Sex Composition of Children and the Third Birth in the United States:

Further Evidence for Emerging Gender Indifference

Felicia Feng Tian
Department of Sociology
Fudan University

S. Philip Morgan
Department of Sociology &
Carolina Population Center
University of North Carolina-Chapel Hill

Abstract

Pollard and Morgan (2002) predict the parental mixed-sex preference will vanish and be replaced by an ideology of gender indifference. However, this prediction has been questioned in recent years, and new evidence tends to suggest a persistence of mixed-sex gender preference. This analysis replicates and extends Pollard and Morgan (2002), using four waves of data from National Survey of Family Growth to trace the changes in the association between the sex composition of previous two children and the third birth in the United States. Results from the third birth intention show that the difference of the probability of wanting another child between parents with same-sex children and parents with mixed-sex children sharply declines toward zero since in the late 1990s. A similar pattern is also found in the analysis of third birth behavior, but is much clearer if we use data for only white parents. The effect or two same-sex children on the risk of a third birth are not significant in any of the observed time periods for African American parents. Overall, this evidence provides additional support for Pollard and Morgan's (2002) prediction of an emerging gender indifference among American parents.

Sex Composition of Children and the Third Birth in the United States:

Further Evidence for Emerging Gender Indifference

In low fertility western societies, parents with two sons or two daughters are more likely to have a third birth than parents of one daughter and one son (Hank and Kohler 2000; Yamaguchi and Ferguson 1995). Such mixed-sex preference exists because, as Williamson (1976: 22) put it, "parents may desire variety, based on the notion that the sexes will have different traits, strengths, leisure activities, and interests…parents may desire at least one of each." The desire for at least one son and one daughter suggests a belief that sons and daughters are fundamentally different – rather than fully substitutable – and therefore not equivalent, a structural and cultural force to sustain gender difference (Lorber 1995).

Pollard and Morgan (2002) predict this mixed-sex preference will weaken over time and be replaced by an ideology of gender indifference. Their argument is relatively straightforward: the decline of mixed-sex preference reflects a shift in the gender system from a dichotomy of traditional gender roles to gender egalitarianism. As men and women become increasingly equal, parents should find unnecessary to balance the sex composition of their children. However, this prediction has been seriously questioned in recent years. New empirical evidence, especially for Western Europe, generally favors a persistence of mixed-sex preference (Andersson, Hank and Vikat 2007; Dahl et al. 2006; Gray and Evans 2005; Nugent 2013).

In this analysis, we provide new evidence to help resolve this empirical debate. Using recently available data from National Survey of Family Growth, we replicate and extend Pollard and Morgan (2002) to examine the association between the sex composition of previous two children and the third birth, both in intention and behavior, and trace the changes until the 2000s. Our results find additional support for a decline of mixed-gender preference as Pollard and Morgan (2002) predicted. In the analysis of the third birth intention, we find the difference between parents with same-sex children and those with mixed-sex children sharply declines toward zero since the late 1990s. A similar pattern is found in the third birth behavior, but only for white parents. There was no preference for a mixed gender in any period for African Americans.

Data and Methods

Data

National Survey of Family Growth (NSFG) is a series of national representative, repeated cross-sectional surveys that collect information of family life, marriage, fertility, contraceptive use, and health. These surveys were collected from in-home, personal interviews with women 15-44 years old in the United States[1]. This analysis uses the recent four waves: 1988, 1995, 2002 and 2006-10. The first two waves are also used in Pollard and Morgan's (2002) analysis.

We pose four restrictions on our analytical sample. First, it restricts to women who had at least two children and were younger than age 41 at the time of the interview. Second, in the analysis of the third birth intention, the sample excludes women who were interviewed between 2008 and 2010. In the analysis of the third birth behavior, the sample excludes women who had the second birth between 2008 and 2010. In this period, the major economic downturns significantly alter the fertility behavior (Pew Center 2010, 2011). Third, the sample excludes women who had multiple births in the first or second parity. Fourth, the sample restricts to non-Hispanic whites or non-Hispanic African-Americans.

Measures

Following Pollard and Morgan (2002), we measure third birth as both intention and behavior. The third birth intention is measured as a dichotomous variable recoded from the following survey question:

---

[1] For more information, please visit http://www.cdc.gov/nchs/nsfg.htm.

