kane and Rouse (1995), Card (1995), Conneely and Uusitalo (1997) and Maluccio (1998) find that the estimated return grows. With their sibship instruments, Butcher and Case (1994) obtain more than doubled estimates. In many cases, just like some of the models here, the IV estimates tend to lack precision, indicating that there are still problems in using family background instruments for education. To improve the precision the common practice is to use interactions of the instruments as further instrumental variables, despite the fact that it often worsens the first-stage F-statistics (Bound et al., 1995). We also tried this strategy and noted that for some models the interactions work nicely, yet for others they did weaken the first-stage estimation. For women, model III and the additional model VI perform well, and estimate the return to be around 0.14. For men the interactions do not perform so well but the over-identification test results are weakened considerably and/or the second stage estimates lack precision. A summary of models using the interactive instruments is displayed in Table 7. Overall, for men the IV coefficients are somewhat lower than their OLS counterparts, as one would expect if ability and schooling are correlated and both affect earnings positively. In many cases, and especially for women, the IV coefficient was larger than in the OLS, which is a typical finding in studies of this kind.

6. Conclusions

This study analyzed the impact of family background and sibling composition on the educational attainment and earnings of Finnish men and women born in 1949-1970. The analysis concentrated on the years 1985-99. The study recognizes that families play an important role in shaping the children's views, establishing their aspirations and supporting their development. Using a very large and detailed data set on Finnish families in 1970, various hypotheses concerning family effects are tested and channels of transmission of the family effects are analyzed.

Family background was found to play an important role as a determinant of schooling. Parental income and education have a positive impact on years of acquired education while parental unemployment or alcohol problems, living in a single parent family or experiencing shocks during childhood and youth (such as parental death, separation or location change) have a negative effect. A mother who works increases the chances that a son will receive more education while the effect on girls is unclear. The size of the family (number of siblings) reduces the educational attainment. Apart from the sibship size, sibling structure also has other effects on educational attainment. For example, the sex composition of siblings plays very minor role in terms of education but the relative birth order of children in the family and their birth intervals do seem matter. However, the magnitude of the sibling effects is small compared to other family effects.

Some of the background factors also matter for children's adult earnings, even though the size of this impact is smaller than that related to schooling. This indicates a diminishing effect of background as the children age. In other words, the family is more important in the early years of children's development, when for example schooling decisions are made, than after the children have moved out of home. Nevertheless, family income has a positive impact on children's adult earnings while the effect of parental education is unclear or even negative. Parental unemployment has a negative impact on boys while a mother who works plays a positive role for girls. There is also some evidence that children of single parents tend to do less well later in life, although this effect is small. Following Case and Butcher (1994) and (Kaestner, 1997), we have studied the possible exogeneity of sibling variables as a determinant of schooling in the earnings regression but have included a wider range of measures than the earlier studies. Interestingly, the sibling variables do not seem to have a direct impact on earnings and can thus be tested as potential instruments for schooling. Few of the instruments work satisfactorily, but some can be argued to be exogenous and have enough explanatory power. The estimated return to education falls from around 0.09 (OLS) to about 0.07 (IV) for men and grows to 0.11-0.14 for women.

From the methodological point of view, it should be noted that despite the large sample size and good data quality the estimated returns to education using sibling instruments remained rather imprecise. The results also varied from specification to specification. This casts doubt on their usefulness, especially in connection with smaller samples.

The policy conclusions to be drawn from this study can be summarized as follows. Firstly, family background continues to play an important role as a determinant of children's attainments even in countries where the social security system is very extensive and schooling is provided by the public sector. This indicates that it is very difficult to remove the delimiting effect that children from less advantageous backgrounds face. Increasing the amount of education provided may not be a good solution because, for various reasons, some children are unable or unwilling to grasp the opportunity provided. Moreover, if the educational level becomes too high the link between schooling and earnings may actually be weakened (Wolf, 2002) and the other methods of signaling ability (e.g. family connections) that will be used instead may put children from disadvantaged backgrounds in an even worse position. If schooling is considered to have better potential in improving the success of children from less advantageous backgrounds compared to other measures, it might be advisable to concentrate on increasing the quality of schooling rather than quantity, as suggested by several recent studies (see e.g. Wolf, 2002 for a survey).

Secondly, while the family income appears to be a major determinant of both children's schooling and adult earnings, the source of that income may not be irrelevant. In other words, the positive impact of family income will be at least partly offset by parental unemployment. Hence, unemployment benefits and social security payments do not carry the same benefit for children as income earned by the parents. It would thus be important to encourage the parents to work outside the home and consider how they could be offered more opportunities to become employed. It should be noted that the vast increase in levels of unemployment during the 1990s may have changed the effect of parental unemployment on children's attainments. However, as the majority of the increase was concentrated on workers with a low education, and as recent Finnish studies suggest that unemployment is partly inherited (Virmasalo, 2002), the link may actually have been strengthened and not weakened. Hence, this proposition is worth considering, especially with the current high level of unemployment.

Thirdly, girls would especially benefit in terms of higher earnings if they had a working mother as a role model. A mother who works also plays a positive role in terms of the sons' education. Related to this, an increase in financial resources (especially non-welfare) for single-parent families should be considered. And finally, as children's educational attainment clearly suffers as a result of shocks (such as parental death, separation, alcohol problems in the family or family

migration) experienced during childhood and youth, more extensive counseling might help in adjusting to the circumstances. In the light of the recent discussion of children's deteriorating well-being in Finland, these findings are worth considering. In fact, many of these propositions are the same as suggested by Haveman and Wolfe (1993) based on US studies of children's attainments, showing that the effects of family background on children's success are very important and also rather universal.

