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Descriptive Finding

Explaining Swedish sibling similarity in fertility: Parental fertility behavior vs. social background

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Descriptive Finding

Explaining Swedish sibling similarity in fertility: Parental fertility behavior vs. social background

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Abstract

OBJECTIVE
The aim of this descriptive study is to determine which of the family-specific factors, parental fertility behavior or social background, matters most for the intergenerational transmission of fertility.

METHODS
Brother and sister correlations in age at first birth and final family size were estimated using multilevel linear regression on data covering 242,976 Swedish men and women born between 1958 and 1967. To explore how much of siblings' similarity in fertility can be explained by parental fertility behavior (age at parenthood and number of children) and social background, we analyzed the decrease in sibling correlation when these family-specific factors were added to the unconditional models.

RESULTS
We found that most of siblings' similarity in fertility could not be explained by parental fertility behavior and social background, but that they explained a substantive part of siblings' similarities in age at first birth and a smaller but non-negligible part of siblings' similarities in completed fertility. Parental fertility behavior and social background explain as much (about 36%) of brothers' and sisters' similarities in age at first birth. Parental fertility behavior matters more than social background for sisters' similarities in completed family size. Parental fertility behavior and social background explain about the same (5%) for brothers' similarities in completed family size.

CONTRIBUTION
This study contributes to the existing understanding of intergenerational transmission of fertility; both methodologically, by introducing a new method to estimate the impact of specific factors shared by siblings, and by determining how much of siblings'

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resemblance in fertility can be explained by parental fertility behavior and social background.

1. Introduction

The study of parental influence on fertility has been a subject of ongoing interest in social sciences for over a century (e.g., Pearson, Lee, and Bramley-Moore 1899; Murphy 1999). Previous research on the association between the number of siblings and completed family size has found a weak yet persistent correlation, usually ranging between 0.10 and 0.15 (for a thorough review of one hundred years' of research, see Murphy 1999). The association between parents' and their children's age at first birth has received less attention, with the partial exception of the transmission of teenage motherhood (e.g., Campa and Eckenrode 2006).

However, a limitation of these studies is that they consider only one aspect of family background: parents' number of children or their age at parenthood. Family background represents a broader set of life 'circumstances' than simply family size and parents' age at first birth. We argue that a comprehensive measurement of family background (where we compare siblings to capture all aspects of family background) has many advantages over an intergenerational design (where covariates of parents are correlated with covariates of children). An alternative method – sibling correlations (SC) – has only recently been introduced in research on intergenerational transmission of fertility (Dahlberg 2013). Comparable methods within fertility research have been used in attempts to estimate the heritability of fertility (e.g., Rodgers et al. 2001), although the adopted approach has been criticized (e.g., Vetta and Courgeau 2003). Although not their main focus, two studies using Dutch historical data report sister correlations for age at marriage, which historically has been closely related to age at first birth (van Poppel, Monden, and Mandemakers 2008; van Bavel and Kok 2009). Previous research has shown that in Sweden the overall variation in fertility that can be explained by the family of origin is approximately 15% to 25% for women and 10% to 15% for men (Dahlberg 2013)

However, while the existence of intergenerational transmission of fertility is well documented, the causes and mechanisms behind it are less explored. In a systematic review, Bernardi (2016) summarizes genetic and socioeconomic heritability and socialization as the three main transmission mechanisms of fertility across generations. In this descriptive study we use sister and brother correlations in Swedish register data to explore and estimate how much of siblings' similarity in fertility can be explained by two family-specific factors, namely parental fertility behavior, an aspect of socialization

related to fertility preferences and ideals, and social background (which we use to refer to observed socioeconomic parental traits). By doing so we aim to determine which of these two family-specific factors matters the most for the intergenerational transmission of fertility.

Previous research has highlighted positive and negative effects of accelerated or postponed timing of parenthood (Dahlberg 2016: 20–27). If potentially (dis)advantageous family demographic behaviors are shaped by the family of origin, they can also affect the intergenerational reproduction of (dis)advantage (McLanahan and Percheski 2008). Below we give a brief summary of previous explanations of family influence on fertility.

Traditionally, genetic heritability of fecundity has been suggested as an important mechanism for intergenerational correlations in fertility. It is also possible that genetic heritability of other characteristics that are associated with fertility could explain the genetic heritability of fertility. Twin-based studies have attempted quantifying the share of variance in fertility apparently related to shared genetic factors (e.g., Rodgers et al. 2001), although Vetta and Courgeau (2003) found the quantification problematic.

