Nonlinearities in the Intergenerational Transmission of Fertility

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Abstract

This paper departs from the existing literature on the intergenerational transmission of fertility, which has focused on the linear impact of an additional sibling on fertility. Instead, we investigate whether individuals from small (one-child) and large (four or more children) families are disproportionately likely or unlikely to have small and large families themselves. Using association models and ordered logistic and logistic regression models, we find strong evidence for the reproduction of large families and more limited evidence for the reproduction of small families in the US. Our results reflect cohort changes but are robust across subgroups with different marital status, educational levels, religions and political affiliations. The evidence points to a polarization of fertility behavior within the population, which may be driven by a polarization of fertility preferences or social inequality limiting access to reproductive and economic resources.

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Introduction

There is by now strong evidence that the number of children that an individual has is correlated with the number of siblings that he or she has. This transmission of fertility across generations has been attributed to a mixture of biological and socioeconomic mechanisms, including transmission of fecundity, fertility preferences and socioeconomic characteristics. Using Danish registry data, Murphy and Knudsen (2002) find that the transmission of fertility cannot be fully explained by the transmission of socioeconomic characteristics. Again using Danish registry data but restricting their analysis to monozygotic and dizygotic twins, Kohler, Rodgers and Christensen (1999) argue that the intergenerational transmission of fertility is attributable in part to genetic transmission of childbearing preferences, and that the relative importance of these genetic influences has grown over time as fertility control becomes more viable and acceptable.

This paper departs from the existing empirical literature on the intergenerational transmission of fertility, which has largely focused on the linear impact of an additional sibling on fertility. Instead, we investigate whether individuals from small (one-child) and large (four or more children) families are disproportionately likely or unlikely to have small and large families themselves. The reproduction of small families may be particularly weak or strong, since only children may a) feel that they have missed out on the experience of having a sibling and wish to provide their own children with this experience, or alternatively, b) be less likely to buy into the common perception that only children are lonely if their own experiences were positive. The logic is similar for large families: children from these families may a) find having a large number of siblings limited each child's access to privacy or parental resources, or b) be more likely to appreciate the benefits of having a large family if their own experiences were positive. Finally, the reproduction of large families could also be the result of lower levels of reproductive knowledge or access to resources among disadvantaged population subgroups.

Nonlinearities in the intergenerational transmission of fertility may have particularly strong policy implications for countries with very low fertility or high social inequality. In low-fertility countries, strong reproduction of small families may further depress fertility and help to explain why German and Austrian women of prime childbearing ages, who are more likely to come from small families than other European women, have below-replacement ideal family sizes (Goldstein, Lutz and Testa 2003). In high-inequality countries, strong reproduction of large families may point to the presence of unequal access to reproductive and economic resources, as well as to a potential mechanism behind the intergenerational transmission of poverty and social inequality.

We are aware of only one other study which has explored whether fertility transmission depends on family size. Using data from the British Household Panel Survey, Booth and Kee (2009) find that the linear effect of an additional sibling is larger for women with more children. As we show later under the Methods section, these results do not provide clear evidence of reproduction of small or large families. Our analysis, which follows two different empirical approaches, finds strong evidence for the reproduction of large families and more limited evidence for the reproduction of small families in the US. The results reflect cohort changes but are robust across subgroups with different marital status, educational levels, religions and political affiliations. Our evidence points to a polarization of fertility behavior within the population, which may be driven by a polarization of fertility preferences or social inequality limiting access to reproductive and economic resources.

Data

Our analysis is based primarily on data from the 1978-2010 General Social Survey (GSS), obtained online from the National Data Program for the Sciences at the University of Chicago. The GSS was conducted every year and then every other year from 1994, giving 22 years of data. We restrict our sample to white and black respondents born in the US who were aged 40 to 70 at the time of survey, since this age group is old enough to have completed childbearing but not old enough to be greatly affected by differential mortality across socioeconomic groups. Our final sample size is 17,984 after excluding 78 observations for who there was missing data for two key variables: a) number of siblings ever born, including step-siblings and adopted siblings, and b) number of children ever born, including children from previous marriages. The observations are reweighted to give equal weight to observations from all household sizes.

