When Mobility meets Fertility

Intergenerational income mobility and fertility patterns in Sweden vs. USA

André Richter

September 27, 2016

Abstract

Intergenerational mobility estimates differ across countries, and the underlying source of these differences is of substantial academic as well as policy interest. I contrast two countries that are consistently ranked at opposing ends of the income mobility spectrum, the USA and Sweden, to shed light on the question if differences in fertility patterns can explain differences in mobility patterns. Regarding fertility differences, I find that Swedish men are more likely to stay childless, and that those with children have fewer than their American counterparts. Both margins furthermore follow an income gradient: low-income groups are more likely to stay childless and to have many children, although the latter is more pronounced in the USA. A larger number of offspring is associated with stronger intergenerational persistence in Sweden, but with less persistence in the USA. Decomposing popular mobility metrics by the number of offspring shows that about a third of the cross-country difference originates from differences in income-fertility and fertility-child outcome gradients. Counterfactual simulations highlight the importance of differences in the population composition for mobility metrics and cross-country differences.

I would like to thank Anders Björklund, Markus Jäntti, Matthew Lindquist, Martin Nybom and various seminar participants for invaluable comments. Financial support of the Swedish Research Council for Health, Working Life and Welfare (FORTE) is gratefully acknowledged.

1 Motivation

Intergenerational mobility estimates differ substantially across countries, and the underlying source of these differences is of substantial interest to both academic scholars and policy makers alike. Most mobility metrics rely on some form of parent-child associations, and as such they are intrinsically linked to fertility outcomes. This raises the question as to how important cross-country differences in fertility patterns are for differences in intergenerational associations. Yet, with the exception of Lindahl (2008), who studies the strength of the transmission of economic outcomes by family size and birth order in Sweden, fertility considerations are lacking in the economic literature on intergenerational mobility. As a case in point, note that the term "fertility" is absent from many of the most widely cited reviews of the income mobility literature. See e.g. Solon (1999), Solon (2002), Corak (2006), Björklund & Jäntti (2009), Blanden (2009), and Jäntti & Jenkins (2015). This demonstrates that fertility as a source of cross-country differences in intergenerational income mobility has received limited attention so far, and thus the quantitative importance of fertility differences remains unclear.[1] To this end, this paper contrasts fertility patterns in two countries that are consistently ranked at opposing ends of the income mobility spectrum, the USA and Sweden, and uses a simple decomposition exercise to quantify the importance of fertility differences for income mobility metrics across countries.

While the discussion of fertility in the mobility literature is limited, the topic pervades several related literatures. A large number of studies in sociology and demography focus on fertility differences in the parental generation and describe fertility gradients along the extensive ("who becomes a parent") and the intensive ("how many children does a parent have") margin by social and economic status, among others. The literature on the quantity-quality trade off focuses on differences in the child generation based on the number of siblings. A range of studies furthermore investigate the consequences of differential fertility for the composition of subsequent generations, taking intergenerational persistence patterns as given.

These various perspectives lend themselves to speculate about potential implications for intergenerational mobility. Starting from the distinction between the extensive and the intensive fertility margin, note that both margins may be relevant for intergenerational mobility parameters. Which margin of a given population enters parenthood is affected by a variety of societal features such as educational opportunities and opportunity costs of childbearing (Aaronson et al., 2014; Baudin et al., 2015), as well as local mating market conditions, e.g. the degree of social selectivity and the attributes relevant for partner choice. If this marginal population differs from the general population along dimensions related to the transmission of economic status, then this selection may affect

[1] In this paper, I use the concept of intergenerational income mobility for expositional purposes, but extensions to other forms of mobility are easily conveived.

mobility parameters.[2]

Regarding the intensive fertility margin, the literature on the income-fertility gradient suggests that different social groups have on average a different number of offspring. The quantity-quality trade off furthermore suggests that the parents' number of offspring (or the child's number of siblings) affects child outcomes, which in combination with the socioeconomic gradient in family size may induce a correlation between parental and child outcomes. To the best of my knowledge, Lindahl (2008) is the only existing study to show that the strength of the transmission of economic outcomes varies by the number of offspring and birth order, using data from Sweden. I am not aware of any study that establishes equivalent estimates for the USA.

Cross-country differences among these fertility-related parameters could thus imply differences in mobility parameters. Regarding the extensive margin, if societal features relevant for the selection into parenthood vary across countries, then the composition of parents that we observe might differ, i.e. some individuals that do not have children in one country might have children in another. Regarding the intensive margin, it is conceivable that both the socioeconomic gradient in family size and the importance of family size for child outcomes vary across countries. Different fertility patterns moreover imply different compositions in corresponding samples, thus inducing differences in estimated mobility measures. For instance, if mobility is highest for two-child households and lowest for four-child households, and one country is dominated by two-child households while another country is dominated by four-child households, then mobility measurements in these countries would differ due to different population compositions.

Despite these reasons to suspect that fertility patterns may have repercussions for mobility metrics, not much is known about how fertility patterns differ and how important such differences are for intergenerational mobility estimates. The aim of this paper is therefore twofold: first, I establish baseline descriptives for both Sweden and the United States to assess if fertility patterns are different across these countries. For doing so, I use data sets and measures widely used in intergenerational income mobility studies. Second, I decompose popular mobility metrics to quantify the importance of different subgroups based on the parents' number of offspring, and to simulate bounds taking into account differences in the selection into parenthood.

Combining fertility and mobility perspectives requires some consideration of

[2] To provide an example: consider individuals suffering from heritary mental conditions. Such conditions arguably affect economic outcomes of both parents and offspring, implying a stronger parent-child similarity. In Sweden, between 1934 and 1975 eugenic policies prevented many such individuals from having children by means of mandated sterilization. Since we do not observe such parent-child pairs in Swedish samples, estimated mobility metrics thus indicate a more mobile society compared to a situation in which we observed these children. While this example is arguably extreme and this particular policy's impact on mobility estimates likely small, it serves to highlight that the extensive fertility margin is relevant for mobility estimates.

the study population of interest. The starting point for the fertility literature are individuals and their fertility outcomes. That is, for a given population or cohort, how many individuals have children at all, and if so, how many? From a practical point of view, this implies starting from a representative generation of individuals and matching offspring outcomes (if any) to them. The mobility literature, on the other hand, considers the association of offspring outcomes with equivalent outcomes of their parents.[3] That is, the mobility literature starts from a representative generation of children, and matches parental outcomes to the data. The difference between both approaches are thus individuals without children.

For the purpose of this paper, it is helpful to realize that apart from different information sets that tend to be used, the population of interest in the fertility literature encompasses the population of interest in the mobility literature. Since the fertility approach includes individuals that do and do not have children, the typical study population in the mobility literature is a subset of the study population of the fertility literature. Individuals with children form the parent-child pairs in the mobility literature, while individuals without children are considered in the fertility literature, but not in the mobility literature. This implies that taking the fertility perspective and starting from a representative "parental" generation, the analytical possibilities are expanded to the fertility domain without compromising the traditional mobility perspective. In particular, this facilitates the following three things: first, it renders an analysis of fertility differences on both margins possible. Second, an analysis of parent-child associations as in standard intergenerational mobility studies is possible using the corresponding subset of the sample. Third, it provides a natural framework to shed light on the importance of differences in childlessness by extending the traditional parent-child pair analysis of the mobility literature to include childless individuals. In this context, note that I will distinguish between "parental generation" or "potential parents" and "parents". Parents are individuals with children, wheras the parental generation also includes individuals born during the same years who do not have children.[4]

The remainder of this paper is organized as follows: In section 2, I provide a brief overview of related literatures. Data sources and measures are presented in section 3. Section 4 compares fertility outcomes across both countries, and section 5 provides a statistical decomposition of mobility metrics to shed light on the importance of fertility differences. Section 6 concludes with a discussion of the results.

[3] An alternative strand of the mobility literature looks at sibling correlations for all offspring with at least one sibling, typically of the same sex. This approach does not rely on parental information, but requires multiple siblings. In this paper I focus on the main strand of the mobility literature, which is based on parent-child associations.

[4] See e.g. Hillmert (2013) or Song & Mare (2014) for a related discussion in the sociological and demographic literature.

2 Literature

This paper relates to a variety of literatures. As I attempt to explain cross-country differences in intergenerational mobility estimates by fertility differences, I will review the corresponding literatures below. I will furthermore point to a related literature in demography that is concerned with consequences of education-fertility gradients.

FERTILITY: Fertility as a research topic spans multiple disciplines, such as demography, sociology, biology, economics, and many more. As such, the literature on fertility itself is vast and can in its entirety not be reviewed here. However, see Balbo et al. (2013) and references therein for the relevant literature in advanced societies. The following follows the distinction between the extensive and the intensive margin, where the extensive margin reflects selection into parenthood or childlessness and the intensive margin reflects the number of offspring.

The literature on selection into parenthood is rather small and mostly descriptive, predominantly depicting various trends and gradients in childlessness in different countries. See for instance Miettinen et al. (2015) and Tanturri et al. (2015) for childlessness trends and related research. Recent theoretical contributions in economics have been made by Aaronson et al. (2014) and Baudin et al. (2015). Aaronson et al. (2014) show that expanding educational opportunities for women leads to delayed motherhood, while expanding educational opportunities for their potential children increases the likelihood of having a child, and reduces the overall number of children. Baudin et al. (2015) built a structural model of fertility to disentangle various causes of childlessness in the USA, and find that 2.5% of women were childless because of poverty, and 8.1% of women were childless because of high opportunity costs of childbearing. Other studies involving the extensive margin of fertility include Lundborg et al. (2014), who investigate female labor supply responses to childbirth after IVF treatments.

It is noteworthy that most studies focus exclusively on women and maternal childbearing. Notable exceptions include Zhang (2011), Boschini et al. (2011), and Schytt et al. (2014). Zhang (2011) provides a differentiation of male from female fertility patterns, predominantly using Taiwanese data. Boschini et al. (2011) document fertility trends (along both margins) and mid-career earnings of Swedish men and women. Schytt et al. (2014) elicit reasons for staying childless in a sample of Swedes that in 2009 were 28-40 years old, and finds that the lack of a suitable partner is the dominant reason (60%) among respondents aged 36-40, suggesting that socially selective pressures in the mating market may play an important role.

