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Anders Björklund · Donna K. Ginther · Marianne Sundström

Family structure and child outcomes in the USA and Sweden

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Abstract Previous research shows that living in a non-intact family is associated with educational disadvantages. This paper compares the relationships between childhood family structure, schooling, and earnings in Sweden and the USA. This comparison is interesting because both family structure and public policies differ significantly. We find a negative relationship between living in a non-intact family and child outcomes, and the estimates are remarkably similar in both countries. After using sibling-difference models, the correlation with family structure is no longer significant. These results cast doubt on the causal interpretation of the negative relationship between non-intact family structures and child outcomes.

Keywords Family structure · Parental separation · Educational attainment

JEL J1 · J12 · I21

1 Introduction

It is well known that children reared in non-intact families on average have less favorable educational outcomes than children reared in two-parent families. For example, in the USA, adults who were reared in single-parent families are less likely to complete high school and attend college (see, e.g., Ginther and Pollak 2004). Studies from Sweden also report lower educational outcomes for adults who grew up in a non-intact family (see, e.g., Jonsson and Gähler 1997). However, studies of the effect of family structure on educational outcomes are complicated

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A. Björklund · M. Sundström (✉)
Swedish Institute for Social Research (SOFI), Stockholm University, 10691 Stockholm, Sweden
Fax: +46-8-154670, E-mail: Marianne.Sundstrom@sofi.su.se, Anders.Bjorklund@sofi.su.se

D. K. Ginther
Department of Economics, University of Kansas, 1300 Sunnyside Drive, 226P Summerfield Hall, Lawrence, KS 66045-7585, USA E-mail: dginther@ku.edu

because the observed correlations could reflect the effects of unobserved variables that are correlated with both family structure and children's outcomes. These selection effects potentially bias the estimated effect of family structure on children's outcomes. In this paper, we compare the effect of family structure on children's educational and earnings outcomes using data from Sweden and the USA and use sibling-difference models to address the selection problem.

Comparing Sweden and the USA is interesting because both family structure and public policy environments in the two countries differ significantly. Family structure could potentially have a less negative effect in Sweden than in the USA. First, social norms in Sweden have de-emphasized the importance of marriage as an institution. As a result, the stigma of growing up in a non-intact family may be less severe in Sweden than in the USA. Second, the extensive social safety net supporting families in Sweden may ameliorate the negative income shock to families when parents separate. For example, in Sweden, parents receive a relatively generous child allowance and higher education is free, whereas in the USA support for parents with children is limited to income tax deductions or means-tested transfers for low-income families. To the extent that family income has an effect on children's educational outcomes, these different policy regimes could serve to magnify or ameliorate the impact of family structure.

A comparison of the magnitude of family structure effects in Sweden and the USA allows us to determine whether public policy can soften the blow of family dissolution. An examination of the incidence of family disruption in 15 European countries and the USA (Andersson 2002) shows that non-intact family types are common in both Sweden and the USA. In Sweden, fewer children are born to single mothers than in the USA, but more children are born outside of married unions (that is, in consensual unions) in Sweden. Given these differences at birth, a remarkably similar number of children in the two countries experience a family disruption if they were born into a union. By age 15 years, 30% of children in Sweden and 40% of those in the USA had experienced some family disruption. The rates in the USA are the highest of all countries considered, and only two other European countries have higher rates of disruption than those of Sweden.

For Sweden, we use a large and unique data set based on a 20% random sample of individuals born in Sweden in 1964 through October 1965 drawn from the population registers of Statistics Sweden. These individuals are matched to their siblings and observed in the bidecennial censuses in 1965, 1970, 1975, and 1980. Educational and earnings outcomes are measured in 1996. The data from the USA are two samples taken from the National Longitudinal Survey of Youth (NLSY, individuals living in the USA in 1979 and born between 1958 and 1965) and the Panel Study of Income Dynamics (PSID, individuals living in the USA in 1968 and born between 1960 and 1970). Where possible, these individuals are matched to their siblings in the sample. The educational outcomes in both US samples are measured between 1990 and 1994, while earnings are measured in 1993 for the PSID sample and in 1994 for the NLSY sample.

We use cross-section estimation to describe and examine the country differences in the correlations between family structure and children's outcomes. We exploit the panel structure of our data to construct measures of family structure that reflect the time children have spent in living in different family types, including time lived with full siblings and half siblings. In particular, we use the sibling structure of our data sets to take account of unobserved family characteristics, which may influence child outcomes, by estimating family fixed-effects models. The outline of the remaining paper is as follows: Section 2 reviews previous studies in the USA and Sweden, Section 3 details the data and empirical approach, Section 4 presents the results, and Section 5 concludes.

2 Previous studies[1]

2.1 Family structure and child outcomes in the USA

McLanahan and Sandefur (1994) use four data sets to evaluate the relationship between family structure and children's outcomes. They find that high school graduation rates, college enrollment, and college graduation rates for children from single-parent and stepparent families are below those of children from two-parent families. Biblarz and Raftery (1999) emphasize that empirical estimates of the influence of family structure on outcomes for children depend on the definitions of family structure groupings, the variables controlled for, and the time period considered. After controlling for mother's employment and occupation, they find that children reared by a single mother have higher occupational status and educational attainment than children reared by a stepparent or single father. Reviewing empirical studies of the effect of family structure on children's well-being, Ribar (2004) finds that marriage is correlated with better outcomes for children. However, this positive correlation is reduced in studies that account for selection into marriage. Ginther and Pollak (2004) examine the educational outcomes for biological children and their half siblings in blended families. They find that the educational outcomes for both types of children in blended families are similar to each other and substantially lower than the outcomes for children reared in traditional nuclear families.