One drawback of using the GSS for our purposes is that the GSS does not collect data on birth order or distinguish between full siblings, step-siblings and adopted siblings. Anderton et al. (1987) find that the intergenerational transmission of fertility is stronger among women of lower birth order, which suggests that our results for large families should be less likely to be significant since individuals from large families are more likely to be of higher birth orders. Murphy and Knudsen (2002), on the other hand, find no evidence that birth order affects transmission of fertility in their Danish registry data. They also find that half-siblings and full siblings have similar marginal effects on fertility.

For comparative purposes, we compare our results for the US to those for two European and four East Asian countries. For European countries, we use data from the International Social Survey Programme (ISSP), obtained from the ISSP website. Information on number of siblings and children were collected only in the 1986 and 2001 waves of the survey. We restrict our sample to Austria and Hungary, which are the only two countries which appear in both waves and have sampling weights. As before, we restrict our samples to respondents who were aged 40 to 70 at the time of survey. The average sample size for each country is 1,156. For East Asian countries, we use data from the East Asian Social Survey (EASS), which is a compilation of data from the Chinese General Social Survey, the Japanese General Social Surveys, the Korean General Social Survey and the Taiwan Social Change Survey, obtained online from the EASS Data Archive. These surveys collect data on number of siblings and children; however, fertility data for unmarried respondents are missing. Since non-marital fertility is rare in these countries, we assume that these individuals have no children. Once again, we restrict our samples to respondents who were aged 40 to 70 at the time of survey to get an average sample size of 966 for each country.

Table 1 below shows the decline in the prevalence of large families in the US: among earlier birth cohorts (1915-1939), the majority of Americans came from large families and around a third had large families themselves; among later birth cohorts (1940-1964), the majority of Americans continued to come from large families, but less than 15% had large families themselves. The decline was less marked in Austria and Hungary, where large families were less common to begin with, but far more precipitous in East Asia, where there was a marked shift towards two-child families. Correspondingly, the prevalence of one-child families grew among all cohorts in all countries and has eclipsed the proportion of large families in all countries except Taiwan.

Table 1: Summary statistics by country

	% of sample						
	GSS	ISSP		EASS			
	US	Austria	Hungary	China	Japan	South Korea	Taiwan
Origin family							
Cohorts 1915-1939							
No sibling	7.03	20.21	20.74	-	-	-	-
One sibling	14.88	22.30	28.10	-	-	-	-
Three or more siblings	62.30	37.28	33.53	-	-	-	-
Cohorts 1940-1964							
No sibling	4.66	15.91	15.71	4.77	5.69	1.15	0.72
One sibling	16.99	24.36	34.22	9.08	25.86	5.10	2.99
Three or more siblings	58.25	36.74	25.39	71.89	41.20	82.73	86.83
Destination family							
Cohorts 1915-1939							
One child	10.27	20.21	32.17	-	-	-	-
Two children	23.79	31.01	36.24	-	-	-	-
Four or more children	32.51	16.72	6.78	-	-	-	-
Cohorts 1940-1964							
One child	15.19	19.65	23.98	39.81	12.98	12.34	7.31
Two children	32.62	33.99	38.71	32.28	52.04	55.76	37.13
Four or more children	14.42	10.02	5.75	8.47	2.36	8.88	16.53
Characteristics							
Gender and race							
Male	44.68	43.86	43.45	45.26	43.35	47.37	50.06
White	86.07	-	-	-	-	-	-
Marital status							
Married	60.15	-	-	-	-	-	-
Divorced, separated or widowed	31.12	-	-	-	-	-	-
Single	8.72	-	-	-	-	-	-
Education							
Less than high school	19.45	-	-	-	-	-	-
High school	51.78	-	-	-	-	-	-
More than high school	28.64	-	-	-	-	-	-
Religion							
Fundamental Protestant	33.02	-	-	-	-	-	-
Moderate Protestant	31.27	-	-	-	-	-	-
Catholic	21.59	-	-	-	-	-	-
Other/Unstated	14.12	-	-	-	-	-	-
Political affiliation							
Conservative	32.94	-	-	-	-	-	-
Moderate	33.41	-	-	-	-	-	-
Liberal	21.45	-	-	-	-	-	-
Unstated	12.19						
No. of observations	17,984	1,083	1,229	1,487	932	608	835