“Looking to the future, do you (and your husband/partner) intent to have another baby (Yes/No/Not Sure)?” Women living with a partner were asked about joint intentions with that partner, while women living alone were asked about individual intentions. The questions were asked in the same way for all four waves. Women who absolutely wanted another child are coded as 1, whereas those who do not, undecided, or had a disagreement with husband/partner are coded as 0. Women who were sterilized or who had partners who were sterilized (or who otherwise physically could not have children) are also coded as 0. The third birth behavior is measured as whether a woman had a third birth or not (1 = yes; 0 = no). In the discrete-time hazard models (illustrate later), it is transformed as the duration from the birth of the second child to either the third birth or being censored at five years since the second birth.

In the analysis of the third birth intention, we classify three periods by the year of the survey:: 1988, 1995, and 2002[2]. In the analysis of the third birth behavior, the periods are classified by the year in which respondents had the second birth, into three groups: 1966-85, 1986-1995, and 1996-2007. These classifications match the ones in Pollard and Morgan (2002).

The major independent variable is the sex composition of the previous two children. Following Pollard and Morgan (2002), it is a dichotomous variable with 1 denoting to having children of the same sex (i.e., two daughters or two sons) and 0 denoting to having both a daughter and a son. Control variables include age, marital status, religious affiliation, abortion history, place of residence, educational attainment, employment status, family income, and mother’s education. Age is a continuous variable ranging from age 15 to 41. Marital status is classified as a series of dichotomous variables, including married, previously married and never married. Catholic is a dichotomous variable with 1 denoting to Catholics and 0 denoting to other religions or no religious affiliation. Abortion history is a dichotomous variable with 1 denoting to women ever had abortion and 0 denoting to women with

[2] Because 2006 NSFG has fewer cases than previous surveys after exclusion of respondents who were interviewed in 2008 and after, we combine them with respondents in 2002 NSFG.

no abortion. Place of residence is measured in a dichotomous variable about whether or not the residence lived in central-city SMSA. Both educational attainment and mother's education are classified into three dichotomous variables -- less than high school; high school; college and up. Employment status is a dichotomous variable with 1 denoting to full-time employment, and 0 denoting to part-time employment, unemployment, or staying at home. Family income is a 14-level scale measure ranging from under $5,000 per year (=1) to $75,000 or more (=14)[3].

The NSFG has very few missing cases. Income has the highest percentage of missing data (8.3%). We use mi impute in Stata 13/SE to generate 20 datasets (Graham, Olchowski and Gilreath 2007). The imputation is done separately for each survey. The dependent variables are included in the imputation, but are dropped during the regression analyses (von Hippel 2007).

Analytical Strategy

Discrete-time hazard models (Allison 1984; Singer and Willett 2003) are used to examine the association between the sex composition of previous two children and probability of third birth. We transform each respondent's birth experience into person-year records. That is, one observation is generated for each person-year of life, beginning of the year the respondent had the second birth until the year she had the third birth (for respondents who had the third birth) or is censored in the year of the survey, or five years after the second birth[4], which comes the first (for respondents who did not have the third birth). To accommodate for those who had the second birth and the third birth in the same year, one person-year is added for every respondent. For instance, a respondent who had the

[3] The family income scale is the following: 1=under $5,000; 2=$5,000-7,499; 3=$7,500-9,999; 4=$10,000-12,499; 5=$12,500-14,999; 6=$15,000-19,999; 7=$20,000-24,999; 8=$25,000-29,999; 9=$30,000-34,999; 10=$35,000-39,999; 11=$40,000-49,999; 12=$50,000-59,999; 13=$60,000-74,999; 14=$75,000 or more.

[4] Kaplan-Meier survival analysis suggests that the hazards of third birth peak around five years and decline after it.

second birth in 1995 and had the third birth in 1999 would have five observations representing five person-years of exposure.

One major task for this analysis is to compare the association (in logit coefficients) between sex composition of the previous two children and third birth (intention and behavior) across different periods. Comparisons of logit coefficients across groups or time periods can be invalid and misleading, as the logit coefficients are influenced by the residual variance of each group/period (Allison 1999; Hoetker 2004; Mood). The logit coefficients can be more accurately estimated by heterogeneous choice models (Williams 2009). The model is estimated using *oglm* in Stata 13/SE (Williams forthcoming).