Studies that estimate the correlation between family structure and children's outcomes in most cases have found that living in a non-intact family is associated with lower educational attainment. Placing a causal interpretation on these results, however, is problematic because it involves assuming that there is no selection bias in the family structure estimates. Thus, Manski et al. (1992) evaluate the impact of identification assumptions about selection when estimating the effect of family structure on high school graduation. They demonstrate that the estimated effect of family structure depends on the assumptions imposed, concluding that: "Any attempt to determine the family structure effect more tightly must bring to bear prior information about the process generating family structure and children's outcomes. As long as social scientists are heterogeneous in their beliefs about this process, their estimates of family structure may vary" (p 36). Subsequent research bears out this conclusion.

Researchers have attempted to control for selection by using family fixed-effects estimators. Under certain assumptions, controlling for the family-fixed effect will eliminate this selection bias. Gennetian (2005) uses the NLSY Child data to examine the effect of family structure on children's test scores and home

[1] In the following, we review studies of family structure and child outcomes for the USA and Sweden; for studies for other countries, see e.g., Ermisch and Francesconi (2001) for the UK, Piketty (2003) for France, and Winkelmann (2006) for Germany.

environment. She finds that living in a single-mother family has a persistent negative effect on children's test scores but the impact of living with a stepparent or with half siblings is not significant. Case et al. (2001) use the PSID to evaluate the educational attainment of children living with their birth and non-birth mothers. They find, after controlling for mother-fixed effects, that children who live apart from the biological mothers have lower educational attainment. Finally, Evenhouse and Reilly (2004) use the National Longitudinal Study of Adolescent Health to evaluate children's well-being in blended families. By comparing siblings in blended families, they find that stepchildren have lower educational outcomes than their half sibs. Some, but not all, of these results suggest that growing up in a single-parent family or as a stepchild in a blended family has a negative effect on children's schooling attainments.

Other researchers have used parental death as a quasi-natural experiment to examine the effect of family structure on children's educational outcomes, finding that family structure changes due to parental death have little impact on children's outcomes (Biblarz and Gottainer 2000; Lang and Zagorsky 2001). In another identification approach, researchers have used instrumental variables to examine the effect of family structure on children's outcomes. Gruber (2004) employs 40 years of census data and changes in state divorce laws to evaluate whether exposure to unilateral divorce is bad for children's educational outcomes. He finds that, on average, children from states exposed to unilateral divorce have lower educational outcomes.

Finally, researchers have compared children's educational outcomes before and after divorce. Cherlin et al. (1991) find that elementary school children whose parents eventually divorce performed poorly in school before the change in family structure. Painter and Levine (2000) find the opposite, the preexisting characteristics in the family before divorce fail to explain the differences in educational outcomes, and conclude that the association between family structure and outcomes for teenagers is causal.

2.2 Family structure and child outcomes in Sweden

Studies of the association between family structure and children's educational outcomes in Sweden are fewer in number. Jonsson and Gähler (1997) use a large sample (about 120,000 cases) of persons born in 1972–1976 to examine the correlation between family structure and the outcomes of early school leaving and transition to upper-secondary school. They estimate cross-section equations as well as equations for change in family structure between 1985 and 1990. The cross-section estimates without control variables show that children from non-intact families have less favorable educational outcomes than those from intact-married families. When controls were added for household social class, household education, disposable income, number of siblings, and house ownership, these differences were substantially reduced. Thus, children who lived with a separated father or a separated mother and those who lived in a reconstituted family were less likely to continue school than those who came from intact-married families. However, there were no significant differences in this regard between children with married parents and those with cohabiting parents or widowed parents. They find similar associations between change in family structure and educational outcomes, especially transitions to upper-secondary school. For example, children whose parents divorced between 1985 and 1990 were less likely to continue to upper-secondary school than those whose parents remained married. They interpret the relationship as causal and reflecting downward social mobility or economic deprivation, or both.

Björklund and Sundström (2006) analyze the association between parental separation and children's educational outcomes using a random sample of about 60,000 Swedes born in 1951–1963 and their full siblings who all lived with both biological parents before the separation. The educational outcomes are measured by earnings-weighted education in 1996. In line with Jonsson and Gähler (1997), the results of their cross-section estimation show that persons who experienced a parental separation in childhood incur an educational disadvantage of about 1 year of schooling compared to those whose parents remained married or cohabiting. However, in their family fixed-effects estimation which uses only full siblings, they find that the effect of parental separation is not statistically significant. This suggests that the correlation between parental separation and children's educational outcomes reflects selection rather than causation. In contrast, in the present paper we use data for two younger cohorts to study the relationship between child outcomes and proportion of childhood spent in five different family structures. The outcomes are also measured at younger ages and by earnings as well as years of schooling. Finally, we compare the outcomes for half siblings with the same mother while Björklund and Sundström (2006) do not.

3 Data and empirical approach

3.1 Data

3.1.1 Data for the USA

We use two US data sets and the same schooling outcome variable in both data sets, years of schooling, which we treat as a continuous variable. We also use log of annual earnings as a second outcome variable. The first sample is taken from the National Longitudinal Survey of Youth. The NLSY began in 1979 with a nationally representative sample of 12,686 young adults between the ages of 14 and 21. Almost half of the observations in the NLSY (5,863) come from multiple-sibling households. To be included in our sample, the individuals must have completed the 1988 Childhood Residence Calendar and have complete measures of schooling in at least 1 year between the 1990 and 1994 survey waves. Income is measured in 1994. We eliminate the individuals who are adopted or who report 0 years of schooling or more than one change in family structure in a given year of childhood.