References

- Acemoglu D. and Pischke J-S. (2001) Changes in the wage structure, family income and children's education, *European Economic Review*, 45, 890-904.
- Albaek K., Asplund R., Blomskog S., Barth E., Guomundsson B., Karlsson V and Madsen E. (1999) Dimensions of the wage-unemployment relationship in the Nordic countries: Wage flexibility without wage curves, *The Research Institute of the Finnish Economy Working Papers*, 698.
- Altonji J. and Dunn T. (1996) The effects of family characteristics on the return to education, *Review of Economics and Statistics*, 78, 692-704.
- Ashenfelter O. and Zimmerman D. (1997) Estimates of the returns to schooling from sibling data: Fathers, sons and brothers, *The Review of Economics and Statistics*, 79, 1-9.
- Asplund R. (1999) Earnings and Human Capital: Evidence for Finland, in Asplund R. and Pereira P. (eds.), *Returns to Human Capital in Europe*, The Research Institute of the Finnish Economy, Helsinki.
- Becker G. (1967) Human capital and the personal distribution of income: An analytical approach, Woytinsky Lecture, University of Michigan, Institute of Public Administration.
- Becker G. (1981) *A Treatise of the Family*, Harvard University Press, Cambridge, MA.
- Becker G. (1991) *A Treatise of the Family*, expanded edition, Harvard University Press, Cambridge, MA.
- Becker G. and Tomes N. (1976) Child endowments and the quantity and quality of children, *Journal of Political Economy*, 84, 143-162.
- Becker G. and Tomes N. (1979) An equilibrium theory of the distribution of income and intergenerational mobility, *Journal of Political Economy*, 87, 1153-1189.
- Becker G. and Tomes N. (1986) Human capital and the rise and fall of families, *Journal of Labor Economics*, 4, S1-39.
- Behrman J. and Taubman P. (1985) Intergenerational earnings mobility in the United States, *Review of Economics and Statistics*, 67, 144-151.
- Behrman J. and Taubman P. (1986) Birth order, schooling and earnings, *Journal of Labor Economics*, 4, 121-150.
- Behrman J., Pollack R. and Taubman P. (1982) Parental preferences and provision for progeny, *Journal of Political Economy*, 90, 52-73.

- Behrman J., Pollack R. and Taubman P. (1986) Do parents favor boys? *International Economic Review*, 27, 33-54.
- Behrman J., Rosenzweig M. and Taubman P. (1994) Endowments and the allocation of schooling in the market: The twins experiment, *Journal of Political Economy*, 102, 1131-1174.
- Blanden J., Gregg P. and Machin S. (2001) Family income and children's educational attainment: evidence from the NCDS and BCS.
- Bound J., Jaeger D. and Baker R. (1995) Problems with instrumental variables when the correlation between the instruments and the endogenous explanatory variable is weak, *Journal of American Statistical Association*, 90, 443-450.
- Brim O. (1958) Family structure and sex role learning by children: A further analysis of Helen Koch's Data, *Sociometry*, 21, 1-16.
- Butcher K. and Case A. (1994) The effect of sibling sex composition on women's education and earnings, *Quarterly Journal of Economics*, 109, 531-564.
- Card D. (1995) Using geographic variation in college proximity to estimate the return to schooling, in Christofides L., Grant K. and Swidinsky R. (eds.), *Aspects of Labour Market Behaviour: Essays in Honour of John Vanderkamp*, University of Toronto Press, Toronto.
- Card D. (1999) The causal effect of education on earnings, in Ashenfelter O. and Card D. (eds.) *Handbook of Labor Economics*, vol. 3, Elsevier.
- Card D. (2000) Estimates of the return to schooling: Progress on some persistent econometric problems, NBER Working Paper 7769.
- Concoran M., Gordon R., Laren D. and Solon G. (1990) Effects of family and community background on economic status, *American Economic Review*, 80, 362-366.
- Conley D. (2000) Sibship sex composition: effects on educational attainment, *Social Science Research*, 29, 441-457.
- Conneely K. and Uusitalo R. (1997) Estimating heterogeneous treatment effects in the Becker schooling model, University of Helsinki, Department of Economics Discussion papers 435.
- Elder G. (1974) *Children of the Great Depression*, University of Chicago Press, Chicago.
- Ermish J. and Francesconi M. (2002) Intergenerational social mobility and assortative mating in Britain, ISER Working Paper 06/2002.
- Griliches Z. (1977) Estimating the returns to schooling: Some econometric problems, *Econometrica*, 45, 1-22.

- Griliches Z. (1979) Sibling models and data in economics: beginnings of a survey, *Journal of Political Economy*, 87, 37-64.
- Hauser R. and Kuo H-H. (1995) Trends in family effects on the education of black and white brothers, *Sociology of Education*, 68, 136-160.
- Hauser R. and Kuo H-H. (1998) Does the gender composition of sibships affect women's educational attainment? *Journal of Human Resources*, 33, 644-657.
- Hauser R. and Sewell W. (1986) Family effects in simple models of education, occupational status and earnings: Findings from the Wisconsin and Kalamazoo Studies, *Journal of Labor Economics*, 4, S83-115.
- Haveman R. and Wolfe B. (1993) Children's prospects and children's policy, *Journal of Economic Perspectives*, 7, 153-174.
- Haveman R. and Wolfe B. (1995) The determinants of children's attainments: a review of methods and findings, *Journal of Economic Literature*, 33, 1829-1878.
- Isoaho H, Kivinen O. and Rinne R. (1990) Education and family background of the young in Finland, *Central Statistical Office Studies*, 171 b.
- Jencks C. and Meyer S. (1990) The social consequences of growing up in a poor neighborhood, in Lynn L. and McGeary M. (eds.) *Inner City Poverty in the United States*, National Academy Press, Washington, DC.
- Kaestner R. (1997) Are brothers really better? Sibling sex composition and educational achievement revisited, *Journal of Human Resources*, 32, 250-284.
- Kane T. and Rouse C. (1993) Labor market returns to two- and four-year college, *American Economic Review*, 85, 600-614.
- Kivinen O. and Rinne R. (1995) The social inheritance of education. Equality of educational opportunity among young people in Finland, *Statistics Finland, Education 1995*: 15.
- Koch H. (1955) Some personality correlates of sex, sibling position and sex of sibling among five and six year children, *Genetic Psychology Monographs*, 52, 3-50.
- Lam D. and Schoeni R. (1993) Effect of family background on earnings and returns to schooling: evidence from Brazil, *Journal of Political Economy*, 101, 710-740.
- Lang K. and Zagorsky J. (2001) Does growing up with a parent absent really hurt?, *The Journal of Human Resources*, 36, 253-273.
- Leibowitz A. (1974) Education and home production, *American Economic Review*, 64, 243-250.