Methods

Nonlinearities in the intergenerational transmission of fertility could manifest in two ways. First, the marginal effect of an additional sibling may increase (or decrease) with family size, so that the difference between having one and two siblings could be smaller (or larger) than the difference between having two and three siblings. Second, the marginal effect of an additional sibling on the probability of having a specific family size may depend on the family size. For example, the effect of having a second sibling on the probability of having one child could be larger than the effect of having a second sibling on the probability of having three children. The analysis by Booth and Kee (2009), which shows that the linear effect of number of siblings on fertility is larger for women with more children, could point to either form of nonlinearity, since women with more children may be disproportionately likely to have a third or fourth sibling; alternatively, the linear effects of additional siblings on the probability of having four or more children may be larger.

The two forms of nonlinearity can be represented graphically. Let the distribution of siblings and children be given by a frequency table with number of siblings on the vertical axis and number of children on the horizontal axis. For simplicity, let there be four rows to denote the number of children in the origin family (hereafter "Gen1"), equal to one for only children, and let there be five columns to denote the number of children in the destination family (hereafter "Gen2"), equal to zero for childless families and one for only-child families. For both Gen1 and Gen2, the value of four refers to four or more children. The first form of nonlinearity can be seen by multiplying each cell frequency by its column number (one through four), summing the original and new frequencies for each row, and dividing the summed new frequencies by the summed original frequencies. This gives the average number of children that each Gen1 category has. The first form of nonlinearity allows the average number of children to increase at a non-uniform rate across rows. In Figure 1 below, this allows the blue and red arrows to be unequal. The second form of nonlinearity allows the average number of children allows this rate to differ across columns. In Figure 1, this allows the red and green arrows to be unequal.

Figure 1: Two forms of nonlinearities in the intergenerational transmission of fertility

	Gen2 = 0	Gen2 = 1	Gen2 = 2	Gen2 = 3	Gen2 = 4
Gen1 = 1					
Gen1 = 2					
Gen1 = 3					
Gen1 = 4					

The above graphical exercise suggests the use of association models. The independence model assumes that the distribution of siblings and children can be fully predicted by the relative row and column frequencies. (Since there are multiple cohorts, the distribution is predicted by the relative row and column frequencies in each cohort.) The uniform association model allows a linear change in Gen2 when Gen1 increases by one (in Figure 1, this assumes that all three arrows are equal). This model reflects the focus of earlier literature. Finally, the reproduction of family size model allows a linear change and also lets frequencies in the four diagonal cells where Gen1 = Gen2 be independently determined. This model allows us to test whether small and large families are disproportionately likely to reproduce themselves, and whether the observed linear effects are largely due to the reproduction of these family sizes.

Next, we explicitly test for the two forms of nonlinearity using ordered logistic and logistic models. The ordered logistic model tests for the first form of nonlinearity (whether the marginal effect of an additional sibling differs across family sizes) by coding Gen1 as four dichotomous variables rather than a single continuous variable. The logistic models test for the second form of nonlinearity by coding both Gen1 and Gen2 as four and five dichotomous variables rather than as two continuous variables, and running the regressions separately for each value of Gen2. (In the Results section, we omit the output for Gen2 = 0 and Gen2 = 3, and present the results only for the other three models.) The logistic models allow us to test whether individuals from small and large families are disproportionately likely or unlikely to have small and large families themselves. All ordered logistic and logistic models control for cohort fixed effects.