Results

Third birth intention

Table 1 shows the coefficients from heterogeneous choice logistic regressions about the period difference in the association between the sex composition of previous two children and the probability of wanting another child. The variance estimation shows the residual variance does not really differ across periods. Model 1 assumes the association does not differ across periods. Net of controls, on average parents with same-sex children are significantly more likely to want to have another child than women with mixed-sex children.

[Table 1 about here]

Model 2 adds interactions between children's sex composition and periods to allow the association to vary by periods. Both interaction terms are significant and negative, which indicates a decline in the association of children's sex composition and third birth intention from 1988 to 1995 and 2002. Model 3 constrains the interaction coefficients of these two periods to be equal. BIC statistics indicate Model 3 is a better fit to the data than Model 2. Thus, the magnitude of decline from 1988 to the latter two periods can be viewed as the same. In fact, the coefficient of same-sex children in these two periods is very small (.521-.451=.070) and is not statistically significant from zero[5]. In other words, the odds of wanting another child for women with same-sex children, compared to those with mixed-sex children, is 68% higher ($e^{.521}$-1) in 1988, but is similar in 1995 and 2002. Further analysis shows that the pattern does not differ by race (results upon request). These results provide strong support Pollard and Morgan (2002)'s prediction of a decline of parental mixed-sex preference and a rise of parental gender indifference.

Third birth behavior

In a second analysis, we trace the association of children's sex composition and the third birth hazards across three periods: 1966-1985, 1986-1995, and 1996-2007. Fertility intention and fertility behavior are not perfectly correlated (Morgan and Rackin 2010). However, if we can find a similar decline of the association between children's sex composition and third birth hazards, it will definitely enhance the robustness of our results. The coefficients are reported in Table 2. In model 1, similar to the analysis of the third birth intention, the results show that on average parents with same-sex children are significantly more likely to have a third birth than parents with mixed-sex children.

[Table 2 about here]

Model 2 adds interaction terms between children's sex composition and periods, and model 3 constrains the interactions to be equal between 1986-1995 and 1996-2007. The BIC statistics suggest model 3 is a better fit to the data than model 2. Thus, we choose model 3 as the preferred model for these data. In model 3, the interaction coefficient is significant and negative, which suggests that a decline in the association of children's sex composition and the hazard of a third birth from 1966-85 to 1986-1995 and 1996-2007. The coefficients of same-sex children in the latter two periods are not

[5] We test the significance the point estimates in 1995 and 2002 by altering the reference categories in Table 1.

statistically significant from zero[6]. This is a similar finding as the results from third birth intention, both of which support a decline of parental mixed-sex preference and a rise of gender indifference.

As whites and African Americans tend to have different fertility behaviors (Yang and Morgan 2003), the change could vary by race. The separate estimates for white parents and African-American parents, with the same model specification, are presented in Table 3. The residual variances are significantly smaller in 1995-2007 than 1966-1985 in the white sample, but does not vary across periods in the African American sample.

[Table 3 about here]

The results suggest racial difference in the patterns of change of the association between children's sex composition and third birth. For African-American parents (in the third model), the association is not significant and does not change across periods. A further analysis (the fourth model) suggests excluding the sex composition of children improves the model fit. For white parents (in the first model), the association is significant and positive in 1966-1985, and declines both significantly and substantially in 1986-1995 and 1996-2007. Constraining the interactions to be equal (in the second model) improves the model fit, which suggests a same magnitude of decline from 1966-1985 to the latter two periods. Thus the results for white parents support Pollard and Morgan (2002)'s prediction, but not for African-American parents.

Discussion

[6] We test the significance the point estimates in the 1986-1995 and 1996-2007 period by altering the reference categories in Table 2.

This paper reports on new evidence concerning parental gender preference in the United States. We drew on four waves of the National Survey of Family Growth to bear on a longstanding empirical puzzle: is there a shift from the mixed-sex preference to gender indifference among American parents?

Using the same data as Pollard and Morgan, the NSFG, and adding more recent NSFG data we are able to extend the examination of emerging gender indifference. Our results are relatively straightforward. In the analysis of third birth intention, the probability of wanting another child is significantly higher for parents with same-sex children than parents with mixed-sex children in 1988, but sharply declines and does not differ between these two groups in 1995 and 2002. A similar pattern is also found in the analysis of third birth behavior, but is much clearer if we use data for only white parents. The effect of two same-sex children on the risk of a third birth are not significant in any of the observed time periods for African-American parents.