The second US sample is taken from the Panel Study of Income Dynamics. The PSID began collecting data in 1968 on a nationally representative, longitudinal sample of 4,800 households. Over time, as a result of births, marriages, divorces, and children leaving home, the PSID has followed individuals from their original families as new ones are formed. Our sample consists of individuals born between 1960 and 1970 with schooling outcomes observed between 1990 and 1993. Income is measured in 1993. In 1985, the PSID collected retrospective data providing information on the pair-wise relationship of all individuals in a 1968 family. We use this information from the 1968–1985 relationship file to derive our measures of family structure. We eliminate the individuals who are not included in the 1968–1985 relationship file, who do not have a biological parent in the PSID sample, and who have no reported years of schooling.

3.1.2 Data for Sweden

For Sweden, we use a random sample of almost 36,000 (non-adopted) individuals born in Sweden in the years 1964 through October 1965 drawn from the population registers of Statistics Sweden and observed in the bidecennial censuses in 1965, 1970, 1975, and 1980. This sample is used in the descriptive section and the cross-section estimations. For the sibling-difference models, we match the random sample to their biological siblings born in 1960–1970 and observed in the censuses in 1965, 1970, and 1975 (siblings born in 1960–1965) or in the censuses in 1970, 1975, and 1980 (siblings born in 1966–1970). This is because we are interested in family structure only when they were children (below age 18). The persons in the random sample were matched to nearly 35,000 full siblings and almost 2,000 half siblings in the relevant age ranges.[2] As we want siblings to have shared part of their early childhood, we require that all siblings (full and half) included in the analysis lived together with their random-sample sibling in the first census they were observed (in 1965 and 1970, respectively). This requirement, however, results in most of the half siblings being on the mother's side and very few on the father's side (only about 190). The number of years of schooling in 1996 is measured as a continuous variable. The educational information has been obtained from Statistics Sweden's educational register; we have inferred years of schooling from the information on highest level of education attained. Annual earnings are also measured in 1996 and include labor income plus sick pay and parental-leave benefits. Our matched samples include about 61,000 full siblings and about 3,300 half siblings (fewer in the analysis of earnings).

3.1.3 Measuring family structure

At first blush, the measurement of family structure is straightforward: Does a child live with one or both biological parents? However, this simple approach breaks down when one considers multiple-sibling households and changes in family structure over time. In multiple-sibling households, it is possible for one sibling to live with both biological parents, while the half sibling lives with a biological parent and a stepparent. The measurement of family structure must take into account the complexity of parental and sibling relationships.

In addition, family structure can change over childhood. For example, a child with a stepparent could potentially experience three separate family structures: living with both biological parents, living with a single parent, and living with a stepparent. Family structure measured at a child's particular age (age 14 in the

[2] The sample sizes are somewhat smaller in the analysis of earnings in 1996 as fewer persons had positive earnings.

NLSY) will not adequately capture the effect of these complex living arrangements. Most studies of the effect of family structure on child outcomes, including those of McLanahan and Sandefur (1994) and Manski et al. (1992), use 1-year 'window' measurements taken at a given age as a proxy for family structure throughout childhood.[3] Wolfe, Haveman, Ginther and An (1996) examine the reliability of these 'window' variable estimates, concluding that 1-year window variables serve as weak proxies for childhood circumstances and events and can result in unreliable estimates.

Family structure variables that are not subject to the 'window problem' can be created with retrospective data collected by the US surveys and the Swedish censuses. Using the data collected by the 1988 NLSY Childhood Residence Calendar Supplement, we construct age-specific changes in family structure over an individual's entire childhood, from ages 0 to 16. Using data collected in the 1968–1985 PSID Family Relationship file, we construct age-specific changes in family structure over an individual's childhood ages 1 to 16. Using data from Sweden's bidecennial censuses, one can observe family structure from ages 0 to 15 (only until age 10 for the matched siblings born in 1965 and in 1970). The census data have the advantage of being less plagued by recall error and measurement error but with the disadvantage of not recording changes in family structure between censuses. In this analysis, family structure is characterized as the proportion of childhood when a child lives with both biological parents (regardless of whether they are formally married or cohabiting), with a single biological mother (single mother), with a biological mother who is married to or cohabits with a stepfather (stepfather), with a single biological father (single father), with a biological father who is married to or cohabits with a stepmother (stepmother), or alternative (other) family structures.[4]

3.2 Samples

We present the distribution of family structure for our two US samples and the Swedish sample in Table 1. The US samples are weighted by survey sampling weights.[5] We see that the two US samples differ somewhat in the proportions never/always in an intact family and never/always with a biological mother and a stepfather. The difference in the US samples most likely results from very high

[3] Wolfe, Haveman, Ginther, and An (1996) enumerate papers with the window problem.

[4] In the US samples, to be considered a stepparent, an individual must be married to the biological parent of the child. The proportion of childhood in a given family structure in the NLSY is measured as the number of years in that family structure divided by 17. In most cases, an individual's childhood (ages 1–16) is not entirely observed between 1968 and 1985 in the PSID sample. Thus, we define family structure as the number of years a child between the ages of 1 and 16 is observed in the sample in a given family structure divided by the total number of years the child is ages 1–16 between 1968 and 1985. The proportion of childhood in a given family structure in Sweden is measured as the number of bidecennial censuses observed in that family structure divided by 4 in the descriptive section below and in the cross-section estimations but divided by 3 for the FE-estimations, see Section 3.1.