Results

In this section, we present the results for the association models and ordered logistic and logistic regression models discussed above. All estimates in the tables are reported as odds ratios relative to the omitted class. We begin by presenting the results for the association models. Table 2 below shows that the uniform association model, which allows a linear change in Gen2 when Gen1 increases by one, represents the data much better than the independence model, which assumes that the distribution of siblings and children can be fully predicted by the relative row and column frequencies (see Deviance at the bottom of the table, reported for regressions using data for all cohorts). The reproduction of family size model, which allows a linear change and also lets frequencies in the four diagonal cells where Gen1 = Gen2 be independently determined, is in turn a significant improvement over the uniform association model. This suggests that Gen2 is not randomly assigned but correlated with Gen1, and that the correlation is partly attributable to the reproduction of specific family sizes.

The coefficients for the uniform association and reproduction of family sizes models in Table 2 suggest that the correlation between Gen1 and Gen2 has grown over cohorts. Among earlier cohorts (those born between 1915 and 1939), the reproduction of the smallest and the largest families accounted for most of the correlation between Gen1 and Gen2. Among later cohorts (those born between 1940 and 1964), on the other hand, there was reproduction of two-child and large families, but even after accounting for this, there remains substantial correlation between Gen1 and Gen2.

Why did the intergenerational transmission of fertility rise over cohorts? One potential explanation is that the earlier cohorts include more cohorts of childbearing age during the baby boom years (1946-1964) where there may have been a universal shift towards larger family sizes, leading to weaker intergenerational transmission of fertility. As the baby boom ebbed, the retreat from larger family sizes towards smaller families may have been less pronounced among those who came from larger families themselves, leading to stronger intergenerational transmission of fertility. Below, we present evidence that the retreat from larger family sizes was particularly slow among those who came from large families.

We compare the results for the US to those for six countries in Europe and East Asia. Table 3 shows that estimated uniform association or linear effects are generally comparable across countries with the possible exception of Taiwan, which has a much larger coefficient.

Table 2: Nonlinearities in the Intergenerational Transmission of Fertility in the US (Association Models)

	Independence model	Uniform association model	Reproduction of family size model
Uniform association effects			
All cohorts			
UA	-	1.088**	1.047**
Cohorts 1915-1939			
UA	-	1.066**	1.011
Cohorts 1915-1939			
UA	-	1.111**	1.077**
Reproduction of family size effects			
All cohorts			
Gen1 not equal to Gen2	-	-	-
Gen1 = Gen2 = 1	-	-	1.072
Gen1 = Gen2 = 2	-	-	1.088**
Gen1 = Gen2 = 3	-	-	0.924*
Gen1 = Gen2 = 4	-	-	1.427**
Cohorts 1915-1939			
Gen1 not equal to Gen2	-	-	-
Gen1 = Gen2 = 1	-	-	1.350**
Gen1 = Gen2 = 2	-	-	1.050
Gen1 = Gen2 = 3	-	-	0.947
Gen1 = Gen2 = 4	-	-	1.487**
Cohorts 1940-1964			
Gen1 not equal to Gen2	-	-	-
Gen1 = Gen2 = 1	-	-	0.905
Gen1 = Gen2 = 2	-	-	1.128**
Gen1 = Gen2 = 3	-	-	0.906*
Gen1 = Gen2 = 4	-	-	1.448**
Deviance	755.82	407.69	294.86
Degrees of freedom (DF)	120	119	115

*Significant at 5% level. **Significant at 1% level.