Social background has often been presented, but not as frequently tested, as an intermediate factor between parents' and children's fertility behaviors. Since educational enrollment and career building have been shown to be important determinants of the timing of parenthood (e.g., Andersson 2000; Hoem 2000) and educational attainment and occupational status are predicted by social background (e.g., Breen and Jonsson 2005), researchers studying intergenerational correlation of fertility have regularly acknowledged that socioeconomic characteristics shared by parents and children are a potential key explanation. Most commonly, education has been argued to be an important mediating variable explaining the correlation between parents and their children's fertility (e.g., Barber 2001; Rijken and Liefbroer 2009). However, previous research has shown that different dimensions of social background – education, occupational class, status – affect the fertility behaviors of offspring independently of each other (Dahlberg 2015).

The socialization of preferences, ideals, and values regarding childbearing (e.g., Johnson and Stokes 1976) is commonly included in research on intergenerational transfer of fertility, using parents' age at first birth and number of siblings (cf. Murphy 1999). It is difficult to observe and measure parental fertility norms and the extent to which they are transmitted to their children, but it is possible to evaluate the observed fertility of parents. Previous research has examined if intergenerational correlations remain after controlling for socioeconomic similarity (e.g., Kolk 2014; Booth and Kee 2009) and largely finds that the magnitude of intergenerational relations are similar after controls. Similarly, an unplanned increase in the number of siblings (through a twin birth) does not affect fertility later in life (Kolk 2015), suggesting the importance

of intergenerational value transmission rather than a direct effect of family size during upbringing as an explanation for intergenerational correlations. In our study we examine the overall family resemblance in fertility, and are able to net out the effect of observed parental fertility behavior from overall correlations in fertility between siblings. Thus, we can examine how much of intragenerational correlation can be explained by the observed fertility of parents. See Bernardi (2016) and Dahlberg (2016: 35–41) for more thorough reviews of the suggested mechanisms behind intergenerational correlation in fertility.

2. Data and methods

2.1 Data

Data was retrieved from the Swedish multigenerational registers, which contain information on all Swedes born from 1932 onwards who have been registered as residents in Sweden at any time since 1961.

When analyzing how much of sibling similarity in fertility can be explained by the family-specific factors of parental fertility behavior and social background, we limited the population to ten cohorts. The analyses include Swedish-born full biological siblings born between 1958 and 1967. Siblings with half-siblings, foreign-born parents, or who have ever been adopted, died, or emigrated before age 45, were excluded from the analysis. Thus, the selection of the study population was relatively stringent. Biological parents were identified for 99% of those who met these criteria.

Both women's and men's age at first birth and completed fertility at age 45 were measured. Our analyses include 88,358 women and 83,595 men when analyzing age at parenthood and 117,560 women and 130,438 men for completed family size. 35% of individuals had at least one same-sex full sibling within the age limits.

2.2 Main predictors and family-specific factors

The main outcome is sibling correlation in age at parenthood and final family size. Two sets of family-specific factors – broadly categorized as parental fertility behavior and social background – were included in the analysis to explore how much of siblings' similarly in fertility they explain. To assess parental fertility behavior, the traditional measures to explain similarities across generations – age at first child and number of siblings – were used. When analyzing brother correlation we included information on the father's age at fatherhood, while the mother's age at first birth was used when

analyzing sister correlation. To assess socioeconomic characteristics within a family of origin, both mothers' and fathers' highest level of education and information on the parents' occupation were used. Mothers' and fathers' occupation were included, using the International Standard Classification of Occupations (ISCO). We included three aspects of social background, since previous research has shown that different indicators of social background – education, occupational class, and status – affect the adult child's fertility independently of each other (Dahlberg 2015). To capture the impact of both occupational class and occupational status we included detailed information on parents' occupation (by using dummies for approximately 300 different ISCO categories), rather than categories of parents' occupational class or occupational status.

2.3 Method

A sibling correlation can be thought of as an omnibus measure of the importance of family of origin and community effects. It includes everything shared by siblings: genes, the parents' family demographic behaviors, the parents' education and socioeconomics, cultural inheritance, and influences not directly experienced in the family, such as school and neighborhood effects. Genetic traits not shared by siblings, differential treatment of siblings, and time-dependent changes in the neighborhood are captured by the individual component. If the non-shared factors are more important than the shared factors, the variance of the family effects will be small relative to the variance of the individual effects, and the sibling correlation will be low. Our contribution in this paper is to include potentially important shared family factors, both one at a time and simultaneously. These additional factors shared by siblings produce a lower estimate of the between-family variation than the estimate produced before the added control for parental characteristics.