[5] In some cases, PSID observations have zero sampling weights in 1993 because of exit and reentry into the sample. For these observations, we assign the average sampling weight. In addition, the 1994 sampling weight may be missing because the number of years of schooling was observed in a previous year; we also assign the average sampling weight for these cases.

rates of attrition of individuals in the PSID. The family structure of the Swedish sample, on the other hand, is rather similar to the one of the NLSY sample. For example, between 69 and 72% of children in both samples have lived in an intact family during their whole childhood and living with a single father or with a biological father plus stepmother are the least common family types in both samples. On the other hand, the fraction of children who spent the greater part of childhood with a single mother is larger in both US samples (than in the Swedish sample), while it is slightly more common to have spent part of childhood with a single dad in the Sweden sample.[6]

3.3 Average outcomes by family type in Sweden and the USA

We compare next the distribution of education and earnings in Sweden and the USA. The educational systems in the two countries differ. In the USA, schooling is publicly financed and free of charge through the 12th year and compulsory through the tenth year. Individuals graduate from high school in the 12th year and have the choice of several different types of post-secondary schools. However, post-secondary schools are not free and do have entrance requirements that vary by institution. Post-secondary schools can take many forms. Technical schools which specialize in trades and junior colleges offer a variety of degree programs ranging from one to two additional years of schooling. Liberal arts colleges and universities offer 4-year college degrees. Our data do not distinguish between the types of degrees granted by these different post-secondary schools. In Sweden, all schooling is publicly financed and free of charge, but only 9 years of schooling – from age 7 to age 16 – are compulsory. For our cohorts, there were two types of secondary schooling (*gymnasium*): 2-year vocational programs and 3-year programs that prepared for further studies at the post-secondary level. Post-secondary education, in turn, consists of many different study tracks of different duration. The level of education variable from which we infer years of schooling distinguishes between short (less than 3 years) and long (3 years or longer) college studies. Swedish college students are eligible for universal (i.e., not means-tested) student loans plus a minor grant. Students with children are eligible for higher loans as well as subsidized daycare. There is no tuition at Swedish colleges. Finally, there is a graduate level. Graduate students are typically salaried – or receive a grant – at the level of starting wages for college-trained workers and pay no tuition.

We get an overview of the differences in child outcomes by family structure in the two countries by comparing the average years of schooling and average annual earnings (indexed) by family structure in Tables 2 and 3.

Although the average years of schooling is higher in the USA than in Sweden, the patterns of years of schooling by family structure in the two countries are very similar. Children who spent the whole childhood in an intact family have the highest level of schooling whereas those who spent a greater part of childhood living in a non-intact family have lower schooling attainment. In both countries, children from intact families have about one additional year of schooling compared to those who spend their entire childhood in non-intact family structures.

[6] Both of these differences are significant at the 5% (or less) level of significance.

Table 1 Percentages of US NLSY, US PSID, and Swedish samples spending a proportion of childhood (*P*) in certain family types

	Intact	Single mum	Single dad	Biodad and stepmum	Biomom and stepdad	Other type
US NLSY sample (N=9,729)						
P=0	4.6	78.3	97.1	97.6	90.9	95.3
0<P≤1/4	4.7	9.0	2.1	1.3	2.8	3.3
1/4<P≤1/2	5.9	5.4	0.5	0.7	2.6	0.7
1/2<P<1	12.8	5.4	0.3	0.5	3.5	0.7
P=1	72.0	1.9	0.0	0.0	0.2	0.0
US PSID sample (N=2,308)						
P=0	22.6	77.5	97.6	97.1	81.7	98.2
0<P≤1/4	1.3	6.1	1.0	0.8	3.4	1.0
1/4<P≤1/2	2.4	5.6	0.6	0.4	4.2	0.4
1/2<P<1	5.2	5.8	0.7	0.8	6.5	0.4
P=1	68.5	5.1	0.1	1.0	4.2	0.0
Swedish sample (N=35,911)						
P=0	5.8	83.5	94.6	98.0	89.4	90.7
0<P≤1/4	5.2	10.0	4.2	1.5	5.0	7.2
1/4<P≤1/2	8.0	4.4	1.0	0.4	3.4	1.2
1/2<P<1	12.5	1.6	0.1	0.1	1.9	0.4
P=1	68.5	0.4	0.0	0.0	0.3	0.4

P=Proportion of childhood, P=0 indicates never living in a particular family structure. P=1 indicates always living in a particular family structure. The data are weighted estimates

Intact both biological parents, *Single mum* single unmarried mother, *Single dad* single unmarried father, *Biodad and stepmum* stepmother married to biological father, *Biomum and stepdad* stepfather married to biological mother, *Other type* other family structure—without a biological parent. For Sweden, a stepparent is an adult in the household who is not a biological parent and for the USA, it is such an adult who is married to the biological parent

As expected, the average annual earnings differ much more by childhood family type in the USA than in Sweden. For example, in the USA, a person who lived with a single mother for the entire childhood earned only about 61–70% of that of a person who spent the entire childhood in an intact family, while in Sweden the corresponding fraction is about 82%. In addition, the distribution of earnings differs between the two countries. In the USA, earnings are more unequal than in Sweden; the standard deviation of log earnings is 1.03 in the NLSY sample and 1.13 in the PSID sample, whereas it is 0.99 in the Sweden sample. However, in both countries, annual earnings in most cases are lower for those from non-intact families. This may simply be a reflection of the lower schooling attainment of children from non-intact families.