Table 3: Nonlinearities in the Intergenerational Transmission of Fertility in 7 Countries (Association Models)

	US	Austria	Hungary	China	Japan	South Korea	Taiwan
Uniform association effects							
All cohorts							
UA	1.088**	0.120**	1.130**	-	-	-	-
Cohorts 1915-1939							
UA	1.066**	1.106**	1.161**	-	-	-	-
Cohorts 1940-1964							
UA	1.111**	1.134**	1.108**	1.089*	1.114*	1.112	1.205**
Reproduction of family size effects							
All cohorts							
UA	1.047**	1.110**	1.106**	-	-	-	-
Gen1 not equal to Gen2	-	-	-	-	-	-	-
Gen1 = Gen2 = 1	1.072	0.810	1.238	-	-	-	-
Gen1 = Gen2 = 2	1.088**	1.012	0.992	-	-	-	-
Gen1 = Gen2 = 3	0.924*	1.272	1.547*	-	-	-	-
Gen1 = Gen2 = 4	1.427**	1.238	1.185	-	-	-	-
Cohorts 1915-1939							
UA	1.011	1.064	1.111*	-	-	-	-
Gen1 not equal to Gen2	-	-	-	-	-	-	-
Gen1 = Gen2 = 1	1.350**	0.654	1.436	-	-	-	-
Gen1 = Gen2 = 2	1.050	0.872	0.834	-	-	-	-
Gen1 = Gen2 = 3	0.947	0.860	1.082	-	-	-	-
Gen1 = Gen2 = 4	1.487**	2.168*	1.553	-	-	-	-
Cohorts 1940-1964							
UA	1.077**	1.157**	1.098*	1.134*	1.123*	1.060	1.186
Gen1 not equal to Gen2	-	-	-	-	-	-	-
Gen1 = Gen2 = 1	0.905	1.032	1.103	1.410	0.834	2.295	1.728
Gen1 = Gen2 = 2	1.128**	1.157	1.075	0.578*	1.135	0.370	1.181
Gen1 = Gen2 = 3	0.906*	1.755*	1.805*	1.016	0.833	0.869	0.556
Gen1 = Gen2 = 4	1.448**	0.651	0.978	0.553*	0.846	1.445	0.786

*Significant at 5% level. **Significant at 1% level.

Comparing the results across cohorts for the US, Austria and Hungary (no data on earlier cohorts are available for East Asia), we find that the coefficient was weaker among the earlier US cohorts than in the other two countries, possibly due to the baby boom-related reasons discussed above.

Turning to the evidence on reproduction of specific family sizes, we find little evidence of the reproduction of large families in countries other than the US except among earlier Austrian cohorts (and possibly for later South Korean cohorts, which have a large but statistically insignificant coefficient). Instead, we find stronger evidence of the reproduction of three-child families in the two European countries (and possibly of the reproduction of small families in China, South Korea and Taiwan, although these coefficients are statistically insignificant).

We repeat our analysis for the US by various socioeconomic subgroups. Table 4 below shows that the results are strengthened when the sample is restricted to females, which may be due to two possible reasons: first, females may report their fertility more accurately; second, the intergenerational transmission of fertility may be stronger for females. The evidence for the second reason is mixed: using Danish registry data, Murphy and Knudsen (2002) find little difference between the transmission of fertility for men and women up to age 27, while Kohler, Rodgers and Christensen (1999) find that biological mechanisms matter more for females. Table 4 also provides the results by race, marital status and educational levels. The results for whites and blacks are broadly similar, with slightly larger coefficients for the reproduction of two-child and large families among blacks in latter cohorts. Comparing individuals who were married and individuals who were once-married but no longer so at the time of survey, we find that the reproduction of large families was markedly stronger among the latter in all cohorts. This is somewhat puzzling since one might have thought that individuals who had not experienced marital disruption were more likely to achieve their intended family sizes. One possible explanation for our finding is that the reproduction of large families may coincide with the reproduction of less stable family environments. We also note that the reproduction of large families is stronger among highly educated individuals, even though less educated individuals are generally more likely to come from or have large families themselves. While perhaps surprising, our findings are consistent with Booth and Kee (2009), who find that the effect of Gen1 is greater for more highly educated women.