While the extensive fertility margin is relatively understudied, the intensive fertility margin has been studied more extensively. Documenting differences in the number of offspring by group membership has a rather long tradition. See e.g. Westoff (1954) and Kiser (1960). A typical finding is that more advantaged groups (for instance in terms of education, occupation, or wealth) have fewer offspring than less advantaged groups.[5] Apart from the income-fertility gradient, which focuses on parental differences, a large literature on the quality-quantity trade off focuses on differences in child outcomes by number of offspring. The trade off is well established theoretically (Becker, 1960; Becker & Lewis, 1973; Becker & Tomes, 1976) and supported by cross-sectional associations (Blake, 1989; Hanushek, 1992; Björklund et al., 2004). Using instrumental variable techniques, support for a causal interpretation of these associations has been found by e.g. Rosenzweig & Wolpin (1980), Cáceres-Delpiano (2006), Conley & Glauber (2006), Rosenzweig & Zhang (2009), and Liu (2014). On the other hand, Black et al. (2005), Angrist et al. (2010), and Åslund & Grönqvist (2010) do not find evidence for a causal effect. However, Mogstad & Wiswall (2016) reanalyzed the results by Black et al. (2005), and point out that their non-results are due to the specification used, which the results by Åslund & Grönqvist (2010) are also based on. In particular, Mogstad & Wiswall (2016) find that a child's educational attainment responds to the number of siblings, with educational attainment of first-born children being maximized with one sibling, and two siblings maximizing educational attainment of second-born offspring. First-born children still benefit from up to three siblings, though to a smaller degree, while the average educational attainment of second-born children decreases with more than two siblings. These results, based on Norwegian data, suggest that the optimal family size for offspring's educational attainment is two to three.

Differential fertility and population compositions: A distinct but related literature examines fertility transitions and their intergenerational consequences. For instance, Mare (1997) and Musick & Mare (2004) study how fertility gradients affect the composition of subsequent generations in terms of education levels or poverty status, and find only negligible effects. Focusing on developing countries, Vogl (2015) finds that fertility differentials traditionally raised the average education levels of the next generation (since advantaged households used to have more children), while in the period after 1960 they are depressing the average education levels of the next generation due to a reversal of the fertility-education gradient.

Intergenerational Income Mobility: Intergenerational income mobility is the topic of a vast literature. Reviews include Solon (1999), Grawe (2006), Björklund & Jäntti (2009), Black & Devereux (2011), and Jäntti & Jenkins (2015). Although cross-country comparisons are difficult to make since mobility estimates tend to be sensitive to sampling rules and measurements employed, evidence from studies estimating mobility metrics for multiple countries using identical approaches generally find that the USA is less mobile than Sweden. For reviews with a particular focus on cross-country comparisons, see e.g. Solon (2002), Corak (2006), and Blanden (2009), among others.

[5] This statement refers to developed countries and time periods relevant for this study. In earlier historical periods, or in some developing countries, high status was associated with a larger number of offspring. See e.g. Skirbekk (2008) and Vogl (2015).

Few mobility studies address topics related to fertility patterns directly. Grawe (2006) shows that up to a quarter of the variation in mobility estimates across studies can be explained by the average age at which fathers are observed in different samples, although this is more related to life cycle bias than fertility per se. Lindahl (2008) is the only study to estimate intergenerational elasticities by family size and birth order, and finds that intergenerational income elasticities tend to decrease with family size and birth order using Swedish register data. Fan & Zhang (2013) develop an overlapping generation model linking intergenerational mobility and differential fertility to investigate the role of private versus public education. To the best of my knowledge, there is no study comparing the importance of fertility differences for mobility metrics across countries.

3 Methods and Data

To measure intergenerational dependence, a variety of metrics exist in the literature. Two popular measures are the intergenerational elasticity (IGE) and Spearman's rank correlation coefficient. The typical measure for the intergenerational elasticity is the estimated slope coefficient $\hat{\beta}$ in the following regression equation:

$$ln(y_i^c) = \alpha + \beta\ ln(y_i^p) + \epsilon_i \tag{1}$$

where y_i^c denotes a measure of child i's lifetime income and y_i^p the corresponding income measure of child i's parent. Both income measures are log-transformed to facilitate an interpretation of the slope coefficient as elasticity.

Spearman's rank correlation coefficient is given by the sample analogue of

$$\rho = \frac{cov(r^c, r^p)}{\sigma_{r^c}\sigma_{r^p}} \tag{2}$$

where r^c denotes the relative income ranks of the children's generation, and r^p the parental income ranks in the parental generation.

The IGE is traditionally the most commonly used measure, so that its use facilitates a comparison with the existing literature. The rank correlation has gained popularity in recent years since it avoids conceptual shortcomings of the IGE. See e.g. Jäntti & Jenkins (2015) for a discussion of mobility concepts. Nybom & Stuhler (2015) have furthermore shown that rank correlations are more robust to biases that arise from the unobservability of lifetime income.

Both of these measures require data on parents and offspring, and for both intergenerational analyzes as well as the analysis of fertility patterns age ranges at which outcomes are measured require attention. In the following, I therefore describe the data sources and measures used in this study, as well as the necessary sample restrictions.

Data: For Sweden, administrative data from the Multigeneration Register, administered by Statistics Sweden, contains information on so-called index individuals, which are all individuals born in Sweden in the period 1932 - 1967, as well as their siblings and children (SCB, 2011). I use a 35% random sample of these data. Parent-child links are based on legal status, and the absence of an official link to a child is interpreted as childlessness. While this may lead to an underestimation of the number of children in case fatherhood is unknown to legal authorities, children with unidentified fathers are rare in Sweden (Björklund et al., 2011).[6] Income data come from official tax registries, and all data are measured until 2007, i.e. the latest born index individuals are observed until age 40, and the oldest until age 75.

For the United States, I use the Panel Study of Income Dynamics (PSID, 2016). The PSID contains a variety of self-reported individual and household level measures and constitutes a combination of two different samples drawn from the US population in 1968: The Survey Research Center (SRC) sample is a representative sample of the US population, and the Survey of Economic Opportunity (SEO) sample is an oversample of socioeconomically disadvantaged groups. All subsequent analyses apply sample weights to render the results representative for the US population. Fertility outcomes are observed until 2013 via responses to the Child Birth and Adoption questionnaire, which was added to the PSID in 1985 and is updated in each wave. This questionnaire elicits individual's retrospective birth histories and covers the number of all births, regardless of whether or not they live in the same household. For the subset of children that lived in the household when the parent entered the PSID, or at any time afterwards, economic outcomes for the mobility analysis can be observed.[7] Income data are self-reported and taken from the Cross-National Equivalent File.

For both countries, I use individual labor income averaged over the mid-career years to attenuate life cycle biases in earnings data (Solon, 1989; Haider & Solon, 2006; Nybom & Stuhler, 2015). More precisely, I average all available income observations over the ages 30 to 45. Note that for individuals born 1963 and later, the age range for which income is measured is truncated according to the latest age at which we observe their income. All income data are expressed in prices of 2006. I furthermore truncate the income observations at the equivalent of USD 10000 average annual labor income.[8]

The income ranks necessary for the estimation of ρ are computed as follows: First, I group individuals in four to five year intervals. This is done to standardize ranks by cohorts, taking into account that some single year cohort sizes in the PSID are rather small. Here, the first cohort covers 5 years, all other cohorts 4 years. Within each of these cohorts, I then compute income ranks rel-

[6] Fatherhood may also be misattributed, in which case the number of children is overstated for some men while understated for others.

[7] The mobility metrics are thus based on legal status in Sweden and on cohabitation in the USA. Using Swedish data, Björklund & Chadwick (2003) show that this distinction is inconsequential for the resulting mobility estimates.

[8] This leads to the exclusion of 16993 Swedes and 78 Americans.

ative to the complete (same-sex) cohort, i.e. including those without children. The ranking is based on the absolute level of income, including observations with zero income. Ties are resolved at random, and confidence intervals are based on the Fisher transformation.[9]

Sample restrictions: To rule out that cross-country differences emerge due to different cohorts or measurements, I apply similar conventions to both countries. In terms of cohort coverage, my sample from the Swedish Multigeneration Register is representative (and unconditional on fertility outcomes) for the time period from 1932 to 1967. Since individuals in the original PSID sample must have been born at the time of data collection in 1968, it covers individual birth years up to 1967. For comparability, I therefore disregard US cohorts born after 1967 and before 1932. Moreover, the Swedish and US sample differ in coverage to the extent that the former also includes individuals who died before 1968. These individuals are excluded from the analysis.

I furthermore follow the majority of intergenerational mobility studies and focus on father-son pairs for the intergenerational analysis. The comparison of fertility patterns relies on father-offspring information.

Regarding the intergenerational analysis, I require that individuals are observed until they are at least 40 years old, which implies that the offspring need to be born before 1968. Hence, the intergenerational analysis is based on parents born 1932 or later with children born some time before 1968. Sample sizes by birth cohort are shown in figure 1, which also indicates the corresponding fractions of individuals with no child, a child born in or before 1967, and a child born after 1967. Note that all parents in my sample were born before 1953.[10]

Completed Fertility: For the comparison of fertility outcomes of men, it is an open question at which age we observe completed fertility. In figure 2, I plot the fractions of men having their first child – corresponding to the extensive margin – or their last child – corresponding to the intensive margin – after the age of 40, 45 or 50, by birth cohorts. We see that in general only few men have their first child after the age of 40, and having the first child at an age later than 45 is rare. Having the last child after the age of 40 is more common, though few have their last child after the age of 45, and having a child after 50 is uncommon.

The preferred age at which to observe completed fertility is thus age 45, though observing fertility at age 40 is a reasonable proxy regarding the extensive margin. Since fertility outcomes for the Swedish sample are observed until 2007, and for the US sample until 2013, this implies that we observe completed fertility for the parental generation, i.e. for the cohorts born up until 1952. Even for the child generation we observe a reasonable proxy for the extensive fertility margin,

[9] I follow the discussion in Ruscio (2008) and compute 95% confidence bounds using the Fisher transformation given by $CI(\rho) = \tan\left(\arctan(\hat{\rho}) \pm \frac{1.96}{\sqrt{n-3}}\right)$.

[10] Age at birth is very similar across countries. See figure 3.

as well as for the intensive margin for cohorts born up until 1962. For cohorts born 1963 or later, the final number of children may be understated.

Descriptive Statistics: Descriptive Statistics are presented in table 1. For each country, I present the average log income of sons, the corresponding income of the fathers, as well as their average number of children and the average age at birth of the son. The main difference between both countries is the average number of offspring, which is higher in the USA compared to Sweden.

4 Fertility patterns: Sweden vs. USA

In the following, I compare fertility outcomes in Sweden and the USA. Following the literature on differential fertility and the reversal of the fertility-education gradient, I present comparisons stratified by income groups.