3.4 Empirical approach

We start by using cross-sectional estimation assuming exogenous selection. Let us, for simplicity, consider a two-child family where investments in the human capital of one child are a function of family economic resources, observable parental

Table 2 Average years of schooling by proportion of childhood (P) in certain family types of US NLSY, US PSID, and Swedish samples

	Intact	Single mum	Single dad	Biodad and stepmum	Biomum and stepdad	Other type
US NLSY sample (N=9,729)						
P=0	11.9	13.3	13.1	13.1	13.2	13.2
0<P≤1/4	12.2	12.6	12.6	12.5	12.4	11.6
1/4<P≤1/2	12.4	12.6	11.9	11.9	12.4	11.7
1/2<P<1	12.7	12.4	13.1	12.4	12.2	11.6
P=1	13.4	11.8	N/A	N/A	12.3	N/A
US PSID sample (N=2,308)						
P=0	12.6	13.4	13.2	13.2	13.3	13.2
0<P≤1/4	13.4	12.9	12.5	13.5	13.2	12.5
1/4<P≤1/2	13.4	12.6	12.2	12.9	12.8	12.9
1/2<P<1	13.0	13.1	13.6	12.9	12.5	12.2
P=1	13.4	12.2	13.4	13.8	12.7	12.0
Swedish sample (N=35,911)						
P=0	10.7	11.5	11.5	11.5	11.5	11.4
0<P≤1/4	10.9	11.0	11.0	11.3	11.0	11.0
1/4<P≤1/2	11.1	11.0	10.8	11.0	10.8	10.8
1/2<P<1	11.3	11.0	11.0	11.0	10.9	10.6
P=1	11.6	10.8	9.7[a]	12.9[a]	11.1	10.2

See notes to Table 1
N/A No observations in that cell
[a]Fewer than 20 observations

characteristics (education), family environment (tastes, proxied by family structure), and the sibling composition of the household. For child i in family j, consider the following human capital investment model:

$$HC_{ij} = \alpha S_{ij} + \beta FS_{ij} + \gamma W_{ij} + \delta X_{ij} + u_{ij} \tag{1}$$

where HC_{ij} measures a child's educational or earnings outcome, S_{ij} measures the sibling composition of the household, FS_{ij} measures the proportion of childhood with both biological parents, W_{ij} is the observable parental characteristics, X_{ij} measures individual characteristics, and u_{ij} is the error term.

We can decompose the error term into three components: $u_{ij} = \varphi_j + \eta_i + \upsilon_{ij}$, where φ_j is the family-specific component, η_i is the individual-specific component, and υ_{ij} is a random error. If φ_j is correlated with family structure, then first differencing across siblings will eliminate selection bias; but if family structure is correlated with individual-specific error components, then selection remains a problem. By assuming that family structure only operates through a family-fixed effect, φ_j, and that all family effects are sibling-invariant, W_{ij}=W_j, we first difference (Eq. 1) with respect to siblings and estimate the following equation:

$$\Delta HC = \alpha\Delta S + \beta\Delta FS + \delta\Delta X + \Delta u \tag{2}$$

Table 3 Average annual earnings in 1994 of US NLSY sample, in 1993 of US PSID sample, and in 1996 of Swedish sample by proportion of childhood (*P*) in certain family types (Intact *P*=1=100)

	Intact	Single mum	Single dad	Biodad and stepmum	Biomum and stepdad	Other type
US NLSY sample (*N*=6,196)						
P=0	59.0	97.7	94.0	93.9	95.1	94.8
0<*P*≤1/4	78.1	78.9	66.8	69.8	75.6	54.0
1/4<*P*≤1/2	68.6	78.9	51.4	60.2	77.4	60.9
1/2<*P*<1	81.3	73.8	93.1	60.0	69.8	61.0
P=1	100.0	60.7	N/A	N/A	61.0	N/A
US PSID sample (*N*=1,901)						
P=0	80.0	98.7	94.8	93.9	97.8	95.1
0<*P*≤1/4	76.6	95.5	100.6	194.7	85.7	96.3
1/4<*P*≤1/2	110.8	69.4	77.7	115.2	83.7	50.6
1/2<*P*<1	83.1	83.2	108.4	85.0	80.3	69.4
P=1	100.0	70.1	75.6	121.7	77.6	N/A
Swedish sample (*N*=35,911)						
P=0	85.5	92.2	97.7	97.1	98.2	97.7
0<*P*≤1/4	89.6	90.8	89.6	94.8	87.9	90.2
1/4<*P*≤1/2	90.1	89.5	91.3	93.1	89.0	83.8
1/2<*P*<1	94.2	88.4	90.1	100.0	90.1	77.5
P=1	100.0	82.1	74.6[a]	124.2[a]	91.9	81.5

The data are weighted estimates. A stepparent is an adult in the household who is not a biological parent

[a]Fewer than 20 observations

Under our assumptions, this model eliminates any observed or unobserved variables that do not vary within a family. The approach we take is to use cross-sectional regressions to estimate versions of (Eq. 1) with different control variables and then control for family-fixed effects using (Eq. 2).

Although fixed-effects estimates have the advantage of allowing us to control for unobserved factors that may be associated with educational outcomes and family structure, they are subject to limitations as well. In particular, fixed-effects estimates can be biased by measurement error. We expect measurement error to be less problematic in this case as family structure is defined over the entire childhood. Although the family structure variables are not measured perfectly, they represent a substantial improvement over measures of family structure taken at one period of time. To evaluate whether measurement error potentially biases our estimates of family structure downwards, we conduct robustness checks that aggregate family structure into a variable that measures the proportion of time spent in a non-intact family. If measurement error is biasing our results, then we would expect that the estimated effect of living in a non-intact family would be larger than results that disaggregate family structure.

4 Results

4.1 Cross-section estimations

We start by estimating cross-section equations of the correlation between years of schooling and proportion of childhood spent in different family types, controlling for age and gender for the two countries. The NLSY and PSID models include controls for race and whether the individual is part of an oversampled group. The resulting estimates are presented in Table 4 (coefficients on gender, age, race, and oversampled group are omitted). It is interesting that we find strikingly similar relationships for the two countries, especially for the most common non-intact family types, single mother, and biological mother plus stepfather in the NLSY and Sweden. This similarity between the NLSY and Sweden coefficients is remarkable given the egalitarian educational policy and additional social support available to families in Sweden.