Table 4: Nonlinearities in the Intergenerational Transmission of Fertility in US Subgroups (Association Models)

	All	Female	Black	Married	Divorced/ separated/ widowed	Less than high school	More than high school
Reproduction of family size effects							
All cohorts							
UA	1.047**	1.050**	1.046*	1.045**	1.048**	1.097**	1.037**
Gen1 not equal to Gen2	-	-	-	-	-	-	-
Gen1 = Gen2 = 1	1.072	1.124	0.699	1.199*	0.878	0.856	1.294*
Gen1 = Gen2 = 2	1.088**	1.111*	1.135	1.076*	1.066	1.128	1.128*
Gen1 = Gen2 = 3	0.924*	0.927	0.911	0.955	0.843	1.183	0.891
Gen1 = Gen2 = 4	1.427**	1.455**	1.337*	1.356**	1.756**	0.882	1.333**
Cohorts 1915-1939							
UA	1.011	0.997	1.057*	1.021	0.986	1.063**	1.019
Gen1 not equal to Gen2	-	-	-	-	-	-	-
Gen1 = Gen2 = 1	1.350**	1.509**	0.913	1.486**	0.967	0.921	1.351
Gen1 = Gen2 = 2	1.050	1.002	0.718	1.067	0.931	1.114	1.025
Gen1 = Gen2 = 3	0.947	0.987	0.698	1.011	0.763*	1.118	0.910
Gen1 = Gen2 = 4	1.487**	1.614**	1.227	1.353**	1.963**	1.012	1.199
Cohorts 1940-1964							
UA	1.077**	1.099**	1.033	1.066**	1.106**	1.185**	1.048**
Gen1 not equal to Gen2	-	-	-	-	-	-	-
Gen1 = Gen2 = 1	0.905	0.894	0.454*	0.996	0.862	0.766	1.278
Gen1 = Gen2 = 2	1.128**	1.209**	1.472*	1.091	1.171	1.193	1.180**
Gen1 = Gen2 = 3	0.906*	0.884	0.999	0.915	0.903	1.348	0.886
Gen1 = Gen2 = 4	1.448**	1.401**	1.512*	1.408**	1.729**	0.632*	1.503**

*Significant at 5% level. **Significant at 1% level.

In general, our association models find evidence of the intergenerational transmission of fertility in multiple subgroups, consistent with Murphy and Wang (2001) and Murphy and Knudsen (2002), who find that transmission of fertility persists after controlling for socioeconomic characteristics. We also find evidence of the reproduction of large families among latter cohorts in all subgroups except for less educated individuals, who are generally much more likely than to have large families regardless of Gen1. In results not shown here, we find that the reproduction of large families among later cohorts is stronger among those who self-identify as Protestant, politically liberal or conservative, while the reproduction of two-child families is stronger among those who self-identify as Catholic or politically moderate.

Next, we test explicitly for nonlinearities in the intergenerational transmission of fertility using ordered logistic and logistic regression models. From our results for association models, we expect to find that individuals who have no siblings do not behave very differently from other individuals, while those who had three or more siblings do. The results in Table 5 below confirm these expectations.

The second column displays the results for the ordered logistic regression model, which tests for the first form of nonlinearity (whether the marginal effect of an additional sibling differs across Gen1 family sizes). The coefficients are proportional odd ratios, i.e. they give the ratio of a) the odds that an individual with Gen1 = x will have two children and b) the odds that she will have one or fewer children. By the proportional odds assumption, this ratio is equal to the ratio of a) the odds that she will have three children and b) the odds that she will have two or fewer children. The results show that individuals who have no siblings do not have lower fertility than those who had one sibling; on the other hand, individuals who come from large families have much higher fertility than everyone else, especially among the latter cohorts.

Next, we test for the second form of nonlinearity (whether the marginal effect of an additional sibling differs across Gen2 family sizes) using logistic models. Table 5 shows that individuals with two or more siblings are less likely to have only one child, and in addition, individuals with three or more siblings are also less likely to have two children and much more likely than others to have four or more children. The results are similar between cohorts, although it does seem that among earlier cohorts, individuals with siblings were significantly less likely to have only one child, consistent with our results from association models which show evidence of the reproduction of small families for these cohorts.