The overall distribution of fathers' total number of children by country is shown in table 2. It is noteworthy how few American men in the PSID have only one or two children. The US sample contains about 25 (26) percentage points fewer fathers with one (two) offspring, and 14 percentage points more fathers with four children.

In figure 4, I show the evolution of the extensive and the intensive fertility margin from 1932 to 1967. The upper panel represents the fraction of childless individuals, and the lower panel the average number of children for those with at least one child. The first, second and third column represent individuals whose income rank falls into the bottom 33%, middle 33% and top 33% of the cohort-specific distribution. The fourth column represents all income groups pooled. Shaded areas represent 95% confidence bands. I additionally show income gradients more directly in figure 5 with error bars corresponding to 95% confidence intervals.

Several differences by margin, over time, and between countries can be found. First, in both countries, childlessness is more frequent in low income groups, and it increases over time. From 1932 to 1967, childlessness in Sweden increased in the bottom third of the income distribution from 28% to 41%, and from 10% to about 22% in the top third of the income distribution. In the USA, childlessness increased from 6% in the 1932-1937 cohort to 44% in the 1963-1967 cohort in the lowest income group, and from 8% to 13% in the highest income group. The increase is larger for low income groups than for high income groups.[11] Focusing on the parental generation (pooled across all income groups), Sweden has a higher prevalence of childlessness than the USA. For the child generation,

[11] Boschini et al. (2011) argue that assortative mating patterns may explain the increase in childlessness among (Swedish) men. Since women traditionally form unions with men of similar or higher qualification levels, the improved educational attainment levels for women may have led to a relative scarcity of suitable partners for low educated men.

on the other hand, differences are considerably smaller, and confidence intervals are largely overlapping.

Second, the average number of children follows an income gradient in both countries, with poorer men having more children. For Sweden however, although statistically significant, the income gradient is rather small. The average number of children is furthermore declining over time, though this trend is more pronounced for the USA than it is for Sweden. From 1932 to 1967, the average number of children in the bottom third of the income distribution decreased from 2.52 to 2.08 in Sweden. In the top 33% of the income distribution, it decreased from 2.34 to about 2.05. In the USA, the average number of offspring decreased from 3.86 in the 1932-1937 cohort to 2.82 in the 1963-1967 cohort in the lowest income group, and from about 3.25 to about 2.32 in the highest income group. The decrease in the average number of children in the USA is furthermore driven by the pre-1953 cohorts, for which the country differences are largest as well.

Figure 5 focuses on income gradients more directly, with a sample split into pre- and post 1953 periods to distinguish between the parental generation and offspring. Most confidence intervals around the corresponding point estimates are disjoint, with the exception of the middle and top income groups for the USA. As discussed above, income gradients in the number of offspring are small for Sweden, but larger for the USA.

There might be concern that the differences in the intensive margin are driven by men with a particularly large number of offspring. In figure 6, I therefore show the distribution of the number of offspring by income groups. The left column presents the distributions for Sweden, and the right column presents the distributions for the USA. The upper, middle and lower panel indicate the bottom, middle and top third of the income distribution, respectively. We see that while the distribution of number of children exhibits fatter tails in the USA, a larger mass is concentrated at three and four children, so that men with a particularly large number of offspring do not drive our results. In the following, I top-code the number of offspring at 6 since the tails in both countries are thin at larger offspring counts.

In summary, a higher fraction of men in Sweden remain childless, and those with children have fewer than their American counterparts. There is furthermore an income gradient in childlessness, with low-income groups being more likely to stay childless than high-income groups, and an income gradient in the number of offspring, with low-income groups having more children on average than high-income groups. The income gradient on the intensive fertility margin is more pronounced in the USA than in Sweden.

5 Fertility differences and intergenerational income mobility

Statistical decompositions and counterfactual simulations can provide insights into how important these fertility differences are for intergenerational mobility estimates. For this purpose I decompose the intergenerational income mobility measures into group-wise contributions. Let $g = 1, ...G$ indicate groups in the population according to the father's number of offspring. Following Hertz (2008) we can then decompose the IGE into

$$\hat{\beta} = \sum_g \pi_g \left(\hat{\beta}_g \frac{\hat{\sigma}^2_{y^p_g}}{\hat{\sigma}^2_{y^p}} + \frac{(\bar{y}^p_g - \bar{y}^p)(\bar{y}^c_g - \bar{y}^c)}{\hat{\sigma}^2_{y^p}} \right) \tag{3}$$

where π_g indicates group g's relative share in the population, $\hat{\beta}_g$ the group-specific elasticity, $\hat{\sigma}^2_{y^p_g}$ the estimated variance of parental income in group g, $\hat{\sigma}^2_{y^p}$ the estimated variance of parental income over all groups, $\bar{y}^p$ and $\bar{y}^c$ the means of parents' and children's income, and $\bar{y}^p_g$ and $\bar{y}^c_g$ the means of parents' and children's income in group g. Let us furthermore define the scaled within-group elasticity as $\tilde{\beta}_g := \hat{\beta}_g \hat{\sigma}^2_{y^p_g} / \hat{\sigma}^2_{y^p}$, the between-group effect as $b_g := (\bar{y}^p_g - \bar{y}^p)(\bar{y}^c_g - \bar{y}^c)/\hat{\sigma}^2_{y^p}$, and the unweighted contribution of group g as $\delta_g := \tilde{\beta}_g + b_g$.

Similarly, Spearman's rank correlation coefficient can be decomposed into:

$$\hat{\rho} = \sum_g \pi_g \left(\hat{\rho}_g \frac{\hat{\sigma}_{r^p_g} \hat{\sigma}_{r^c_g}}{\hat{\sigma}_{r^p} \hat{\sigma}_{r^c}} + \frac{(\bar{r}^p_g - \bar{r}^p)(\bar{r}^c_g - \bar{r}^c)}{\hat{\sigma}_{r^p} \hat{\sigma}_{r^c}} \right) \tag{4}$$

with equivalent definitions as above. For ease of notation, I refer to $\hat{\beta}$ and $\hat{\rho}$ as $\hat{\omega}$, and to $\tilde{\beta}$ and $\tilde{\rho}$ as $\tilde{\omega}$.

This decomposition highlights the distinction between the group-specific transmission of economic outcomes $\hat{\omega}_g$, and the between-group contribution b_g. The between-group contribution consists of the parental deviation from the overall mean $(\bar{y}^p_g - \bar{y}^p)/\hat{\sigma}_{y^p}$, which I denote by z^p_g, and the corresponding difference on the offspring level $(\bar{y}^c_g - \bar{y}^c)/\hat{\sigma}_{y^p}$, which I denote by z^c_g. For the rank correlation, the corresponding expressions are $(\bar{r}^p_g - \bar{r}^p)/\hat{\sigma}_{r^p}$ and $(\bar{r}^c_g - \bar{r}^c)/\hat{\sigma}_{r^c}$, where I similarly denote each component by z^p_g and z^c_g. The first term accounts for average income differences between groups, i.e. the income-fertility gradient, while the latter term reflects average differences in child outcomes by sibship size, which is the primary concern of the literature on the quantity-quality trade off.

To shed light on group-specific patterns of intergenerational mobility, between-group contributions need to be taken into account separately since within-group mobility estimates ignore group-specific mean differences. The latter is problematic for at least two reasons: first, individuals of a given group may be confined to certain parts of the overall distribution, indicating long term persistence of economic outcomes not reflected in $\hat{\omega}_g$. For instance, if father-son pairs in which the father has a large number of offspring are confined to the bottom of the income distribution, then within this part of the distribution the sons may appear mobile, yet overall they are still confined to the bottom. Second, as evidenced by the literatures on differential fertility and the child quantity-quality trade off, income-fertility gradients and effects of sibship size on child outcomes are potentially important. By focusing on the variation around group-specific means, within-group estimates are uninformative about these effects to the extent that they are captured in average group differences. It is thus necessary to take both $\tilde{\omega_g}$ and b_g into account for group-specific comparisons. I follow Hertz (2008)'s proposal and use the group-specific contribution δ_g as a measure of the group-specific intergenerational persistence capturing both within- and between-group differences.

The above decomposition additionally provides a framework for counterfactual simulations that can be used to assess the importance of differences along both fertility margins. Differences along the intensive margin can be addressed by changing the relative weights π_g and income gradients can be manipulated with b_g. Differences along the extensive margin can be addressed by imputing hypothetical values for missing individuals. Before I present these counterfactual simulations, I establish baseline estimates and the decomposition into within and between-group contributions.

5.1 Mobility estimates

Within-group estimates: Table 3 presents IGE and rank correlation estimates, both for all fathers regardless of their number of children ($g = any$), as well as for fathers with a specific number of offspring ($g \in 1, \ldots, 6$). The former represent baseline estimates that are methodologically similar to estimates commonly reported in mobility studies, and the latter represent the within-group estimates. The baseline estimates show that Sweden is more mobile than the USA, both in terms of the intergenerational elasticity (0.27 vs. 0.44) and in terms of rank correlations (0.25 vs. 0.36). They are furthermore well aligned with the existing literature. For instance, Corak (2006) report preferred elasticity estimates of 0.27 for Sweden and 0.47 for the USA in a review of relevant studies. Blanden (2009) reports very similar preferred elasticity estimates for both countries in another review. Findings from rank correlations tend to be similar. See e.g. Mazumder (2015) for PSID results, as well as Corak et al. (2014) and Nybom & Stuhler (2015) for results on Swedish data.[12]

The within-group point estimates indicate that Sweden is more mobile across all groups, though note that US metrics are imprecisely estimated. This is reflected in formal tests, also presented in table 3: Out of twelve group-specific comparisons, only 4 differences are significantly different from zero on the 5%

[12] The exception is Corak et al. (2014)'s preferred estimate of the US rank correlation, which is lower than other estimates and on par with the Swedish rank correlation.

level, and 5 on the 10% level. Regarding the relationship between within-group estimates and the number of offspring, I find that within-group estimates are decreasing in the number of offspring, similar to results reported by Lindahl (2008). This pattern is more pronounced for the IGE than for the rank correlation, though. For the USA, within-group estimates appear more unstable than Swedish estimates. For instance, the IGE for American men with only one child is estimated to be 0.76, which is unusually large. The corresponding rank correlation appears more reasonable, although the rank correlation for American men with two children (0.29) appears low compared to American men with one (0.55) or three (0.49) children.