In summary, our results provide additional support for Pollard and Morgan's (2002) prediction of a decline in parental mixed-sex preference and rising gender indifference. Although recent work has raised serious concerns about this prediction and provided evidence in favor of a persistence of parental mixed-sex preference, our results, generated using a large sample of respondents interviewed across about 20 years, show that the mixed-sex preference vanishes and are replaced by behavior consistent with gender indifference among American parents.

Reference

Allison, Paul. 1999. "Comparing Logit and Probit Coefficients Across Groups." *Sociological Methods and Research* 28:186-208.

Allison, Paul D. 1984. *Event History Analysis : Regression for Longitudinal Event Data*. London: Sage Publications, Inc.

Andersson, Gunnar, Karsten Hank, and Andres Vikat. 2007. "Understanding Parental Gender Preference in Advanced Societies: Lessons from Sweden and Finland." *Demographic Research* 17:135-56.

Dahl, E., M. Beutel, B. Brosig, S. Grussner, Y. Stobel-Richter, H.-R. Tinneberg, and Elmar Brahler. 2006. "Social Sex Selection and the Balance of the Sexes: Empirical Evidence from Germany, the UL=K, and the US." *Journal of Assistance Reproductive Genetics* 23:331-18.

Graham, John W., Allison E. Olchowski, and Tamika D. Gilreath. 2007. "How many imputations are really needed? Some practical clarifications of multiple imputation theory." *Prevention science : the official journal of the Society for Prevention Research* 8(3):206-13.

Gray, Edith, and Ann Evans. 2005. "Parity Progression in Australia: What Role does Sex of Existing Children Play." *Australia Journal of Social Issues* 40(4):505-20.

Hank, Karsten, and Hans-Peter Kohler. 2000. "Gender Preferences for Children in Europe: Empirical Results from 17 FFS Countries." *Demographic Research* 2(1).

Hoetker, Glenn. 2004. "Confounded Coefficients: Accurately Comparing logit and Probit Coefficients Across Groups." *Working Paper*.

Lorber, Judith. 1995. *Paradoxes of Gender*: Yale University Press.

Mood, Carina. "Logistic Regression: Why We Cannot Do What We Think We Can Do, and What We Can Do About It." *European Sociological Review* 26(1):67-82.

Morgan, S. Philip, and Heather Rackin. 2010. "The Correspondence Between Fertility Intentions and Behavior in the United States." *Population and Development Review* 36(4):91-118.

Nugent, Colleen N. 2013. "Wanting Mixed-Sex Children: Separate Spheres, Rational Choice, and Symbolic Captal Motivations." *Journal of Marriage and Family* 75(4):886-902.

Pollard, Michael S., and S. Philip Morgan. 2002. "Emerging Parental Gender Indifference? Sex Composition of Children and the Third Birth." *American Sociological Review* 67(4):600-13.

Singer, Judith D., and John B. Willett. 2003. *Applied longitudinal data analysis : modeling change and event occurrence*. Oxford ; New York: Oxford University Press.

von Hippel, Paul T. 2007. "Regression with Missing Ys: An Improved Strategy for Analyzing Multiply Imputed Data." *Sociological Methodology* 37:83-117.

Williams, Richard. 2009. "Using Heterogeneous Choice Models to Compare Logit and Probit Coefficients Across Groups." *Sociological Methods and Research* 37(4):531-59.

—. forthcoming. "Estimating Heterogeneous Choice Models with oglm." *The Stata Journal*.

Williamson, Nancy E. 1976. "Sons or Daughters: A Cross-Cultural Survey of Parental Preferences." Beverly Hills, CA: Sage.

Yamaguchi, Kazuo, and Linda R. Ferguson. 1995. "The Stopping and Spacing of Childbirths and Their Birth-History Predictors: Rational-Choice Theory and Event-History Analysis." *American Sociological Review* 60(2):272-98.

Yang, Yang, and S. Philip Morgan. 2003. "How Big are Educational and Racial Fertility Differentials in the United States?" *Social Biology* 50(3-4):167-87.

Table 1: The coefficients from heterogeneous-choice logistic regressions predicting the likelihood of wanting a third birth, for women with two children.