We used multilevel OLS regressions to estimate sibling correlations in completed fertility and the age at first birth. The unconditional model involves no covariates at either the individual or family level. The multilevel OLS model without covariates (unrestricted model) is

$$y_{ij} = \mu + a_i + b_{ij}, \quad (1)$$

where y_{ij} is the number of children (or age at first birth) for sibling j from family i, μ is the population mean, a_i is a family-specific factor shared by all siblings from family i, and b_{ij} is an individual-specific factor unique to individual j from family i. Assuming

that a_i and b_{ij} are independent and normally distributed, the variance of y_{ij} is the sum of variances of family and individual factors:

$$\sigma_y^2 = \sigma_a^2 + \sigma_b^2. \quad (2)$$

The proportion of total variance, explained by shared family background, is

$$\rho = \frac{\sigma_a^2}{\sigma_a^2+\sigma_b^2}, \quad (3)$$

which is the sibling correlation (SC) (e.g., Mian, Shoukri, and Tracy 1991). Since σ_a^2 and σ_b^2 cannot be negative, ρ takes on values between 0 and 1. Zero indicates that there is no influence from family of origin – thus siblings are as (dis)similar as two randomly paired individuals – and 1 indicates that all variation in fertility can be attributed to the family of origin and that siblings are maximally similar (Field 2005).

a_i in Equation (1) is

$$a_i = \alpha_i + u_i, \quad (4)$$

where α_i is the intercept (that siblings share within family *i*) and u_i is the error term (the dissimilarity between siblings within family *i*). To explore which family-specific factors explain sibling similarity, we add family-specific factors (x_{in}) to equation (4)

$$a_i = \alpha_i + \alpha_1 x_{i1} + \alpha_2 x_{i2} + \cdots + \alpha_n x_{in} + u_i. \quad (5)$$

These additional family-specific factors reduce the residual variation in the outcome variable and produce lower sibling correlations. The proportional decrease in sibling correlation when family-specific factor x is added to the model equals the percentage of sibling similarity that the family-specific factor x explains (Raudenbush and Bryk 2002).

We report these estimates for men and women separately. Previous research has shown that women generally are more influenced by their family of origin, both in terms of socioeconomics (Björklund, Lindahl, and Lindquist 2010) and family demographic behavior (e.g., Booth and Edwards 1990; Dahlberg 2018). It has been argued that parents' influence over their children declines as the child grows older, and since women on average are younger than men when they enter parenthood they are also more responsive to family background (Rossi and Rossi 1990). Thus, including brothers and sisters in the same analysis could potentially generate incorrect estimations, since opposite-sex siblings are not necessarily exposed to the same family-specific factors.

3. Results

Our main results are shown in Table 1. We start by reporting the results of the unconditional models, followed by the impact of parental fertility behavior and social background for age at first birth, and end by reporting the results of the same family-specific factors for completed family size.

Table 1: Multilevel linear regression estimates of the importance of parental fertility behavior and social background for sister and brother correlations in age at first birth and completed fertility

	Sister correlation age at first birth (95% CI)	Proportion of sister correlation explained	Sister correlation completed fertility (95% CI)	Proportion of sister correlation explained	Brother correlation age at first birth (95% CI)	Proportion of brother correlation explained	Brother correlation completed fertility (95% CI)	Proportion of brother correlation explained
Unconditional model								
Model 1	0.262 (0.254–0.271)		0.133 (0.129–0.138)		0.176 (0.171–0.181)		0.116 (0.111–0.123)	
Parental fertility behavior								
Model 2 (Number of siblings)	0.249 (0.241–0.258)	5.0%	0.124 (0.116–0.131)	7.0%	0.168 (0.159–0.177)	4.4%	0.112 (0.105–0.120)	3.3%
Model 3 (Mother's/ father's age at first birth)	0.213 (0.204–0.222)	18.8%	0.125 (0.117–0.132)	6.0%	0.146 (0.137–0.155)	17.2%	0.113 (0.105–0.120)	3.2%
Model 4 (Models 2 + 3)	0.207 (0.200–0.216)	20.8%	0.120 (0.111–0.126)	10.7%	0.142 (0.134–0.152)	18.9%	0.110 (0.103–0.118)	5.3%
Social background								
Model 5 (Parental education)	0.209 (0.201–0.218)	20.1%	0.129 (0.122–0.137)	3.0%	0.142 (0.132–0.150)	19.6%	0.116 (0.109–0.123)	0.0%
Model 6 (Parent's occupational class, parent's occupational status)	0.197 (0.190–0.205)	25.0%	0.124 (0.116–0.131)	7.0%	0.133 (0.124–0.142)	24.5%	0.110 (0.103–0.117)	5.3%
Model 7 (Model 5 + 6)	0.188 (0.180–0.197)	25.2%	0.123 (0.115–0.130)	7.7%	0.127 (0.118–0.137)	27.7%	0.110 (0.103–0.117)	5.4%
Full model								
Model 8 (Model 4 + 7)	0.162 (0.154–0.174)	38.1%	0.112 (0.104–0.119)	15.7%	0.113 (0.104–0.121)	36.0%	0.103 (0.096–0.110)	11.2%
Number of Individuals	87,715		115,785		82,755		127,191	
Number of families	41,816		54,877		39,508		60,155	

The baseline sister correlations (Model 1) are 0.262 for age at first birth and 0.133 for completed family size. For men, the brother correlations from the unconditional model are 0.176 for age at fatherhood and 0.116 for completed family size. Thus,

approximately 18% of the variation in the age at fatherhood and 26% of the age at entering motherhood in Sweden can be explained by factors shared by the siblings. Furthermore, about 11% of completed fertility among men and just above 13% of completed fertility among women are explained by the same factors.