Between group contributions: To move from within-group estimates to mobility metrics that take between-group contributions into account, I present the constituent parts of the decomposition according to equations 3 and 4 in figure 7. The left panel contains the decomposition of the intergenerational elasticity, and the right panel contains the rank correlation. I first present the sample weight π_g and then the within-group estimate for the mobility metric $\hat{\beta}$ or $\hat{\rho}$. In the third row I show the scaled metric $\tilde{\beta}$ or $\tilde{\rho}$, before I present the between-group component b_g and the group-specific persistence measure δ_g.

Figure 7 highlights that while within-group estimates indicate that a larger number of offspring is associated with higher mobility, the picture is more nuanced when between-group differences are taken into account. This is due to two effects: first, the within-group estimates are scaled with the ratio of the group-specific standard deviations to the overall standard deviation in income (or ranks). These scaled within-group estimates follow more closely an inverse-u shaped relationship in the number of offspring. Second, between-group contributions are added, and between-group contributions tend to be large for men with many offspring, thus accentuating the persistence among this group. Using δ_g as the preferred group-specific persistence measure reveals that the latter effect dominates in Sweden and a larger number of offspring is associated with a higher degree of intergenerational persistence. In the USA, on the other hand, the persistence tends to decrease in the number of offspring, though due to the instability in US estimates definite statements are difficult to make.

Some country-specific differences in between-group contributions and fertility patterns are worth pointing out. In Sweden, the largest between-group differences are observed for men with five and more children. In the USA, large between-group differences can be observed for men with six or more children, but also for men with only one child. The distribution of the number of offspring exacerbates this contrast as there are only few men with five or more children in Sweden, and comparatively many men with a large number of offspring in the USA. The weighted sum of the between-group contributions to the IGE ($\sum_g \pi_g b_g$) amounts to 0.01 for Sweden and to 0.06 for the USA. This highlights the relative importance of between-group differences: Given that the absolute difference between the Swedish and American IGE is 0.17, it follows that the difference in between-group components (i.e. 0.05) accounts for almost a third of the of the cross-country difference. The corresponding values for rank correlations are very similar.

5.2 Counterfactual scenarios:

Using the decompositions of $\hat{\beta}$ and $\hat{\rho}$ outlined in equations 3 and 4, I simulate counterfactual values for the IGE and the rank correlation under different scenarios, changing one parameter at a time. It is important to stress that this kind of counterfactual thought experiment amounts to an accounting exercise, which is not to be mistaken for evidence generated from randomized controlled trials or natural experiments. Rather, these simulations are useful to highlight potentially important sources of cross-country differences.

I investigate the following three scenarios:

First, to quantify the role of within- and between-group contributions, I calculate both countries' mobility metrics without between-group effects ($b = 0$) and without within-group effects ($\tilde{\omega} = 0$). Second, to shed light on the importance of different parts of the decomposition, I simulate mobility metrics using identical parameters for each country. I do this for the distribution of the number of offspring π, the within-group effects $\tilde{\omega}$, the parental income-fertility gradient z^p, the offspring's fertility-outcome gradient z^c, and the entire between group contribution b. Third, to account for differences on the extensive margin, I compute possible values for the mobility metrics for a situation in which all childless individuals (i.e. $g = 0$) would have had children. In this respect, observe that with the exception of $\hat{\beta}_0$ and y_0^c for the IGE, and $\hat{\rho}_0, r_0^c$ and $s_{r_0^c}$ for the rank correlation, we observe all relevant variables necessary to add this group to the composition in equations 3 and 4. I impute values for the missing offspring as the average of corresponding outcomes of children that belong to the 10 observationally most similar fathers, with similarity being assessed via a nearest neighbor algorithm using year of birth, income, income rank, years of education, and marital as well as employment status in 1990. Using hypothetical values for the remaining unknown parameter $\hat{\beta}_0$ and $\hat{\rho}_0$, I can thus bound the effects of childlessness on mobility metrics using either perfect within-group mobility or perfect within-group inheritance of economic outcomes. That is, assuming $\hat{\omega}_0 = 0$ yields an lower bound, and assuming $\hat{\omega}_0 = 1$ yields an upper bound.

All results are presented in table 4.[13] The first three columns indicate IGE estimates, and the last three columns indicate rank correlations. I first report results for Sweden, then for the USA, and then I present the ratio of the counterfactual difference Δ^* to the baseline cross-country difference Δ, which is 0.17 for the IGE and 0.11 for the rank correlation. To evaluate these results relative to the basic estimation uncertainty, I present 95% confidence intervals for the

[13] The main constituent parts of the decompositions are presented in tables 7 and 8

baseline estimates in table 5, and indicate counterfactual values that lie outside of these intervals in bold in table 4.

These counterfactual scenarios lead to the following five observations: First, by setting $b = 0$ or $\tilde{\omega} = 0$, we learn that about two thirds of the cross-country difference originates from differences in within-group estimates, and about a third of the cross-country difference can be explained by differences in between-group contributions. Hence, both parts play a non-negligible role in creating the gap between Swedish and American mobility metrics, though within-group transmission of economic outcomes constitutes the dominant part. However, note that the estimation uncertainty is large for the USA, which implies that US mobility metrics with $b = 0$ remain within the 95% confidence interval of the baseline estimates.

Second, applying the Swedish distribution for the intensive fertility margin (i.e. π) to the USA or applying the US distribution to Sweden both increase corresponding IGE estimates. For the US case, a larger fraction with fewer children leads to a higher IGE due to the relatively large within-group estimate for men with few offspring. For Sweden, the between-group component for men with a large number of offspring outweighs the lower within-group component, and US weights for these groups are several times larger than the corresponding Swedish weights. This has the following implications for the cross-country differences: applying the Swedish distribution to the USA increases the cross-country difference substantially, both in terms of the IGE but also in terms of the rank correlation. Applying the US distribution to both countries decreases the difference since mobility metrics for Sweden indicate a stronger persistence for men with many offspring, which are more frequent in the USA.

Third, applying Swedish within-group estimates to both countries comes close to equalizing mobility metrics, while applying American within-group estimates to both countries reverses the mobility ranking in terms of the IGE, but equalizes rank correlations. The reversal of the IGE is an artifact of the large within-group estimate for American men with one offspring, though. This is discussed in greater detail below.

Fourth, applying various components of the between-group contributions reveals that neither changing z^p nor z^c substantially affects mobility metrics. While applying the Swedish income-fertility gradient to the USA raises the IGE and the rank correlation to some extent, the increase is small compared to the baseline estimation uncertainty. The same holds true for changing the fertility-child outcome gradient, which tends to only marginally decrease US mobility metrics. Only the application of the American between-group component b, i.e. the interaction between z^p and z^c, leads to substantial increases in Swedish mobility metrics and a reduction of the cross-country difference by 29% and 31% for the IGE and rank correlation, respectively.

Fifth, the bounding exercise gives the following results: First, the bounding exercise yields substantial changes in mobility metrics only for Sweden, which reflects that childlessness is more prevalent in Sweden and estimation uncertainty lower relative to the USA. Regarding the implied country-differences: if the same lower bounds are applied to both countries, the cross-country difference for the IGE stays roughly the same, though the difference for the rank correlations decreases. This is because the Swedish rank correlation decreases relatively less than the American rank correlation, so that the difference between both countries becomes smaller. On the other hand, applying the same upper bound to both countries results in converging mobility metrics. The possibility of differential selection across countries provides further insights. For a situation in which $\hat{\beta}_0^{Sweden} = 1$ and $\hat{\beta}_0^{USA} = 0$, the cross-country difference would be as small as 0.05 for the IGE, and 0.04 for the rank correlation. This provides two important insights: first, the country differences in mobility metrics could indeed be sensitive to differential patterns of selection into parenthood. However, the upper bound of 0.35 for the Swedish IGE is still lower than the lower bound of 0.4 for the USA, which leads to the second insight from this exercise: Sweden remains more mobile than the USA even when we take extreme scenarios for childless individuals into account.

It is an open question to what extent the above results are influenced by potentially unreliable within-group estimates for the USA. In particular, the value of $\hat{\beta}_1^{US}$ =0.76 and $\hat{\rho}_2^{US}$ =0.29 appear questionable, given the surrounding values. To assess the importance of these two within-group estimates, I extrapolate the value of $\hat{\beta}_1^{US}$ and interpolate the value of $\hat{\rho}_2^{US}$ based on a second-order polynomial approximation. This yields values of 0.42 for the IGE, and 0.43 for the rank correlation, both of which are more in line with other within-group estimates. Using these values I recreate table 4 in table 6, which shows that all main conclusions are qualitatively similar, with the exception that using the American within-group estimates, the cross-country difference is largely diminished rather than reversed. This establishes that this earlier finding is indeed the consequence of the large IGE estimate for American men with one offspring.

Overall, these results provide three major insights: First, if we measure the importance of different parameters by the magnitude of the induced change in the cross-country difference, then the within-group components $\tilde{\beta}$ and $\tilde{\rho}$ are most important, followed by differences along the intensive fertility margin π. Second, the extensive fertility margin potentially matters in a situation with differential selection into parenthood in both countries. Given the dearth of research on selection into parenthood in general, and for men as well as across countries in particular, it is however difficult to attach likelihoods to such a scenario. Third, neither income-fertility gradients z^p nor fertility-child outcome gradients z^c are by themselves sufficiently different across countries as to make a substantial difference for mobility metrics. The increase in Swedish mobility metrics when using the American between-group components may hint at a potential role for an interaction between z^p and z^c, although the change in American mobility metrics is small when using the Swedish equivalent.