We test the two null hypotheses that the coefficients are equal (1) in the NLSY and PSID samples and (2) in the US and the Swedish samples. We reject the null hypothesis at the 5% level of significance for single mother, single father, and stepfather families when comparing the PSID and Sweden samples. The estimates are smaller in the PSID than in either the Sweden or NLSY samples. It is only the coefficient for other family structure that significantly differs between the Sweden and NLSY samples. In addition, the PSID coefficients are significantly smaller than the NLSY coefficients for single mothers, stepfathers, and other family structures. This may result from the fact that the PSID has a higher incidence of children living in non-intact family structures.

We next supplement our family structure covariates with measures of proportion of childhood lived with full siblings and with half siblings, respectively, while controlling for the total number of full siblings and half siblings, regardless of whether the individual lived with them or not. We can only use the PSID data in this analysis because the NLSY does not have complete information on the sibling

Table 4 Regressions of childhood family structure on educational attainment for Sweden and US samples

Education	Sweden	NLSY	PSID
Single mother	−1.01 (0.07)*	−0.79 (0.10)[b]*	−0.46 (0.13)[a,b]*
Single father	−1.51 (0.14)*	−1.24 (0.40)*	−0.51 (0.46)[a]
Stepmother, biological father	−0.28 (0.23)	−1.11 (0.44)**	−0.13 (0.39)
Stepfather, biological mother	−0.86 (0.07)*	−1.03 (0.14)[b]*	−0.46 (0.17)[a,b]*
Other family structure	−1.15 (0.09)*	−2.17 (0.33)[a,b]*	−0.44 (0.54)[b]
Number of observations	35,911	9,729	2,308
R^2	0.02	0.06	0.08

The dependent variable is years of schooling. For Sweden, controlling for age, age^2, and gender; for USA, controlling for year of birth, gender, race, and oversampled group. Robust standard errors

*p<0.01; **p<0.05

[a]Indicates US family structure coefficient is significantly different from Sweden coefficient at 5% level of significance

[b]Indicates PSID and NLSY coefficients are significantly different at 5% level

composition of the household over the entire childhood.[7] In addition, we control for the education of step or biological parents. We see (Table 5) that, as expected, the differences in schooling outcomes between children from intact families and those from non-intact families are reduced when childhood sibling structure and parents' education are taken into account. Furthermore, the Sweden and NLSY coefficients differ significantly for single-mother and stepfather families, and the PSID coefficients only differ from those of Sweden for single-mother families. The PSID coefficients are significantly smaller than the NLSY coefficients for stepfather and other family structures.

The number of siblings – full and half– are about equally negatively related to educational attainment in both countries, though the number of half siblings is only statistically significant for Sweden. Sibling correlations are negative, likely reflecting the reduction in resources (time and money) devoted to children in larger families. While there is also a positive and non-significant relationship between the proportion of childhood lived with full siblings and years of schooling for the US sample, the relationship is negative for Sweden; but the coefficient for proportion lived with half siblings is negative for both countries and larger in absolute value than for lived with full siblings. Living with half siblings possibly involves more of rivalry and conflict over money and norms among other things than living with full siblings does, as half siblings generally have an absent parent and 'another family'. The associations between educational outcomes and total number of full and half siblings are both negative, more so for full siblings.

We go on to estimate a similar set of cross-section equations of the correlation between the log of annual earnings and proportion of childhood spent in different family types, controlling for age and gender. The resulting estimates are presented in Table 6 (coefficients on gender, age, race and oversampled group are omitted) and show that these relationships are more similar across samples than the education estimates. The PSID coefficient is significantly different from Sweden's for single fathers, and the PSID coefficient is significantly smaller than NLSY's for stepfather families.

When we add controls for sibling structure and parents' education (Table 7), the differences between children from intact families and those from other family types are reduced. In addition, sibling structure matters for earnings in both countries. In the PSID, there are negative associations between earnings and number of full siblings. For Sweden, earnings are negatively related to the number of both full and half siblings. These results indicate that larger families may have fewer resources to invest in children's human capital accumulation. Furthermore, sibling structure seems at least as important as family structure in determining children's outcomes, again likely reflecting the effect of resource allocation.

[7] Note also that the standard argument that measurement-error bias is aggravated in sibling-difference models comes from research on the returns to schooling – where years of schooling is an independent variable – and does not apply to our study. In returns to schooling applications, the educational attainment of two siblings are measured independently in two interviews and any (independent) measurement error leads to a sibling difference in educational attainment that does not exist. In our data sets, family structure is, by construction, defined in the same way for two siblings who belong to the same family. This said, we do not rule out that some measurement-error bias plague the results from many sibling-difference analyses of family structure, and we recommend that future research effort be devoted to this somewhat neglected question.

Table 5 Regressions of childhood family and sibling structure on educational attainment for Sweden and US samples

Education	Sweden	NLSY	PSID
Single mother	−0.87 (0.06)*	−0.55 (0.09)[a]*	−0.23 (0.18)[a]
Single father	−1.07 (0.14)*	−0.62 (0.38)	−0.17 (0.48)
Stepmother, biological father	−0.48 (0.21)**	−0.80 (0.38)**	0.10 (0.41)
Stepfather, biological mother	−0.65 (0.08)*	−1.00 (0.13)[a,b]*	−0.29 (0.17)[b]
Other family structure	−0.97 (0.09)*	−1.18 (0.31)[b]*	0.09 (0.54)[b]
Lived with full siblings	−0.09 (0.04)**		0.17 (0.12)
Lived with half siblings	−0.30 (0.06)*		−0.40 (0.40)
Number of full siblings	−0.14 (0.01)*		−0.16 (0.02)*
Number of half siblings	−0.10* (0.01)		−0.08 (0.09)
Mother's education	0.17 (0.01)*	0.18 (0.01)*	0.06 (0.01)*
Father's education	0.18 (0.00)*	0.17 (0.01)*	0.04 (0.01)*
Number of observations	35,911	9,729	2,308
R^2	0.19	0.25	0.14