Table 5: Nonlinearities in the Intergenerational Transmission of Fertility in the US (Ordered Logistic and Logistic Models)

	Ordered logistic model	Logistic model		
		Gen2 = 1	Gen2 = 2	Gen2 = 4
All cohorts				
Gen1 = 1	-	-	-	-
Gen1 = 2	1.059	0.867	1.062	0.884
Gen1 = 3	1.254**	0.732***	1.025	1.171
Gen1 = 4	1.654**	0.720***	0.835**	1.740***
Cohorts1915-1939				
Gen1 = 1	-	-	-	-
Gen1 = 2	1.117	0.695*	1.027	0.924
Gen1 = 3	1.310**	0.630**	0.952	1.265
Gen1 = 4	1.593**	0.632**	0.808	1.676**
Cohorts1940-1964				
Gen1 = 1	-	-	-	-
Gen1 = 2	1.000	1.030	1.100	0.835
Gen1 = 3	1.204	0.839	1.084	1.076
Gen1 = 4	1.694**	0.819	0.864	1.842**
Cohort effects	Included	Included	Included	Included
Prob > χ^2	0.000	0.000	0.000	0.000
Pseudo R^2	0.025	0.012	0.014	0.065
No. of observations	17,984	17,984	17,984	17,984

*Significant at 5% level. **Significant at 1% level.

Table 6 below compares the results for the US with those for the other six countries. We show that among latter cohorts, individuals who come from large families behave much more differently from other individuals in the US than in other countries (except possibly for China, Japan and Taiwan, for which the coefficients are also markedly different but insignificant). Instead, for Austria and Hungary, fertility levels are most different between those who have one or no siblings and those who have two or more siblings.

Our last table, Table 7, shows that these results are broadly similar across socioeconomic subgroups in the US, although some differences are apparent. Among individuals who had faced marital disruption, the effect of having a large family is the strongest, whereas among less educated individuals in latter cohorts, the effect of having a *small* family may be larger, although this is not statistically significant. In between these two groups are married and highly educated individuals, who have more gradual fertility differentials. In results not shown, we also find more gradual fertility differentials for individual in latter cohorts who self-identify as Catholic and politically moderate.

Discussion

This paper departs from the existing literature on the intergenerational transmission of fertility, which has focused on the linear impact of an additional sibling on fertility. Instead, we investigate whether individuals from small (one-child) and large (four or more children) families are disproportionately likely or unlikely to have small and large families themselves. Our analysis follows two different empirical approaches.

Using association models, we find, consistent with earlier literature, that there is intergenerational transmission of fertility. In addition, we show that among earlier cohorts (those born between 1915 and 1939), the reproduction of small and large families accounted for most of the transmission, whereas among later cohorts (those born between 1940 and 1964), the reproduction of two-child and large families accounted for only part of the transmission. In both sets of cohorts, we find strong evidence of the reproduction of large families.

Using ordered logistic and logistic regression models, we confirm our above findings that in the US, individuals who have no siblings do not behave very differently from other individuals, while those who had three or more siblings do. In particular, individuals with three or more siblings in later cohorts are much less likely to have two-child families and much more

Table 6: Nonlinearities in the Intergenerational Transmission of Fertility in 7 Countries (Ordered Logistic Model)