- Lindert P. (1977) Sibling position and achievement, *Journal of Human Resources*, 12, 198-219.
- Maluccio J. (1998) Endogeneity of schooling in the wage equation: evidence from rural Philippines, *International Food Policy Research Institute Discussion Paper* 54.
- Mincer J. (1974) *Schooling, Experience and Earnings*, Columbia University Press, New York.
- OECD (2001) *Education at a Glance*, OECD Indicators, OECD Paris.
- Powell B. and Steelman L. (1984) Variations in state SAT performance: Meaningful or misleading? *Harvard Educational Review*, 54, 389-412.
- Powell B. and Steelman L. (1990) Beyond sibship size: Sibling density, sex composition, and educational outcomes, *Social Forces*, 69, 181-2006.
- Rosenberg M. (1965) *Society and the Adolescent Self Image*, Princeton University Press, Princeton, NJ.
- Rosenzweig M. (1986) Birth spacing and sibling inequality: asymmetric information within the family, *International Economic Review*, 27, 55-76.
- Seltzer J. (1994) Consequences of marital dissolution for children, *Annual Review of Sociology*, 20, 235-266.
- Solon G. (1992) Intergenerational mobility in the United States, *American Economic Review*, 82, 393-407.
- Statistics Finland (1972) *Higher Education 1968/69*, *Official Statistics of Finland*, 37: 3.
- Stelman L. and Powell B. (1985) The social and academic consequences of birth order: Real, artifactual, or both, *Journal of marriage and the family*, 117-124.
- Sweetman A. and Rama E. (2000) Sibling structure and the labour market: evidence from Canada. Paper presented in the CERF Conference, University of British Columbia, Vancouver, Canada.
- Thomas D. (1994) Like father, like son; Like mother, like daughter: Parental resources and child height, *Journal of Human Resources*, 29, 950-988.
- Uusitalo R. (1999) Returns to education in Finland, *Labour Economics* 6, 569-580.
- Virmasalo I. (2002) *Perhe, työttömyys ja lama (Family, unemployment and recession)*, Ph.D. Thesis, Jyväskylä Studies in Education, Psychology and Social Research 204.

- Welch F. (1975) Human capital theory: Education, discrimination, and life cycles, *American Economic Review*, 65, 63-73.
- Wolf A. (2002) *Does Education Matter? Myths about Education and Economic Growth*, Penguin Books, London.
- Zajonc R. (1976) Family configuration and intelligence, *Science*, 192, 227-236.
- Zimmerman D. (1992) Regression towards mediocrity in economic stature, *American Economic Review*, 82, 409-429.

Tables

Table 1: *Variable means and standard deviations*

Variable	Men		Women	
	Mean	St. dev.	Mean	St. dev.
Age in 1970	10.54	6.11	9.90	5.88
Fathers age in 1970	41.68	9.84	40.99	9.61
Mothers age in 1970	38.91	9.27	38.19	9.10
Family size in 1970	5.23	1.77	5.12	2.05
Number of brothers	1.17	1.28	1.20	1.27
Number of sisters	1.03	1.17	1.09	1.21
Number of older siblings	0.99	1.35	1.07	1.39
Number of younger siblings	1.21	1.48	1.22	1.45
Very large family	0.04	0.19	0.04	0.19
Singleton child	0.16	0.37	0.14	0.34
Birth interval to next child (years)	3.55	2.80	3.49	2.77
Birth interval to previous child (years)	3.10	2.34	3.11	2.35
Minority sex	0.11	0.32	0.15	0.36
All children same sex	0.24	0.43	0.20	0.40
Single mother family	0.15	0.35	0.14	0.34
Single father family	0.04	0.19	0.03	0.18
Mother works	0.47	0.50	0.49	0.50
Parent unemployed	0.02	0.15	0.03	0.16
Mother died before child 16	0.006	0.08	0.007	0.08
Father died before child 16	0.023	0.15	0.025	0.16
Parent ever died of alcohol related cause	0.01	0.10	0.01	0.10
Parents separated before child 16	0.07	0.26	0.08	0.27
Family moved region before child 16	0.06	0.23	0.07	0.26
Distance to university region at age 17-18	49.30	69.06	47.41	67.84
Household head's (father / mother) education	10.87	1.91	10.93	1.94
Ln(average family income)	11.28	0.85	11.35	0.96
Finnish speaking	0.952	0.21	0.952	0.21
Swedish speaking	0.047	0.21	0.047	0.21
Mother tongue foreign	0.001	0.04	0.001	0.04
Years of education 1985	11.61	1.69	11.81	1.89
Years of education 1999	13.09	2.63	13.67	2.60
Ln(wage earnings 1985)	10.70	1.34	10.40	1.27
Ln(wage earnings 1999)	11.50	1.21	11.26	1.09
Ln(total earnings 1985)	10.79	1.24	10.42	1.26
Ln(total earnings 1999)	11.60	0.99	11.29	1.02

Table 2: Summary of previous studies on family background, schooling and earnings