6 Conclusion

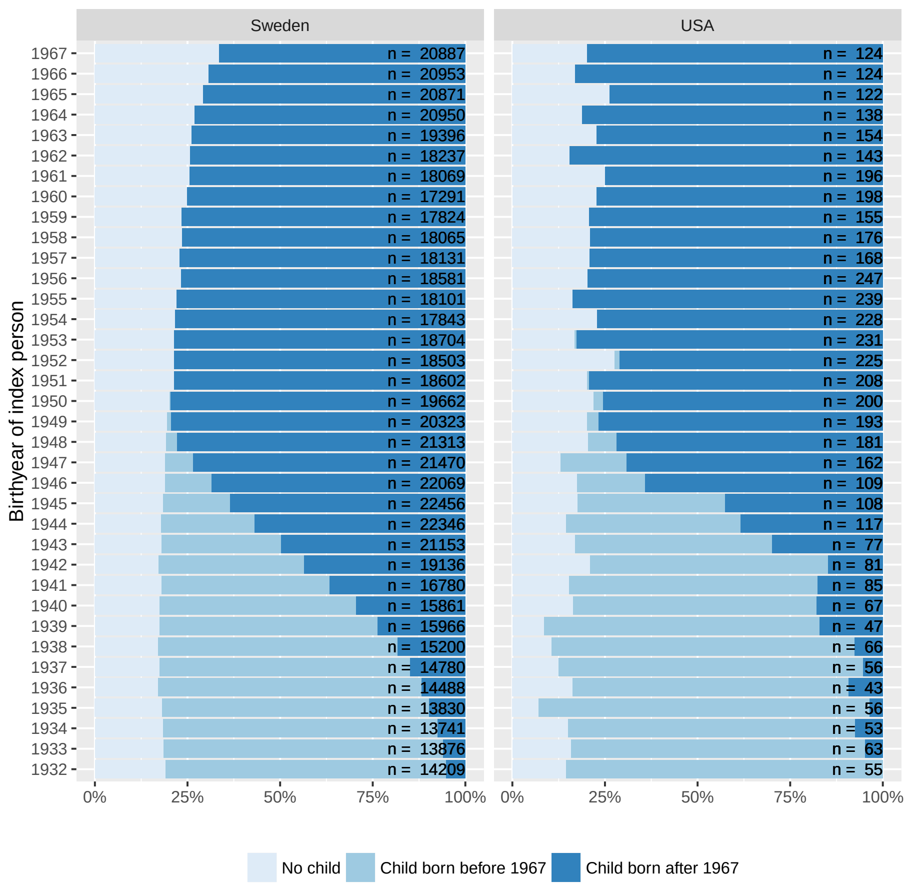
Intergenerational mobility estimates differ across countries and cross-country fertility differences are one potential source for these differences. In this paper I contrast fertility patterns of Sweden and the USA to establish differences in fertility patterns between both countries. I furthermore use a simple decomposition exercise to document how intergenerational persistence varies by the number of children within both countries, as well as how important differences in fertility patterns are for cross-country differences in mobility parameters.

I find that a larger fraction of men remains childless in Sweden, and those with children have fewer than their American counterparts. Both fertility margins follow an income gradient: low-income groups are more likely than high income groups to stay childless, though conditional on having at least one child low income is associated with a larger number of offspring. The income gradient on the intensive fertility margin is more pronounced in the USA, though. Regarding the within-country association between intergenerational persistence and fertility, I find that a larger number of offspring is associated with stronger intergenerational persistence in Sweden, but with less persistence in the USA.

Decomposing the sample into groups defined by the number of offspring allows to distinguish between within- and between-group contributions, as well as to shed light on the importance of the population composition. I find that about 2/3 of the cross-country difference comes from differences in within-group and 1/3 from between-group components. Neither the income-fertility gradient nor the fertility-child outcome gradient by themselves are very different across countries, though, albeit an interaction between both may be relevant. The population composition, however, plays an important part in shaping cross-country mobility differences. Since a low number of offspring is more prevalent in Sweden, and a large number of offspring more common in the USA, this implies that in both countries low-persistence groups receive large weights. If the USA had the Swedish population composition in terms of number of offspring, the cross-country difference would increase by at least 26% due to relatively larger weights on high-persistence groups, i.e. fathers with few offspring. Similarly, if Sweden had the US population composition, the cross-country difference would decrease by at least 17%. This is because of an increase in Swedish mobility metrics due to larger weights on fathers with many offspring – a group exhibiting stronger persistence. Under some scenarios, cross-country differences in mobility metrics are furthermore sensitive to differential selection into parenthood, though the prevalence of the latter is difficult to ascertain due to the lack of research in this area.

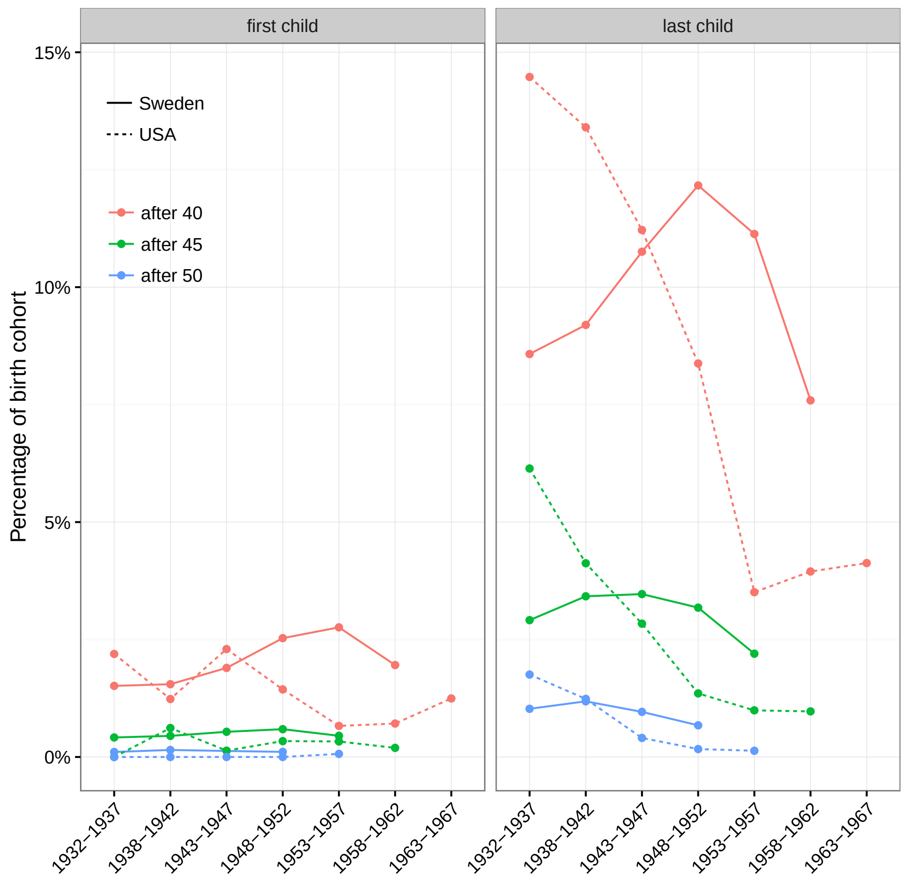
In general, this paper documents that mobility metrics are sensitive to the fertility parameters in a given country, and given the startling scarcity of research linking fertility and intergenerational persistence, the fertility-mobility nexus is a promising avenue for future research.

Figure 1: Sample sizes Sweden and USA



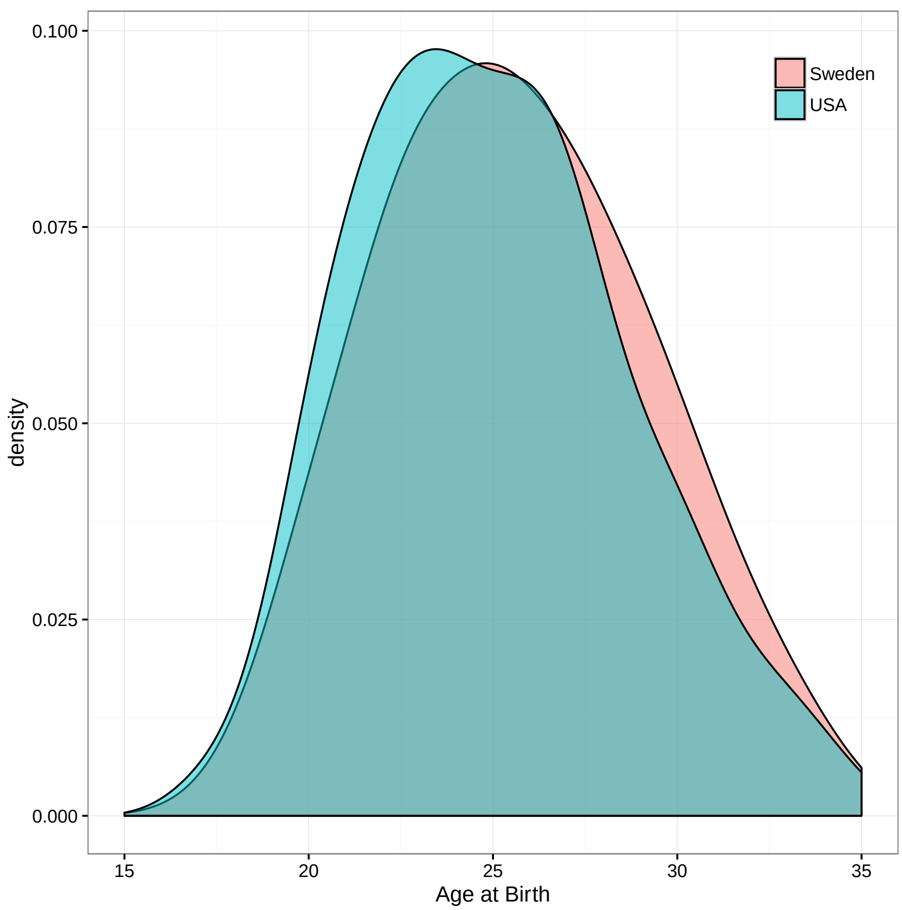
Sample sizes of overlapping cohorts of men in the Swedish Multigeneration Register and the Panel Study of Income Dynamics. For Sweden, fertility outcomes are observed until 2007. For the USA, fertility outcomes are observed until 2013, and the age of the last valid update of the birth history data is restricted to be at least 40.