The dependent variable is years of schooling. For Sweden, controlling for year and month of birth and gender; for USA, controlling for year of birth, gender, race, and oversampled group. Robust standard errors. Parent's education is the education in 1970 of the (step/bio) parents the child lived with in 1975 for Sweden sample. Parent's education is education of biological parent in US samples

*p<0.01; **p<0.05

[a] Indicates US family structure coefficient is significantly different from Sweden coefficient at 5% level of significance

[b] Indicates PSID and NLSY coefficients are significantly different at 5% level

Table 6 Regressions of childhood family structure on annual earnings for Sweden and US samples

Earnings	Sweden	NLSY	PSID
Single mother	−0.30 (0.03)*	−0.18 (0.05)*	−0.25 (0.09)*
Single father	−0.46 (0.08)*	−0.43 (0.24)	0.09 (0.24)[a]
Stepmother, biological father	−0.13 (0.11)*	−0.64 (0.25)**	−0.19 (0.19)
Stepfather, biological mother	−0.17 (0.04)*	−0.34 (0.10)[b]*	−0.03 (0.09)[b]
Other family structure	−0.36 (0.05)*	−0.63 (0.19)*	−0.04 (0.26)
Number of observations	35,911	6,196	1,901
R^2	0.05	0.08	0.14

The dependent variable is log of annual earnings. For Sweden, controlling for year and month of birth and gender; for US, controlling for year of birth, gender, race, and oversampled group. Robust standard errors

*p<0.01; **p<0.05

[a] Indicates US family structure coefficient is significantly different from Sweden coefficient at 5% level of significance

[b] Indicates PSID and NLSY coefficients are significantly different at 5% level

Table 7 Regressions of childhood family and siblings structure on annual earnings for Sweden

Earnings	Sweden	NLSY	PSID
Single mother	−0.26 (0.04)*	−0.15 (0.06)*	−0.18 (0.10)
Single father	−0.40 (0.08)*	−0.37 (0.24)	0.23 (0.25)[a]
Stepmother, biological father	−0.11 (0.11)	−0.56 (0.25)**	−0.10 (0.18)
Stepfather, biological mother	−0.10 (0.04)**	−0.34 (0.10)[a,b]*	0.00 (0.10)[b]
Other family structure	−0.30 (0.05)*	−0.43 (0.19)**	0.08 (0.26)
Lived with full siblings	0.02 (0.02)		0.06 (0.07)
Lived with half siblings	−0.05 (0.03)		−0.58 (0.26)**
Number of full siblings	−0.04 (0.01)*		−0.04 (0.01)*
Number of half siblings	−0.03 (0.01)*		0.00 (0.04)
Mother's education	0.02 (0.00)*	0.03 (0.01)*	0.02 (0.01)*
Father's education	0.01 (0.00)*	0.03 (0.00)*	0.00 (0.01)
Number of observations	35,911	6,196	1,901
R^2	0.06	0.11	0.15

The dependent variable is log of annual earnings. For Sweden, controlling for year and month of birth and gender; for USA, controlling for year of birth, gender, race, and oversampled group. Robust standard errors. Parent's education is the education in 1970 of the (step/bio)parents the child lived with in 1975 in Sweden sample. Parent's education is education of biological parent in US samples

*$p<0.01$; **$p<0.05$

[a] Indicates US family structure coefficient is significantly different from Sweden coefficient at 5% level of significance

[b] Indicates PSID and NLSY coefficients are significantly different at 5% level

Table 8 Fixed-effects estimates of the relationships between childhood family structure and educational attainment for Sweden and US samples

Education	Sweden samples		US samples	
	Full sibl	Half sibl mum	NLSY	PSID
Single mother	−0.05 (0.20)	−0.47 (0.49)	0.11 (0.20)	−0.14 (0.38)
Single father	−0.14 (0.28)	−0.08 (0.66)	1.25 (1.16)	−0.96 (0.82)
Stepmother, biological father	−0.22 (0.55)	−0.59 (2.18)	−0.59 (0.72)	0.78 (0.62)
Stepfather, biological mother	0.27 (0.27)	−0.15 (0.16)	−0.04 (0.29)	0.01 (0.30)
Other family structure	0.06 (0.27)	−0.19 (0.37)	−0.49 (0.62)	0.77 (0.71)
Did not live w. sibling[a]	−0.03 (0.21)	−0.37 (0.48)		
Number of families	26,453	1,475	1,976	659
Number of observations	60,944	3,146	4,679	1,718
Number of identifying observations[b]	10,089	2,946	1,638	826
R^2 within	0.01	0.01	0.02	0.02

The dependent variable is years of schooling. For Sweden, controlling for age, age^2 , and gender. Robust standard errors

*$p<0.01$; **$p<0.05$

[a] For full and half siblings who did not live with their sibling in the random sample, we cannot classify family structure otherwise

[b] The number of individuals in the total sample where at least one sibling experiences a different type of family structure from another

4.2 Family fixed-effects models

Table 8 presents the fixed-effects estimates of the relationship between family structure and educational attainment for the samples from the USA and Sweden. For Sweden, the sample size is large enough to allow comparisons of this relationship also for half siblings who have the same mother. As seen, a substantial number of individuals/siblings in both countries, especially in the larger Swedish data set, experienced different family structures during childhood and thereby identify the effects in the sibling models. Whereas the family structure variables are negatively and significantly correlated with years of schooling in Table 4, controlling for unobserved family heterogeneity the family structure coefficients are no longer statistically significant in either the US or Sweden sample (nor from one another), neither for full nor for half siblings. The latter finding may seem at odds with the negative relationship with half siblings found in Table 7, but it is consistent if half siblings are about equally disadvantaged as found by Ginther and Pollak (2004).