Background variable	Typical observed effect		Typical significance (%)		Countries where studied
	Schooling	Earnings	Schooling	Earnings	
Family income	+	+	1	1	US, UK, FIN
Mother's earnings	+	-	ns	ns	US
Mother works/in labor force	-	-	1-5	5 / ns	US
Income from social security	-	-	1 / ns	ns	US
Father's education	+	- / +	1	ns	US, UK, CAN, BR
Mother's education	+	+	1	ns	US, UK, CAN, BR
Parents' socioeconomic status	+	+	1 / ns	ns	US, UK
Family head self-employed	+	+	ns	1	US
Number of siblings	-	-	1	ns	US, CAN
Single-parent family	-	-	1	ns	US
Female-headed family	-	-	1-5	ns	US
Stepparent family	-	+	1	10	US
Parents not married	-		ns		US
Location moves	-		1		US
Parents separated	-	-	1	ns	US
Parent dead	-	-	ns	ns	US
Parent has alcohol/drug problems	-	-	1/ns	1/ns	US
Foreign language spoken at home	-	-	ns		US
Mothers age at birth	+	+	ns	ns	US
Distance to school or college	-		5		US
Birth order	-	-	5	ns	US, CAN
Birth interval to next child*	-	?	-	-	US
Oldest child	+		ns		US
Number of brothers/siblings: Boys	+		ns		US
Number of brothers/siblings: Girls	-		ns		US
Number of sisters / siblings: Boys	-		ns		US
Number of sisters / siblings: Girls	+	-	ns	ns	US
% of older sibling sisters: Boys	-		ns		US
% of older sibling sisters: Girls	+		ns		US
Number of studies reviewed	23	12			

*Notes: Studied reviewed for this table are those also discussed in Haveman and Wolfe (1995) tables 3, 4 and 6 plus the following: Behrman and Taubman (1986), Lam and Schoeni (1993), Case and Butcher (1994), Isoaho, Kivinen and Rinne (1990), Kuo and Hauser (1995), Altonji and Dunn (1996), Kaestner (1997), Hauser and Kuo (1997), Conley (2000), Sweetman and Rama (2000), Acemoglu and Pischke (2001), Blanden, Gregg and Machin (2001), Ermish and Fracesconi (2002). ♣ Only indirect estimates, expected coefficient displayed.

Table 3: *Finnish families in 1970*

	Two-parent families	Single-parent families
Number of families	40 533	11 209
Average number of children	2.60	2.39
One-child families	25.4%	34.1%
Taxable income 1970 (2000 FIM)	127 924	48 362
- mother	26 913	46 208
- father	101 011	103 635
Income per capita 1970 (2000 FIM)	25 884	11 986
Average income 1970-85 (2000 FIM)	153 931	70 787
College education, mother	4.7%	2.3%
College education, father	7.1%	1.2%
High-school, mother	18.8%	13.4%
High-school, father	20.0%	4.5%
Mother works	51.0%	60.2%
Father works	87.4%	86.4%
One or both parents unemployed	2.4%	1.8%
Mother (father) at home	45.4% (2.5%)	30.9% (1.9%)
Family owns residence	65.1%	54.8%
Rented residence	22.7	34.9%

Table 4a: *Maximum education obtained by sibship composition and birth interval, men*

	Years of education	Persons		
0 siblings	12.99	8 963		
1 sibling (all)	13.38	15 395		
- no brothers	13.39	7 214		
- 1 brothers	13.37	8 181		
2 siblings (all)	13.27	12 693		
- no brothers	13.22	2 806		
- 1 brother	13.30	6 264		
- 2 brothers	13.25	3 623		
3 siblings (all)	13.00	8 236		
- no brothers	12.98	893		
- 1 brother	12.93	2 832		
- 2 brothers	13.03	3 289		
- 3 brothers	13.12	1 222		
	First child only		All children	
	Years of education	Persons	Years of education	Persons
1 sibling				
- interval to next 1 year	13.39	873	-	
- interval to next 2-4 years	13.59	4 326	-	
- interval to next 5-8 years	13.34	2 356	-	
- interval to next 9- years	13.03	1 010	-	
2 siblings				
- interval to next 1 year	13.29	1 031	13.30	1 451
- interval to next 2-4 years	13.48	2 854	13.38	4 771
- interval to next 5-8 years	12.95	835	13.11	2 108
- interval to next 9- years	12.24	135	12.96	722
3-4 siblings				
- interval to next 1 year	13.05	1 035	12.97	2 143
- interval to next 2-4 years	12.92	1 982	12.93	5 859
- interval to next 5-8 years	12.36	297	12.95	1 656
- interval to next 9- years	12.00	44	12.62	368

Table 4b: *Maximum education obtained by sibship composition and birth interval, women*

	Years of education	Persons		
0 siblings	13.62	6 645		
1 sibling (all)	13.95	12 983		
- no brothers	13.92	5 702		
- 1 brothers	13.98	7 281		
2 siblings (all)	13.90	11 519		
- no brothers	13.98	2 755		
- 1 brother	13.88	5 662		
- 2 brothers	13.86	3 102		
3 siblings (all)	13.58	7 456		
- no brothers	13.79	862		
- 1 brother	13.61	2 676		
- 2 brothers	13.49	2 829		
- 3 brothers	13.55	1 089		
	First child only		All children	
	Years of education	Persons	Years of education	Persons
1 sibling				
- interval to next 1 year	13.95	736	-	
- interval to next 2-4 years	14.07	3 620	-	
- interval to next 5-8 years	14.10	1 960	-	
- interval to next 9- years	13.74	800	-	
2 siblings				
- interval to next 1 year	13.96	894	13.93	1 305
- interval to next 2-4 years	14.04	2 617	13.95	4 348
- interval to next 5-8 years	14.02	647	13.96	1 806
- interval to next 9- years	13.46	114	13.70	637
3-4 siblings				
- interval to next 1 year	13.67	889	13.47	1 928
- interval to next 2-4 years	13.47	1 627	13.45	5 203
- interval to next 5-8 years	13.22	194	13.51	1 459
- interval to next 9- years	13.50	16	13.42	330