Figure 2: Fraction of men having children above age 40, 45 or 50



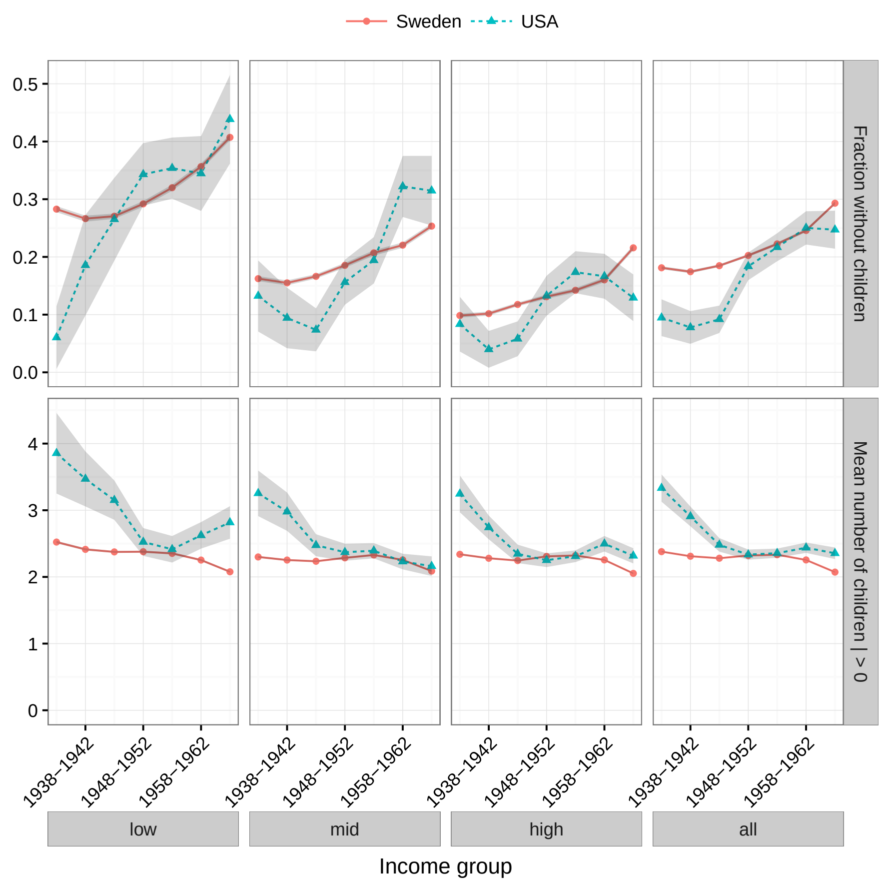
Share of Swedish and American men whose first and last child was born after the age of 40, 45 and 50, by birth cohort. The birth of the first child reflects a change along the extensive fertility margin. The birth of the last child, indicating the intensive fertility margin, provides information about the age at which completed fertility is observed.

Figure 3: Distribution of age at birth for parents with child born before 1967



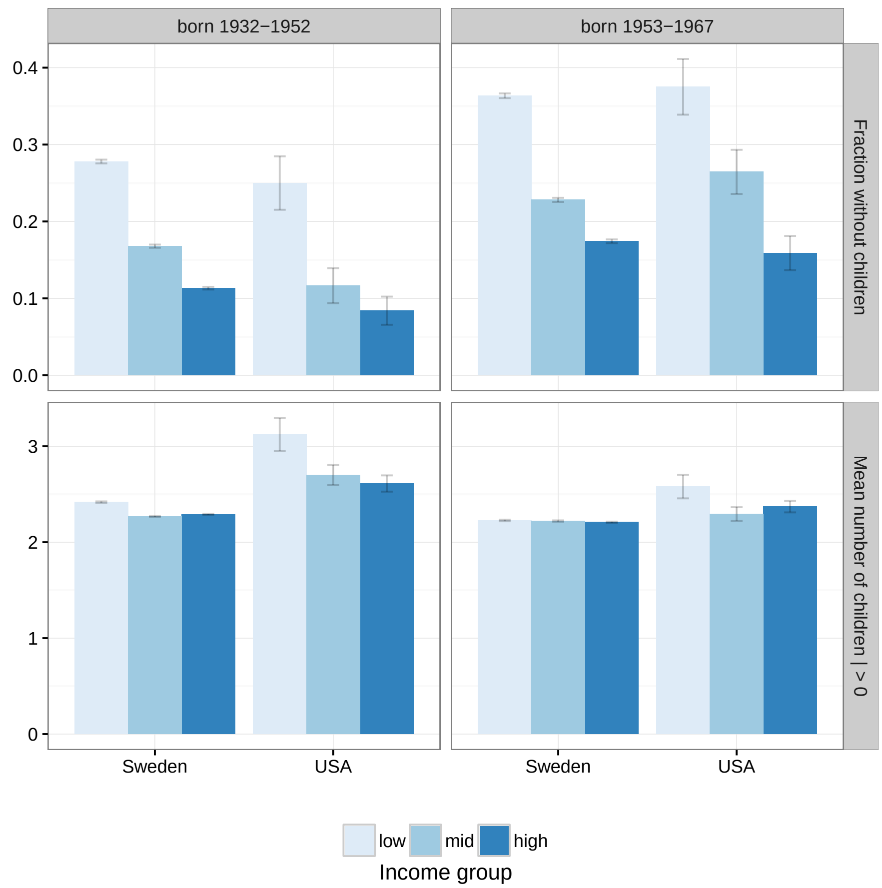
A comparison of the distribution of the age at birth for parents with a child born anytime before 1967, by country.

Figure 4: Fertility Margins by Income Groups over Time



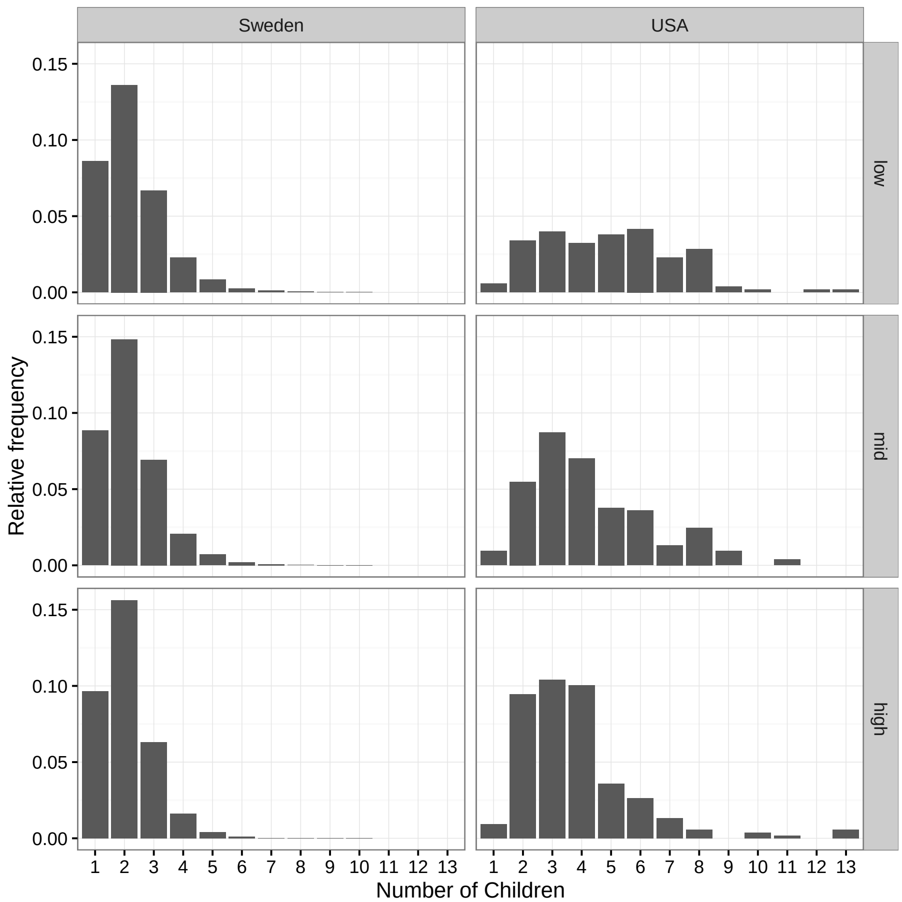
Fertility margins in Sweden and the USA, by birth cohorts and income groups. The shaded area indicates 95% confidence intervals. Low, mid and high indicate individuals in the bottom 33%, middle 33%, and top 33% of the cohort specific income distribution.

Figure 5: Income Gradients of Fertility Margins



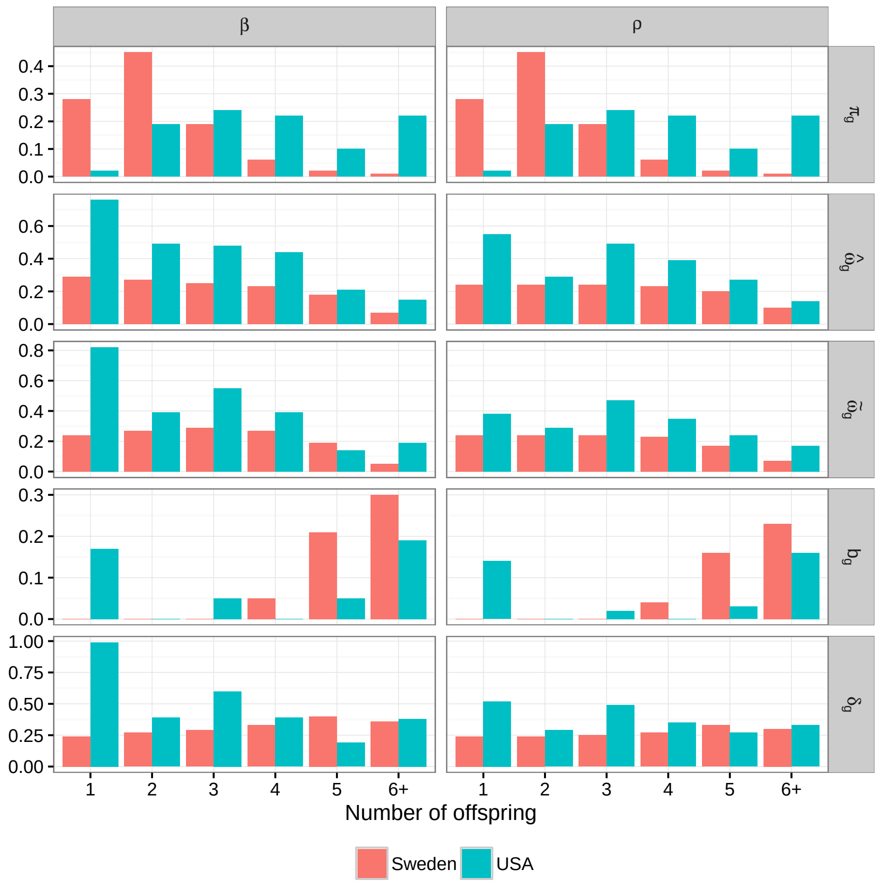
Income gradients of fertility margins in Sweden and the USA, pre and post 1952. Error bars indicate 95% confidence intervals for the corresponding means.

Figure 6: Number of Children by Income Groups



Relative frequency of the number of children by income groups: low, mid and high refer to the bottom 33%, middle 33% and top 33% of the income distribution in the parental generation.

Figure 7: Decomposition of mobility metrics



Various components of the decomposition according to equations 3 and 4. The left panel represents the constituent parts of the decomposition for the intergenerational income elasticity, and the right panel represents the corresponding parts for the rank correlation. The upper row shows the corresponding sample weights π_g. The second row shows the within-group estimates, with w as a placeholder for β and ρ. The third row shows the within-group estimates scaled by the ratio of standard deviations of the corresponding income measures. The fourth row shows the between group components b_g (with values below 0.005 rounded to 0), and the last row indicates the group-specific measure of intergenerational persistence δ_g.