Table 9 shows the fixed-effects estimates of the impact of family structure on earnings. Controlling for unobserved heterogeneity reduces the magnitude of the family structure coefficients and they are no longer statistically significant. The one exception is the coefficient for living with a stepmother and biological father (the least frequent non-intact family type) on earnings in the NLSY. This coefficient also significantly differs in the NLSY and PSID samples. After controlling for

Table 9 Fixed-effects estimates of the relationships between childhood family structure and annual earnings for Sweden and US samples

Earnings	Sweden samples		US samples	
	Full sibl	Half sibl mum	NLSY	PSID
Single mother	−0.11 (0.15)	0.36 (0.49)	0.18 (0.20)	−0.14 (0.34)
Single father	0.31 (0.23)	0.10 (0.72)	−0.08 (1.02)	0.26 (0.68)
Stepmother, biological father	−0.31 (0.40)	−1.54 (1.73)	−1.51 (0.59)**	0.61 (0.49)
Stepfather, biological mother	0.05 (0.21)	0.01 (0.13)	−0.08 (0.24)	0.18 (0.26)
Other family structure	−0.34 (0.21)	0.15 (0.40)	0.04 (0.64)	0.22 (0.63)
Did not live with sibling[a]	0.06 (0.18)	−0.20 (0.43)		
Number of families	24,484	1,263	1,670	639
Number of observations	55,852	2,673	3,136	1,402
Number of identifying observations[b]	8,774	2,499	1,333	630
R^2 within	0.06	0.04	0.07	0.06

The dependent variable is log of annual earnings. For Sweden, controlling for age, age^2 , and gender. Robust standard errors

*p<0.01; **p<0.05

[a]For full and half siblings who did not live with their sibling in the random sample we cannot classify family structure otherwise

[b]The number of individuals in the total sample where at least one sibling experiences a different type of family structure from another

unobservable family characteristics, spending one's childhood with a stepmother has a negative and significant effect on earnings.

4.3 Robustness tests

We further performed sensitivity tests of the robustness of our results.[8] First, we tested whether our disaggregation into five non-intact family types weakens the relationship between living in a non-intact family and outcomes by re-estimating the sibling difference models with the binary variable: always intact—ever in a non-intact family. We do so to evaluate whether measurement error is potentially biasing the estimated coefficients on disaggregated family structure downwards. The resulting estimates were insignificant but smaller in absolute values as were the standard errors in all three samples. These results suggest that measurement error is not biasing our fixed-effects estimates.

Second, it is possible that the siblings are too close in age so that their experience of family disruption will be very similar. We tested this by re-estimating the fixed-effects models only for full siblings among which at least one was at least 6 years older than the other(s).[9] This test did not produce any statistically significant estimates, except for a *positive* and weakly ($p<0.1$) significant relationship between earnings and living with a single dad in Sweden. In the NLSY sample, we found a *positive* and weakly ($p<0.1$) significant relationship between education and living with a stepfather. In the PSID sample, we found *positive* and weakly ($p<0.1$) significant relationships between single mother, stepfather, and stepmother families and earnings. These results suggest, if anything, that non-intact family structures have little negative impact on education and earnings in the USA once one controls for unobserved heterogeneity.

Third, there is the possibility that family disruptions that occur in early childhood are more detrimental than those that occur later. We investigated this by re-estimating the siblings models only for those full siblings (too few half siblings) among which at least one had spent more than 66% of his/her childhood in a non-intact family, but we obtained no statistically significant estimates in Sweden. In the NLSY, we found a weakly *positive* relationship between stepfathers and earnings.

Taken together, the results in Tables 4, 5, 6, 7, 8 and 9 and the robustness checks indicate that much of the impact of family structure is the result of selection of family structure.

5 Conclusions

We began this analysis expecting to find substantial differences between the USA and Sweden in the association between family structure and outcomes as adults, measured as educational attainment and annual earnings. We found strikingly similar educational differences by family structure in the two countries, whereas

[8] Out of consideration of space, the results of these tests are not presented here but can be obtained from the authors upon request.
[9] There are too few half siblings for a meaningful analysis.

the average earnings differentials by childhood family type were smaller in Sweden. While this is as expected, it may suggest that differences in wage formation systems are more important than differences in educational policy in shaping the income distribution.

When only family structure and controls for age, sex, race, and oversampled group are included in the regression, nearly all non-intact family structure variables are negatively associated with years of schooling and annual earnings. In many cases, we cannot reject the null hypothesis of equal associations between family structure and child outcomes in the two countries. This is remarkable given the very different social welfare systems. However, when sibling composition and parents' education are included in the model, the estimated coefficients for family structure are reduced. In particular, our findings show that the number of full and half siblings and the time lived with them tend to be negatively related to educational attainment and earnings as adult in both countries. This is likely the result of reduced time and money for children in larger families.

Finally, controlling for unobserved family characteristics, we find that the effect of family structure in both the Sweden and US samples (in all but one case) becomes statistically insignificant and we cannot reject the null hypothesis that the coefficients do not differ from one another. These results were robust to a number of sensitivity tests performed. The sensitivity tests even found weakly positive associations between non-intact family structure and education and earnings. Taken together, our findings cast considerable doubt on the causal interpretation of the negative relationship between childhood time lived in a non-intact family and child outcomes measured as years of schooling or earnings as adults in both countries. A possible explanation for why our results differ from those obtained by some previous studies is that our rich data are not plagued by the 'window' problem but allow us to take into account the childhood family structure in detail, including proportion of childhood spent in different family types and the number of full and half siblings and time lived with them. In addition, we only consider the impact of family structure on the outcomes of education and earnings. Non-intact family structure may have a causal effect on other child outcomes such as teen parenthood, behavioral problems, or economic inactivity.

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