Table 5a: Family background effects on educational attainment – OLS-results, men 25+

	<i>Model I</i>	<i>Model II</i>	<i>Model III</i>	<i>Model IV</i>	<i>Model V</i>
Age	.069 (.001)	.074 (.001)	.070 (.001)	.070 (.001)	.071 (.001)
Cohort	.079 (.002)	.080 (.003)	.079 (.002)	.079 (.002)	.080 (.002)
Ln(average family income)	.303 (.015)	.255 (.016)	.305 (.012)	.302 (.012)	.304 (.013)
Hh. heads' education (years)	.331 (.008)	.313 (.009)	.320 (.007)	.319 (.007)	.320 (.007)
Mother works	.092 (.025)	.039 (.026)	.055 (.020)	.055 (.020)	.070 (.021)
Parent unemployed	-.270 (.068)	-.245 (.074)	-.284 (.055)	-.284 (.055)	-.270 (.059)
Parent ever died of alcohol	-.391 (.093)	-.311 (.104)	-.424 (.080)	-.422 (.080)	-.381 (.082)
Single mother	-.087 (.040)	-.068 (.044)	-.079 (.029)	-.071 (.029)	-.071 (.034)
Single father	-.308 (.071)	-.177 (.081)	-.323 (.046)	-.302 (.046)	-.277 (.060)
Foreign	-.185 (.295)	-.434 (.233)	-.344 (.222)	-.338 (.221)	-.344 (.241)
Mother died	-.196 (.173)	-.346 (.131)	-.260 (.127)	-.258 (.127)	-.309 (.121)
Father died	.124 (.076)	.090 (.062)	.155 (.056)	.157 (.056)	.138 (.058)
Parents separated	-.275 (.051)	-.356 (.052)	-.311 (.037)	-.312 (.037)	-.356 (.041)
Location move	-.127 (.056)	-.133 (.062)	-.149 (.043)	-.152 (.044)	-.145 (.047)
Distance to university town	-.002 (.001)	-.002 (.001)	-.002 (.001)	-.002 (.001)	-.002 (.001)
Sibs	-.151 (.017)	-.118 (.017)	-.080 (.015)	-.125 (.014)	-.135 (.014)
Sibs2	.004 (.002)	.003 (.002)	-.001 (.001)	.003 (.002)	.004 (.002)
Very large family	0.218 (.068)	0.167 (.069)	.211 (.065)	.181 (.065)	.188 (.065)
Minority sex	-.047 (.032)	-	-.054 (.038)	-.039 (.028)	-
All same sex	.026 (.031)	-	-	-	-
Older brothers	-	0.002 (.013)	-.014 (.016)	-	-
Younger brothers	-	-	-.002 (.016)	-	.015 (.012)
Younger siblings	-	-	-	-	.024 (.016)
Oldest	-	-	-	.045 (.022)	-
Singleton child	-	-	-	-.132 (.039)	-
Birth interval to next	-.026 (.005)	-	-	-	-
Birth interval to previous	-	.026 (.006)	-	-	-
Constant	-1.147 (.204)	-0.878 (.222)	-1.748 (.150)	-1.160 (.157)	-1.301 (.172)
N	414 060	338 233	667 289	667 289	560 374
R2	0.153	0.142	0.141	0.141	0.148

*Notes: Robust standard errors in parentheses. All models include controls for region of residence and year dummies.

Table 5b: Family background effects on educational attainment – OLS-results, women 25+

	<i>Model I</i>	<i>Model II</i>	<i>Model III</i>	<i>Model IV</i>	<i>Model V</i>
Age	.090 (.001)	.092 (.001)	.090 (.001)	.090 (.001)	.091 (.001)
Cohort	.109 (.003)	.111 (.003)	.110 (.002)	.110 (.002)	.111 (.002)
Ln(average family income)	.321 (.017)	.285 (.017)	.300 (.013)	.294 (.013)	.301 (.014)
Hh. heads' education (years)	.267 (.009)	.250 (.009)	.256 (.007)	.256 (.007)	.256 (.007)
Mother works	.034 (.027)	.013 (.027)	.028 (.021)	.028 (.021)	.031 (.023)
Parent unemployed	-.406 (.070)	-.378 (.072)	-.386 (.059)	-.384 (.058)	-.370 (.061)
Parent ever died of alcohol	-.384 (.110)	-.410 (.107)	-.337 (.090)	-.334 (.090)	-.381 (.381)
Single mother	-.033 (.046)	.058 (.049)	-.064 (.034)	-.054 (.034)	-.018 (.039)
Single father	-.534 (.081)	-.397 (.087)	-.551 (.052)	-.527 (.052)	-.497 (.066)
Foreign	-.218 (.314)	-.384 (.315)	-.132 (.263)	-.127 (.263)	-.243 (.268)
Mother died	-.130 (.176)	-.278 (.118)	-.131 (.113)	-.133 (.113)	-.234 (.113)
Father died	.016 (.077)	.128 (.065)	.123 (.059)	.123 (.059)	.116 (.061)
Parents separated	-.433 (.052)	-.471 (.054)	-.449 (.038)	-.452 (.038)	-.480 (.043)
Location move	-.328 (.052)	-.340 (.055)	-.316 (.041)	-.322 (.041)	-.315 (.044)
Distance to university town	-.002 (.000)	-.002 (.000)	-.002 (.000)	-.002 (.000)	-.002 (.000)
Sibs	-.214 (.019)	-.130 (.019)	-.112 (.014)	-.165 (.016)	-.201 (.015)
Sibs2	.009 (.002)	.004 (.002)	.002 (.002)	.006 (.002)	.007 (.002)
Very large family	.178 (.071)	.163 (.070)	.183 (.068)	.137 (.068)	.151 (.068)
Minority sex	-.054 (.032)	-	-.026 (.038)	-.037 (.028)	-
All same sex	.069 (.036)	-	-	-	-
Older brothers	-	-.036 (.014)	-.071 (.018)	-	-
Younger brothers	-	-	.023 (.018)	-	-.015 (.017)
Younger siblings	-	-	-	-	.030 (.013)
Oldest	-	-	-	.150 (.024)	-
Singleton child	-	-	-	-.108 (.044)	-
Birth interval to next	-.014 (.005)	-	-	-	-
Birth interval to previous	-	.053 (.006)	-	-	-
Constant	-2.670 (.227)	-2.655 (.240)	-2.568 (.171)	-2.484 (.178)	-2.590 (.196)
N	357 488	307 589	565 356	565 536	488 699
R2	0.146	0.138	0.132	0.133	0.136

*Notes: Robust standard errors in parentheses. All models include controls for region of residence and year dummies.