Table 1: Descriptive statistics

	Sweden	USA
log income child	10.46	10.78
	(0.43)	(0.61)
log income father	10.31	10.88
	(0.39)	(0.50)
avg num offspring	2.12	3.77
	(1.00)	(1.93)
avg age at birth	25.60	25.05
	(3.72)	(3.67)
n	91659	450

Descriptive statstics for Sweden and the USA (weighted). Standard deviations are reported in parentheses. Income refers to individual labor income averaged over all available income observations over the ages 30 to 45.

Table 2: Frequencies of Father's Total Number of Children

Number of Children	Sweden	%	USA	%	Δ
1	25228	27.52	10	2.22	-25.30
2	41009	44.74	86	19.11	-25.63
3	17845	19.47	109	24.22	4.75
4	5200	5.67	99	22.00	16.33
5	1674	1.83	45	10.00	8.17
6	450	0.49	44	9.78	9.29
7	180	0.20	19	4.22	4.03
8	54	0.06	21	4.67	4.61
9	15	0.02	6	1.33	1.32
10	4	0.00	3	0.67	0.66
11	0	0.00	3	0.67	0.67
12	0	0.00	1	0.22	0.22
13	0	0.00	4	0.89	0.89

Table 3: ESTIMATES BY NUMBER OF CHILDREN

	Num Children	Sweden	SE	USA	SE	Δ	$pval(\Delta = 0)$
$\hat{\beta}$	any	0.27	(0.004)	0.44	(0.054)	0.17	0.00
	1	0.29	(0.007)	0.76	(0.228)	0.47	0.04
	2	0.27	(0.005)	0.49	(0.145)	0.21	0.14
	3	0.25	(0.007)	0.48	(0.114)	0.23	0.04
	4	0.23	(0.013)	0.44	(0.109)	0.21	0.05
	5	0.18	(0.022)	0.21	(0.162)	0.03	0.85
	6+	0.07	(0.040)	0.15	(0.105)	0.08	0.47
$\hat{\rho}$	any	0.25	(0.002)	0.36	(0.030)	0.12	0.00
	1	0.24	(0.004)	0.55	(0.211)	0.30	0.15
	2	0.24	(0.003)	0.29	(0.069)	0.05	0.45
	3	0.24	(0.005)	0.49	(0.061)	0.25	0.00
	4	0.23	(0.009)	0.39	(0.064)	0.16	0.01
	5	0.20	(0.015)	0.27	(0.095)	0.08	0.41
	6+	0.10	(0.024)	0.14	(0.063)	0.04	0.56

Estimates of mobility metrics by number of children for Sweden and the USA. $\hat{\beta}$ represents the intergenerational income elasticity, and $\hat{\rho}$ represents the rank correlation. Δ indicates the country-difference and $pval(\Delta = 0)$ indicates the p-value for a test of no difference between both estimates. *any* indicates baseline estimates, using all father-son pairs regardless of the number of children.

Table 4: Counterfactual scenarios

	$\hat{\beta}$			$\hat{\rho}$		
	Sweden	USA	Δ^*/Δ	Sweden	USA	Δ^*/Δ
baseline	0.27	0.43	1.00	0.25	0.36	1.00
$b = 0$	**0.26**	0.37	0.67	**0.24**	0.32	0.66
$\tilde{\omega} = 0$	**0.01**	**0.06**	0.33	**0.01**	**0.05**	0.34
$\pi = \pi^{Sweden}$	0.27	**0.59**	1.98	0.25	0.40	1.26
$\pi = \pi^{USA}$	**0.32**	0.43	0.70	**0.27**	0.36	0.80
$\tilde{\omega} = \tilde{\omega}^{Sweden}$	0.27	**0.28**	0.06	0.25	**0.24**	-0.03
$\tilde{\omega} = \tilde{\omega}^{USA}$	**0.55**	0.43	-0.69	**0.36**	0.36	0.04
$z^p = z^{p,Sweden}$	0.27	0.46	1.15	0.25	0.38	1.15
$z^p = z^{p,USA}$	0.27	0.43	1.00	0.24	0.36	1.03
$z^c = z^{c,Sweden}$	0.27	0.42	0.88	0.25	0.35	0.89
$z^c = z^{c,USA}$	0.27	0.43	1.02	0.24	0.36	1.03
$b = b^{Sweden}$	0.27	0.47	1.23	0.25	0.39	1.24
$b = b^{USA}$	**0.32**	0.43	0.71	**0.28**	0.36	0.69
$\hat{\omega}_0 = 0$	**0.24**	0.40	1.04	**0.22**	0.32	0.86
$\hat{\omega}_0 = 1$	**0.35**	0.48	0.78	**0.28**	0.37	0.77

Various intergenerational persistence metrics for Sweden and the USA based on counterfactual scenarios. b indicates between group effects, $\tilde{\omega}$ scaled within group estimates, π the sample composition in terms of number of offspring, z^p and z^c the father's as well as the sons' contribution to the between group effect. Superscript *Sweden* or *USA* indicates that either the Swedish or the American value has been imposed on both countries. Δ^*/Δ indicates the ratio of the counterfactual cross-country difference Δ^* to the actual cross-country difference Δ. Bold indicates that the corresponding metric lies outside the 95% confidence interval of the baseline estimates.

Table 5: 95% Confidence Intervals

		low CI	high CI
$\hat{\beta}$	Sweden	0.27	0.28
	USA	0.33	0.54
$\hat{\rho}$	Sweden	0.24	0.25
	USA	0.28	0.44

Table 6: Counterfactual scenarios, using adjusted US within-group estimates

	$\hat{\beta}$			$\hat{\rho}$		
	Sweden	USA	Δ^*/Δ	Sweden	USA	Δ^*/Δ
baseline	0.27	0.42	1.00	0.25	0.39	1.00
$b = 0$	**0.26**	0.36	0.65	**0.24**	0.34	0.72
$\tilde{\omega} = 0$	**0.01**	**0.06**	0.35	**0.01**	**0.05**	0.28
$\pi = \pi^{Sweden}$	0.27	0.48	1.38	0.25	**0.46**	1.46
$\pi = \pi^{USA}$	**0.32**	0.42	0.69	**0.27**	0.39	0.83
$\tilde{\omega} = \tilde{\omega}^{Sweden}$	0.27	**0.28**	0.07	0.25	**0.24**	-0.03
$\tilde{\omega} = \tilde{\omega}^{USA}$	**0.44**	0.42	-0.07	**0.42**	0.39	-0.21
$z^p = z^{p,Sweden}$	0.27	0.45	1.16	0.25	0.41	1.12
$z^p = z^{p,USA}$	0.27	0.42	1.00	0.24	0.39	1.03
$z^c = z^{c,Sweden}$	0.27	0.41	0.88	0.25	0.38	0.91
$z^c = z^{c,USA}$	0.27	0.42	1.03	0.24	0.39	1.02
$b = b^{Sweden}$	0.27	0.46	1.24	0.25	0.42	1.19
$b = b^{USA}$	**0.32**	0.42	0.69	**0.28**	0.39	0.75
$\hat{\omega}_0 = 0$	**0.24**	0.40	1.05	**0.22**	0.34	0.86
$\hat{\omega}_0 = 1$	**0.35**	0.47	0.78	**0.28**	0.39	0.79

Similar to table 4, but using adjusted within-group estimates for the USA. In particular, based on a second-order polynomial fit, the values $\hat{\beta}_1^{US} = 0.42$ and $\hat{\rho}_2^{US} = 0.43$ are used.

Table 7: IGE Decomposition

country	g	π_g	$\hat{\beta}_g$	$\sigma_{y^p_g}$	σ_{y^p}	$\tilde{\beta}_g$	z^p	z^c	b_g	δ_g
Sweden	1	0.275	0.286	0.356	0.387	0.243	-0.010	0.081	-0.001	0.242
	2	0.447	0.274	0.382	0.387	0.266	0.068	0.041	0.003	0.269
	3	0.195	0.249	0.418	0.387	0.290	-0.004	-0.082	0.000	0.291
	4	0.057	0.232	0.421	0.387	0.274	-0.216	-0.243	0.052	0.327
	5	0.018	0.182	0.394	0.387	0.188	-0.528	-0.402	0.212	0.400
	6+	0.008	0.072	0.337	0.387	0.055	-0.621	-0.491	0.305	0.359
USA	1	0.022	0.757	0.523	0.502	0.822	0.513	0.324	0.166	0.988
	2	0.191	0.487	0.451	0.502	0.394	-0.016	0.054	-0.001	0.393
	3	0.242	0.482	0.535	0.502	0.549	0.212	0.237	0.050	0.600
	4	0.220	0.444	0.472	0.502	0.393	0.008	0.093	0.001	0.394
	5	0.100	0.213	0.413	0.502	0.145	-0.094	-0.513	0.048	0.193
	6+	0.224	0.154	0.553	0.502	0.187	-0.415	-0.470	0.195	0.382

Table 8: Rank correlation decomposition

country	g	$\hat{\rho}_g$	$\sigma_{r^p_g}$	σ_{r^p}	$\sigma_{r^c_g}$	σ_{r^c}	$\tilde{\rho}_g$	z^p	z^c	b_g	δ_g
Sweden	1	0.242	0.247	0.252	0.270	0.267	0.239	-0.007	0.032	-0.000	0.239
	2	0.243	0.250	0.252	0.268	0.267	0.241	0.074	0.036	0.003	0.244
	3	0.242	0.257	0.252	0.265	0.267	0.245	-0.019	-0.036	0.001	0.246
	4	0.231	0.256	0.252	0.262	0.267	0.229	-0.239	-0.165	0.039	0.269
	5	0.196	0.235	0.252	0.243	0.267	0.166	-0.520	-0.309	0.161	0.326
	6+	0.098	0.205	0.252	0.235	0.267	0.070	-0.610	-0.370	0.226	0.296
USA	1	0.546	0.180	0.236	0.202	0.221	0.381	0.440	0.311	0.137	0.519
	2	0.295	0.228	0.236	0.224	0.221	0.290	0.014	0.073	0.001	0.291
	3	0.493	0.221	0.236	0.222	0.221	0.465	0.155	0.132	0.021	0.486
	4	0.392	0.232	0.236	0.199	0.221	0.348	0.049	0.097	0.005	0.353
	5	0.275	0.223	0.236	0.206	0.221	0.243	-0.080	-0.387	0.031	0.274
	6+	0.138	0.274	0.236	0.235	0.221	0.171	-0.426	-0.374	0.159	0.330

References

Aaronson, Daniel, Fabian Lange & Bhashkar Mazumder (2014): "Fertility Transitions along the Extensive and Intensive Margins". In: *American Economic Review* 104.11, pp. 3701–24.