	US	Austria	Hungary	China	Japan	South Korea	Taiwan
All cohorts							
Gen1 = 1	-	-	-	-	-	-	-
Gen1 = 2	1.059	1.183	1.102	-	-	-	-
Gen1 = 3	1.254**	1.528*	1.684**	-	-	-	-
Gen1 = 4	1.654**	1.994**	1.871**	-	-	-	-
Cohorts 1915-1939							
Gen1 = 1	-	-	-	-	-	-	-
Gen1 = 2	1.117	1.181	1.844**	-	-	-	-
Gen1 = 3	1.310**	0.991	1.526	-	-	-	-
Gen1 = 4	1.593**	1.976**	2.614**	-	-	-	-
Cohorts 1940-1964							
Gen1 = 1	-	-	-	-	-	-	-
Gen1 = 2	1.000	1.207	0.824	0.946	1.015	1.572	0.614
Gen1 = 3	1.204	2.327**	1.663*	1.015	1.177	2.250	0.681
Gen1 = 4	1.694**	2.070**	1.484	1.498	1.501	2.220	1.207

Table 7: Nonlinearities in the Intergenerational Transmission of Fertility in US Subgroups (Ordered Logistic Model)

	All	Female	Black	Married	Divorced/ separated/ widowed	Less than high school	More than high school
Reproduction of family size effects							
All cohorts							
Gen1 = Gen2 = 1	-	-	-	-	-	-	-
Gen1 = Gen2 = 2	1.059	1.061	0.834	1.048	0.978	0.969	1.125
Gen1 = Gen2 = 3	1.254**	1.227*	1.145	1.336**	1.020	1.209	1.306*
Gen1 = Gen2 = 4	1.654**	1.690**	1.454*	1.611**	1.721**	1.507	1.499**
Cohorts 1915-1939							
Gen1 = Gen2 = 1	-	-	-	-	-	-	-
Gen1 = Gen2 = 2	1.117	1.001	0.762	1.178	0.931	0.808	1.265
Gen1 = Gen2 = 3	1.310**	1.162	1.255	1.491**	1.000	1.003	1.405
Gen1 = Gen2 = 4	1.593**	1.476**	1.527	1.662**	1.507**	1.260	1.474*
Cohorts 1940-1964							
Gen1 = Gen2 = 1	-	-	-	-	-	-	-
Gen1 = Gen2 = 2	1.000	1.142	0.857	0.909	1.010	1.859	1.033
Gen1 = Gen2 = 3	1.204	1.331*	0.993	1.179	1.085	2.364	1.235
Gen1 = Gen2 = 4	1.694**	1.968**	1.296	1.519**	1.999**	2.882*	1.468**

*Significant at 5% level. **Significant at 1% level.

likely to have large families themselves. Our evidence points to a polarization of fertility behavior within the population, which may be driven by a polarization of fertility preferences or social inequality limiting access to reproductive and economic resources.

Comparing our results across seven countries and across US subgroups with different marital status, educational levels, religions and political affiliations, we find that only in the US do individuals from large families have very different fertility from other individuals; on the other hand, this polarization of fertility behavior is found in nearly all the US subgroups we examined. One possible implication of finding strong reproduction of large families even among highly educated individuals, who are less likely to face limited access to reproductive and economic resources, is that this behavior is being driven by a polarization of fertility preferences rather than social inequality. We leave it to future research to determine whether the causes of the reproduction of large families differ between socioeconomic groups.

Conclusion

Nonlinearities in the intergenerational transmission of fertility may have particularly strong policy implications for countries with very low fertility or high social inequality. In low-fertility countries, strong reproduction of small families may further depress fertility, while in high-inequality countries, strong reproduction of large families may point to the presence of unequal access to reproductive and economic resources, as well as to a potential mechanism behind the intergenerational transmission of poverty and social inequality.

In this paper, we find little evidence of the reproduction of small families among more recent cohorts in the US or in two low-fertility European countries, Austria and Hungary. We also note that Kotte and Ludwig (2011) find little evidence that siblings' fertility affects one's own fertility. These results suggest that the perpetuation of small family sizes and low fertility ideals in low-fertility countries may be the result of peer influences or non-conducive environments for childbearing rather than family-level transmission of low fertility.

On the other hand, we find strong evidence of the reproduction of large families across various socioeconomic subgroups in the US, including highly educated individuals. Our results point to a polarization of fertility preferences in the US, as well as the potential role of unequal access to reproductive and economic resources.

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