Table 6a: Returns to schooling – OLS and IV estimates, men 25+

	<i>Model I OLS</i>	<i>Model II IV</i>	<i>Model III IV</i>	<i>Model IV IV</i>	<i>Model V IV</i>
Years of education	.089 (.001)	.095 (.052)	.071 (.021)	.185 (.039)	.080 (.071)
Age	.134 (.004)	.126 (.011)	.130 (.006)	.113 (.008)	.144 (.015)
Age2	-.002 (.000)	-.002 (.000)	-.002 (.000)	-.001 (.000)	-.002 (.000)
Cohort	-.006 (.001)	-.006 (.004)	.004 (.002)	-.013 (.003)	-.007 (.007)
Ln(average family income)	.088 (.005)	.088 (.015)	.094 (.008)	.061 (.011)	.092 (.016)
Hh. heads' education (years)	-.020 (.002)	-.021 (.018)	-.012 (.008)	-.051 (.013)	.019 (.024)
Mother works	-.003 (.007)	-.001 (.009)	.001 (.008)	-.008 (.007)	-.007 (.008)
Parent unemployed	-.066 (.023)	-.079 (.028)	-.084 (.027)	-.043 (.024)	-.054 (.030)
Parent ever died of alcohol	-.057 (.022)	-.051 (.043)	-.062 (.037)	-	-.061 (.046)
Single mother	-.029 (.013)	-.040 (.017)	-.043 (.016)	-.019 (.013)	-.018 (.018)
Single father	-.097 (.025)	-.099 (.035)	-.106 (.031)	-.038 (.024)	-.105 (.035)
Foreign	-.504 (.144)	-.562 (.168)	-.568 (.169)	-.464 (.134)	-.550 (.173)
Mother died	.034 (.047)	.001 (.069)	.006 (.067)	-.048 (.050)	-.056 (.054)
Father died	.046 (.022)	.049 (.030)	.061 (.029)	.023 (.022)	.043 (.025)
Parents separated	-.020 (.015)	-.017 (.023)	-.025 (.020)	-	-.029 (.032)
Location move	-.059 (.016)	-.052 (.020)	-.048 (.020)	-.045 (.020)	-.064 (.024)
Sibs	.002 (.005)	.001 (.009)	-.003 (.006)	.020 (.005)	-.003 (.010)
Sibs2	.001 (.001)	.001 (.001)	.001 (.001)	-.001 (.001)	.001 (.001)
Very large family	-.045 (.027)	-.041 (.030)	-.038 (.028)	-.067 (.028)	-.046 (.032)
Constant	7.448 (.102)	7.535 (.189)	7.469 (.135)	7.725 (.145)	7.430 (.218)
N	477 585	351 684	351 684	568 222	289 326
Second stage R2	0.106	0.106	0.104	0.064	0.102
Partial R2 of instruments	-	.001	.007	.001	.001
F-test	-	122.82	797.32	365.44	95.65
First stage R2	-	0.168	0.173	0.155	0.157
Overidentification test, Chi-sq P-value	-	3.236 (.198)	2.569 (.277)	0.291 (.589)	0.505 (.477)

*Notes: Robust standard errors in parentheses. All models include controls for region of residence and year dummies. Model II: instruments are birth interval to next, minority sex and all same sex. Model III: instruments are birth interval to next, minority sex and university region at age of college entry. Model IV: instruments are parental alcoholism and parental separation. Model V: instruments are birth interval to previous and number of older brothers.

Table 6b: Returns to schooling – OLS and IV estimates, women 25+

	<i>Model I OLS</i>	<i>Model II IV</i>	<i>Model III IV</i>	<i>Model IV IV</i>	<i>Model V IV</i>
Years of education	.092 (.001)	.101 (.084)	.137 (.023)	.116 (.029)	.204 (.036)
Age	.050 (.005)	.053 (.017)	.046 (.007)	.048 (.007)	.017 (.011)
Age2	-.001 (.000)	-.001 (.000)	-.001 (.000)	-.003 (.000)	-.001 (.000)
Cohort	-.007 (.001)	-.008 (.009)	-.012 (.003)	-.009 (.003)	-.022 (.004)
Ln(average family income)	.036 (.005)	.038 (.025)	.027 (.009)	.032 (.009)	.009 (.011)
Hh. heads' education (years)	-.020 (.002)	-.022 (.026)	-.033 (.007)	-.029 (.008)	-.055 (.011)
Mother works	.020 (.007)	.021 (.009)	.020 (.009)	.023 (.007)	.021 (.010)
Parent unemployed	-.035 (.023)	-.026 (.040)	-.011 (.028)	-.035 (.024)	.321 (.031)
Parent died of alcohol	-.010 (.033)	-.007 (.053)	-.021 (.042)	-	-.090 (.043)
Single mother	-.023 (.014)	-.011 (.017)	-.010 (.017)	-.027 (.013)	-.029 (.019)
Single father	-.027 (.024)	-.004 (.054)	-.015 (.032)	-.018 (.027)	-.013 (.039)
Foreign	-.132 (.099)	-.092 (.098)	-.094 (.102)	-.124 (.096)	-.217 (.147)
Mother died	-.025 (.047)	-.031 (.067)	-.025 (.066)	-.009 (.044)	-.007 (.056)
Father died	.082 (.022)	.105 (.029)	.108 (.029)	.024 (.021)	.059 (.026)
Parents separated	-.029 (.016)	-.014 (.042)	-.002 (.022)	-	-.018 (.027)
Location move	-.040 (.016)	-.033 (.036)	-.011 (.021)	-.013 (.020)	-.021 (.027)
Sibs	.012 (.006)	.012 (.021)	.021 (.009)	.019 (.006)	.032 (.010)
Sibs2	-.003 (.001)	-.003 (.001)	-.003 (.001)	-.004 (.001)	-.004 (.001)
Very large family	-.017 (.030)	-.019 (.034)	-.024 (.032)	-.011 (.031)	-.018 (.034)
Constant	8.876 (.113)	8.805 (.360)	8.964 (.162)	8.900 (.147)	9.646 (.231)
N	405 505	295 054	294 643	466 385	252 969
Second stage R2	0.086	0.092	0.084	0.087	0.028
Partial R2 of instruments	-	.001	.006	.002	.003
F-test	-	44.83	608.27	560.11	413.63
First stage R2	-	0.165	0.170	0.148	0.157
Overidentification test, Chi-sq P-value	-	5.280 (.071)	4.817 (.090)	0.011 (.916)	0.054 (.816)