Åslund, Olof & Hans Grönqvist (2010): "Family size and child outcomes: Is there really no trade-off?" In: *Labour Economics* 17.1, pp. 130–139.

Angrist, Joshua, Victor Lavy & Analia Schlosser (2010): "Multiple Experiments for the Causal Link between the Quantity and Quality of Children". In: *Journal of Labor Economics* 28.4, pp. 773–824.

Balbo, Nicoletta, Francesco C. Billari & Melinda Mills (2013): "Fertility in Advanced Societies: A Review of Research". In: *European Journal of Population* 29.1, pp. 1–38.

Baudin, Thomas, David de la Croix & Paula E. Gobbi (2015): "Fertility and Childlessness in the United States". In: *American Economic Review* 105.6, pp. 1852–82.

Becker, Gary S. (1960): "An Economic Analysis of Fertility". In: *Demographic and Economic Change in Developed Countries*. NBER Chapters. National Bureau of Economic Research, Inc, pp. 209–240.

Becker, Gary S & H Gregg Lewis (1973): "On the Interaction between the Quantity and Quality of Children". In: *Journal of Political Economy* 81.2, pp. 279–88.

Becker, Gary S & Nigel Tomes (1976): "Child Endowments and the Quantity and Quality of Children". In: *Journal of Political Economy* 84.4, pp. 143–62.

Björklund, Anders & Laura Chadwick (2003): "Intergenerational income mobility in permanent and separated families". In: *Economics Letters* 80.2, pp. 239–246.

Björklund, Anders & Markus Jäntti (2009): "Intergenerational Income Mobility and the Role of Family Background". In: *The Oxford Handbook of Economic Inequality*. Ed. by Brian Nolan, Wiemer Salverda & Timothy M. Smeeding. Oxford Handbooks. Oxford University Press.

Björklund, Anders, Tor Eriksson, Markus Jäntti, Oddbjørn Raaum & Eva Österbacka (2004): "Family structure and labor market success: the influence of siblings and birth order on the earnings of young adults in Norway, Finland, and Sweden". In: *Generational Income Mobility in North America and Europe*. Ed. by Miles Corak. Cambridge Books Online. Cambridge University Press, pp. 207–225.

Björklund, Anders, Karin Hederos Eriksson & Marianne Sundström (2011): *Children of Unknown Fathers: Prevalence and Outcomes in Sweden*. Working Paper Series 6/2011. Swedish Institute for Social Research.

Black, Sandra E. & Paul J. Devereux (2011): "Recent Developments in Intergenerational Mobility". In: ed. by O. Ashenfelter & D. Card. Vol. 4. Handbook of Labor Economics. Elsevier. Chap. 16, pp. 1487–1541.

Black, Sandra E., Paul J. Devereux & Kjell G. Salvanes (2005): "The More the Merrier? The Effect of Family Size and Birth Order on Children's Education". In: *The Quarterly Journal of Economics* 120.2, pp. 669–700.

Blake, Judith (1989): *Family Size and Achievement*. University of California Press.

Blanden, Jo (2009): *How Much Can We Learn from International Comparisons of Intergenerational Mobility?* CEE Discussion Papers 0111. Centre for the Economics of Education, LSE.

Boschini, Anne, Christina Håkanson, Åsa Rosén & Anna Sjögren (2011): *Trading off or having it all? Completed fertility and mid-career earnings of Swedish men and women*. Working Paper Series 2011:15. IFAU - Institute for Evaluation of Labour Market and Education Policy.

Cáceres-Delpiano, Julio (2006): "The Impacts of Family Size on Investment in Child Quality". In: *Journal of Human Resources* 41.4.

Conley, Dalton & Rebecca Glauber (2006): "Parental Educational Investment and Children's Academic Risk: Estimates of the Impact of Sibship Size and Birth Order from Exogenous Variation in Fertility". In: *Journal of Human Resources* 41.4.

Corak, Miles (2006): *Do Poor Children Become Poor Adults? Lessons from a Cross Country Comparison of Generational Earnings Mobility*. IZA Discussion Papers 1993. Institute for the Study of Labor (IZA).

Corak, Miles, Matthew J. Lindquist & Bhashkar Mazumder (2014): "A comparison of upward and downward intergenerational mobility in Canada, Sweden and the United States". In: *Labour Economics* 30.C, pp. 185–200.

Fan, C. Simon & Jie Zhang (2013): "Differential fertility and intergenerational mobility under private versus public education". In: *Journal of Population Economics* 26.3, pp. 907–941.

Grawe, Nathan D. (2006): "Lifecycle bias in estimates of intergenerational earnings persistence". In: *Labour Economics* 13.5, pp. 551–570.

Haider, Steven & Gary Solon (2006): "Life-Cycle Variation in the Association between Current and Lifetime Earnings". In: *American Economic Review* 96.4, pp. 1308–1320.

Hanushek, Eric A (1992): "The Trade-Off between Child Quantity and Quality". In: *Journal of Political Economy* 100.1, pp. 84–117.

Hertz, Tom (2008): "A group-specific measure of intergenerational persistence". In: *Economics Letters* 100.3, pp. 415–417.

Hillmert, Steffen (2013): "Analysing Intergenerational Transmissions: From Social Mobility to Social Reproduction". In: *Class and Stratification Analysis*. Chap. 11, pp. 131–157.

Jäntti, Markus & Stephen P. Jenkins (2015): "Chapter 10 - Income Mobility". In: *Handbook of Income Distribution*. Ed. by Anthony B. Atkinson & Francois Bourguignon. Vol. 2. Handbook of Income Distribution. Elsevier, pp. 807–935.

Kiser, Clyde V. (1960): "Differential Fertility in the United States". In: *Columbia University Press*.

Lindahl, Lena (2008): "Do birth order and family size matter for intergenerational income mobility? Evidence from Sweden". In: *Applied Economics* 40.17, pp. 2239–2257.

Liu, Haoming (2014): "The quality–quantity trade-off: evidence from the relaxation of China's one-child policy". In: *Journal of Population Economics* 27.2, pp. 565–602.

Lundborg, Petter, Erik Plug & Astrid Würtz Rasmussen (2014): *Fertility Effects on Female Labor Supply: IV Evidence from IVF Treatments.* IZA Discussion Papers 8609. Institute for the Study of Labor (IZA).

Mare, Robert D. (1997): "Differential Fertility, Intergenerational Educational Mobility, and Racial Inequality". In: *Social Science Research* 26.3, pp. 263–291.

Mazumder, Bhashkar (2015): *Estimating the Intergenerational Elasticity and Rank Association in the U.S.: Overcoming the Current Limitations of Tax Data*. Working Paper Series WP-2015-4. Federal Reserve Bank of Chicago.

Miettinen, Anneli, Anna Rotkirch, Ivett Szalma, Annalisa Donno & Maria-Letizia Tanturri (2015): "Increasing childlessness in Europe: time trends and country differences". In: *Families and Society Working Paper Series.*

Mogstad, Magne & Matthew Wiswall (2016): "Testing the Quantity-Quality Model of Fertility: Estimation using Unrestricted Family Size Models". In: *Quantitative Economics.*

Musick, Kelly & Robert D. Mare (2004): "Family Structure, Intergenerational Mobility, and the Reproduction of Poverty: Evidence for Increasing Polarization?" In: *Demography* 41.4, pp. 629–648.

Nybom, Martin & Jan Stuhler (2015): *Biases in standard measures of intergenerational income dependence*. Working Paper Series 2015:13. IFAU - Institute for Evaluation of Labour Market and Education Policy.

Panel Study of Income Dynamics, public use dataset. Produced and distributed by the Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI (2016).

Rosenzweig, Mark R & Kenneth I Wolpin (1980): "Testing the Quantity-Quality Fertility Model: The Use of Twins as a Natural Experiment". In: *Econometrica* 48.1, pp. 227–40.

Rosenzweig, Mark R. & Junsen Zhang (2009): "Do Population Control Policies Induce More Human Capital Investment? Twins, Birth Weight and China's "One-Child" Policy". In: *Review of Economic Studies* 76.3, pp. 1149–1174.

Ruscio, John (2008): "Constructing Confidence Intervals for Spearman's Rank Correlation with Ordinal Data: A Simulation Study Comparing Analytic and Bootstrap Methods". In: *Journal of Modern Applied Statistical Methods* 7.2.

SCB (2011): *Multi-generation register 2010 - A description of contents and quality*. Tech. rep. 2011:2. Statistics Sweden.

Schytt, E., A.B.V. Nilsen & E. Bernhardt (2014): "Still childless at the age of 28 to 40 years: A cross-sectional study of Swedish women's and men's reproductive intentions". In: *Sexual & Reproductive Healthcare* 5, pp. 23–29.

Skirbekk, Vegard (2008): “Fertility trends by social status”. In: *Demographic Research* 18.5, pp. 145–180.

Solon, Gary (1989): “Biases in the Estimation of Intergenerational Earnings Correlations”. In: *The Review of Economics and Statistics* 71.1, pp. 172–74.

— (1999): “Intergenerational mobility in the labor market”. In: *Handbook of Labor Economics*. Ed. by O. Ashenfelter & D. Card. Vol. 3. Handbook of Labor Economics. Elsevier. Chap. 29, pp. 1761–1800.

— (2002): “Cross-Country Differences in Intergenerational Earnings Mobility”. English. In: *The Journal of Economic Perspectives* 16.3, pp. 59–66.

Song, Xi & Robert D. Mare (2014): “Prospective Versus Retrospective Approaches to the Study of Intergenerational Social Mobility”. In: *Sociological Methods & Research*.

Tanturri, Maria Letizia, Melinda Mills, Anna Rotkirch, Tomáš Sobotka, Judit Takács, Anneli Miettinen, Cristina Faludi, Venetia Kantsa & Despina Nasiri (2015): “Childlessness in Europe”. In: *Families and Societies Working Paper Series* 32.

Vogl, Tom S. (2015): “Differential Fertility, Human Capital, and Development”. In: *The Review of Economic Studies*.

Westoff, Charles F. (1954): “Differential Fertility in the United States: 1900 to 1952”. In: *American Sociological Review* 19.5, pp. 549–561.

Zhang, Li (2011): *Male Fertility Patterns and Determinants*. Springer Series on Demographic Methods and Population Analysis 27. Springer.