In models 2 to 4 we include the traditional measures of parental fertility behavior. The mother's age at first birth and number of siblings explain approximately the same share of sister correlations as the father's age at first birth and number of siblings do for brother correlations. Number of siblings explains 5% of sisters' similarity in age at first birth (Model 2), mother's age at first birth explains nearly 19% (Model 3), and these two family-specific factors together explain almost 21%. For men, the corresponding factors explain slightly less of brothers' similarities in age at fatherhood. Number of siblings explains somewhat more than 4% of brothers' similarity in age at first birth, father's age at first birth explains just above 17%, and together they explain approximately 19%. Models 5 through 7 include family social background factors. Parental education explains about 20% each of sisters' and brothers' similarity in age at parenthood (Model 5), parental occupation explains approximately 25%, and together they explain about 28%. Model 8, where both measurements of parental fertility behavior and both measurements of social background are included simultaneously, shows that parental fertility behavior and social background together explain 38% of sisters' similarity in age at first birth and 36% of brothers' similarity in age at fatherhood.

Number of siblings explains about 3% of brother correlation in completed fertility (Model 2), mother's age at first birth also explains around 3% (Model 3), and these two shared family factors together explain somewhat more than 5%. For women, the corresponding factors each explain approximately 6% of sisters' similarity in completed fertility, and 11% together. Social background, included as parental education, does not substantially explain any brother similarity in completed family size (Model 5). Parents' occupation explains approximately 5% of brothers' similarity in completed fertility (Model 6). For women, parental education together with parents' occupation explains approximately 8% of sisters' similarity in completed fertility (Model 7). When both measurements of parental fertility behavior and both measurements of social background are included simultaneously (Model 8), 16% of sisters' similarity and 11% of brothers' similarity in completed fertility are explained.

4. Conclusions

The aim of this descriptive study was to determine which of the two common explanations – parental fertility behavior or social background – matters the most for intergenerational family resemblance in fertility. We did this by examining if observed parental characteristics such as fertility behavior and socioeconomic status can explain why siblings resemble each other. We found that most of the resemblance could not be explained by parental fertility behavior and social background, but that they explained a substantive part of siblings' similarities in age at first birth and a smaller but non-negligible part of siblings' similarities in completed fertility. Thus, the main conclusion is that parents' age at parenthood, number of siblings, and social background all matter for sibling similarities in fertility, but that other aspects of family background are more substantial for the timing of first birth and completed family size.

Regarding the importance of parental fertility behavior versus social background for explaining siblings' similarities in age at first birth, the results show that social background matters the most. Both parental fertility behavior and social background substantially matter for explaining sibling similarities in age at parenthood, but the share of explained similarity is greater for measurements of social background than for measurements of the parents' fertility behavior. Concerning the importance of parental fertility behavior versus social background for explaining siblings' similarities in completed fertility, it turns out that parental fertility behavior matters more than social background. For men, social background and parental fertility behavior explain only a small share of brother similarity in completed fertility. For women, social background explains a non-negligible but still smaller part of sisters' similarity in completed fertility than parental fertility behavior. The results also show that a substantially greater share of sister correlations than brother correlations in completed fertility is explained by parental fertility behavior. However, our choice of studying a relatively homogeneous group in a fixed context makes the results more difficult to directly generalize outside Sweden's population.

Our results are consistent with previous research that has examined intergenerational resemblance in fertility, rather than intergenerational similarity (Kolk 2014; Cools and Hart 2017). The current results present further evidence that it is cultural and social values and preferences among parents that appear to explain why there is a familial component to fertility choices, even though other aspects of the family background are also substantial for timing of first birth. Actual observed parental fertility behavior only captures a small share of such unobserved parental influences. In the current study we further show that such parental values are not necessarily related to the fertility choices of the parents.

The fact that the family of origin has a greater impact on the age at parenthood than on the final family size may partly be explained by the relatively small variation in completed family size and because as parity increases the likelihood of an intended pregnancy decreases (Denton and Scott 1994). However, timing of parenthood is more of an active choice, and shows greater heterogeneity in Sweden. Factors such as relationship status (Perelli-Harris et al. 2012), completed education, establishment in the labor market (Andersson 2000), and a settled housing situation (Ström 2010) have all been proved important factors in the decision to enter parenthood. This might explain why both observed parental fertility choices and parental background explain more of the familial component for timing of first birth than completed fertility.

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