*Notes: Robust standard errors in parentheses. All models include controls for region of residence and year dummies. Model II: instruments are birth interval to next, minority sex and all same sex. Model III: instruments are birth interval to next, minority sex and university region at age of college entry. Model IV: instruments are parental alcoholism and parental separation. Model V: instruments are birth interval to previous and number of older brothers.

Table 7: Returns to schooling – IV estimates with interactive instruments

	<i>Model II IV</i>	<i>Model III IV</i>	<i>Model IV IV</i>	<i>Model V IV</i>	<i>Model VI IV</i>
<i>Men</i>					
Years of education	.083 (.049)	.071 (.022)	.178 (.038)	.101 (.067)	.074 (.022)
Second stage R2	0.106	0.104	0.068	0.101	0.104
Partial R2 of instruments	.001	.006	.001	.001	.006
F-test	82.08	362.25	252.02	73.26	708.93
First stage R2	0.168	0.166	0.155	0.157	0.166
Overidentification test, Chi-sq P-value	5.515 (.238)	9.440 (.093)	8.878 (.645)	1.174 (.556)	5.959 (.051)
<i>Women</i>					
Years of education	.091 (.082)	.144 (.023)	.116 (.029)	.208 (.035)	.139 (.017)
Second stage R2	0.092	0.081	0.087	0.026	.083
Partial R2 of instruments	.001	.006	.002	.004	.005
F-test	28.08	269.55	373.47	296.62	514.13
First stage R2	0.165	0.158	0.148	0.157	0.158
Overidentification test, Chi-sq P-value	5.558 (.235)	4.679 (.456)	0.036 (.982)	0.165 (.921)	1.251 (.535)

*Notes: Robust standard errors in parentheses. All models include controls for region of residence and year dummies plus the controls displayed in table 6a. Model II: instruments are birth interval to next, minority sex and all same sex plus interactions of these instruments. Model III: instruments are birth interval to next, minority sex and university region at age of college entry plus interactions of these instruments. Model IV: instruments are parental alcoholism and parental separation plus interaction of these instruments. Model V: instruments are birth interval to previous and number of older brothers plus interaction of these instruments. Model VI: instruments are birth interval to next and university region plus interaction of these instruments.

Figures

Figure 1: Public expenditure on schooling

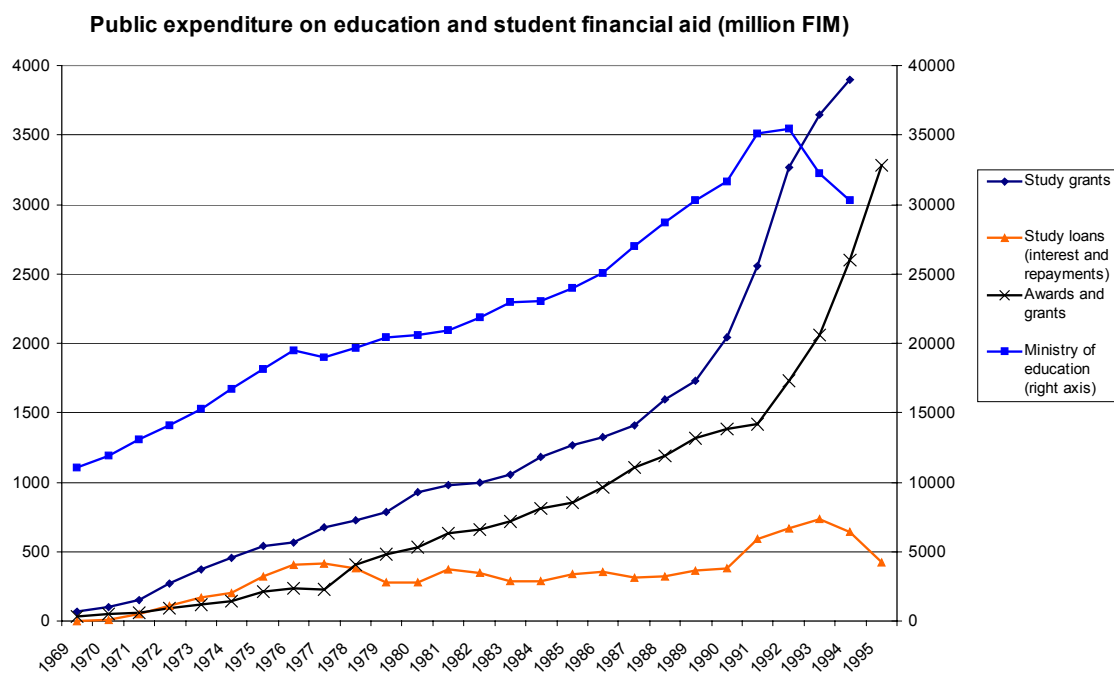


Figure 2: Returns to schooling (right axis) and supply of college graduates (left axis)

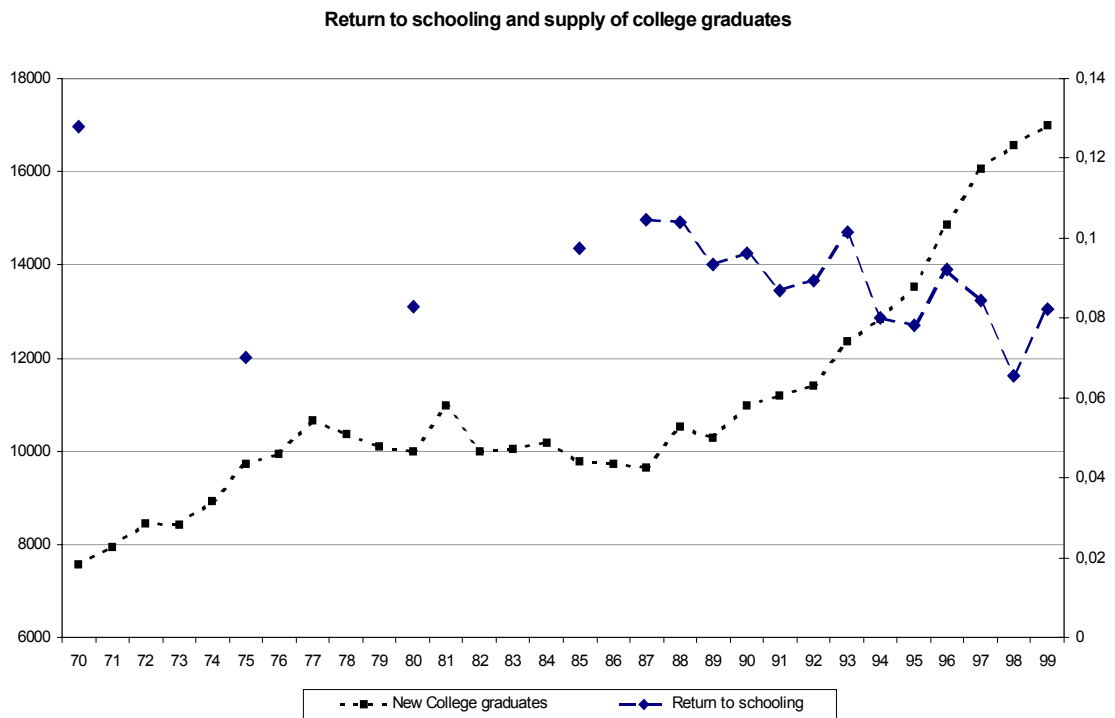
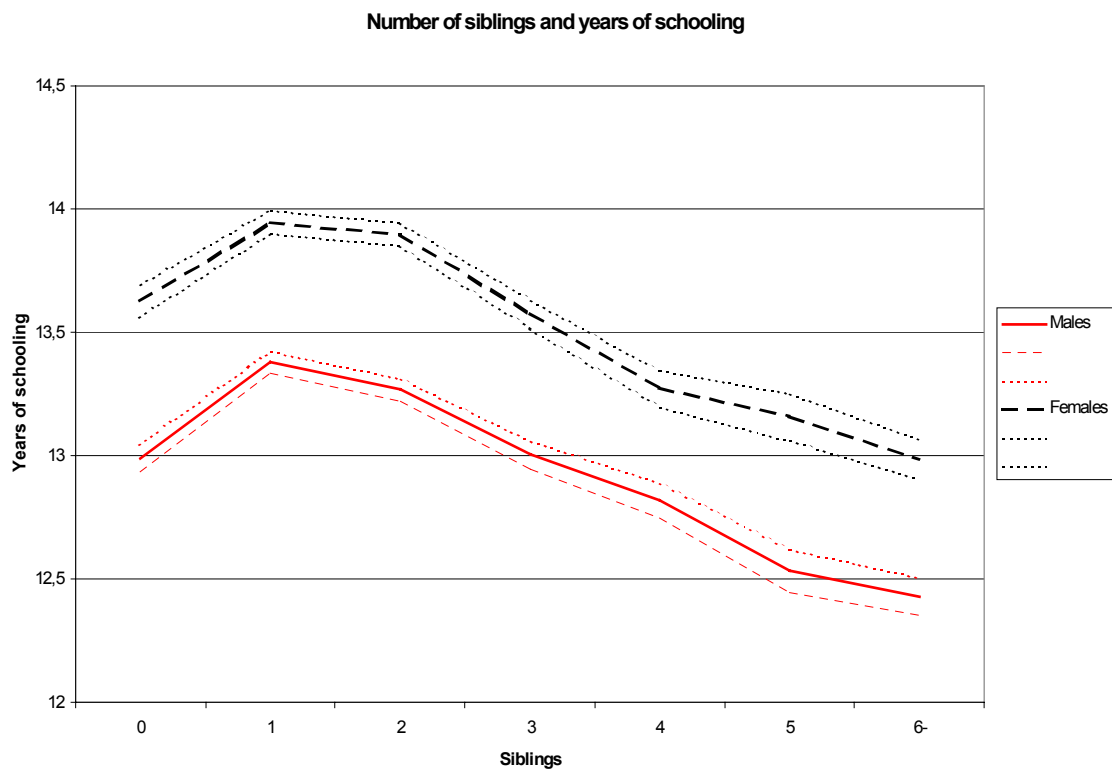


Figure 3: Years of schooling by number of siblings



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