Period	Model1		Model2		Model3	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Same-sex children (SSC)	.184**	(.079)	.521**	(.152)	.521**	(.152)
Period (ref=1988)						
1995	.298	(.189)	.566**	(.215)	.565**	(.210)
2002	.607	(.156)	.866***	(.186*)	.867***	(.182)
Interactions						
SSC*1995			-.454*	(.192)		
SSC*2002			-.448*	(.192)		
SSC*1995=SSC*2002					-.451*	(.174)
Controls	Included		Included		Included	
Variance						
Period						
1995	-.162	.124	-.184	(.125)	-.184	(.125)
2002	-.204	.125	-.227+	(.126)	-.227+	(.126)
Log-likelihood[a]	-1767.1		-1763.8		-1763.8	
Degrees of freedom	16		18		17	
BIC[b]	3669.6		3679.8		3671.4	
Chi-square[c]	568.7		575.4		575.4	
No. of observations	4728		4728		4728	

+ p<.1, * p<.05, ** p<.01, *** p<.001 (two-tailed test).

Controls include: educational attainment, employment status, family income, mother's education, age, marital status, religious affiliation, abortion history, and place of residence.

a: log-likelihood reported here is the average log-likelihood of 20 imputed datasets.

b: BIC is calculated based on the average log-likelihood reported in the table: BIC=-2*log-likelihood+Degrees of freedom*ln(No. obs).

c: Chi-square reported here is the average log-likelihood of 20 imputed datasets.

Table 2: The coefficients from discrete-time heterogeneous-choice logistic regressions predicting the likelihood of third birth, for women with two or more children, the combined white and black sample.

Period	Model1		Model2		Model3	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Same-sex children (SSC)	.160***	(.033)	.238***	(.055)	.249***	(.060)
Period (ref=1966-85)						
1986-1995	-.054	(.126)	-.041	(.152)	-.006	(.157)
1996-2007	.089	(.116)	.250+	(.130)	.301*	(.134)
Interactions						
SSC*1986			-.156+	(.086)		
SSC*1996			-.132	(.081)		
SSC*1986=SSC*1996					-.146*	(.075)
Controls	included		included		Included	
Variance						
Period						
1986-1995	-.155	(.069)	-.027	(.069)	-.050	(.067)
1996-2007	-.141*	(.067)	-.151*	(.068)	-.162*	(.066)
Log-likelihood[a]	-9112.6		-9110.7		-9110.7	
Degrees of freedom	18		20		19	
BIC[b]	18414.3		18431.5		18421.1	
Number of person-years	36488		36488		36488	

+ p<.1, * p<.05, ** p<.01, *** p<.001 (two-tailed test).

Controls include: educational attainment, employment status, family income, mother's education, age, marital status, religious affiliation, abortion history, and place of residence.

a: log-likelihood reported here is the average log-likelihood of 20 imputed datasets.

b: BIC is calculated based on the average log-likelihood reported in the table: BIC=-2*log-likelihood+Degrees of freedom*ln(No. person-years).

c: Chi-square reported here is the average log-likelihood of 20 imputed datasets.

Table 3: The coefficients from discrete-time heterogeneous-choice logistic regressions predicting the probability of third birth, for women with two or more children, white and African American women separately.

Period	White		White		Black		Black	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Same-sex children (SSC)	.371***	(.079)	.372***	(.-79)	.084	(.093)		
Period (ref=1966-85)								
1986-1995	-.102	(.236)	-.108	(.232)	-.0001	(.228)	.022	(.212)
1996-2007	.379*	(.181)	.383*	(.179)	.050	(.239)	.112	(.214)
Interactions								
SSC*1986	-.287*	(.124)			.034	(.145)		
SSC*1996	-.273*	(.113)			.073	(.151)		
SSC*1986=SSC*1996			-.279**	(.006)				
Controls	Included		Included		Included		Included	
Variance								
Period								
1986-1995	.007	(.089)	.082	(.090)	-.077	(.104)	-.076	(.104)
1996-2007	-.176*	(.086)	-.175*	(.086)	-.076	(.111)	-.084	(.111)
Log-likelihood[a]	-5568.4		-5568.4		-3524.1		-3525.9	
Degrees of freedom	19		18		19		16	
BIC[b]	11328.2		11318.2		7727.6		7203.0	
No. person-years	23851		23851		12637		12637	

+ p<.1, * p<.05, ** p<.01, *** p<.001 (two-tailed test).

Controls include: educational attainment, employment status, family income, mother's education, age, marital status, religious affiliation, abortion history, and place of residence.

a: log-likelihood reported here is the average log-likelihood of 20 imputed datasets.

b: BIC is calculated based on the average log-likelihood reported in the table: BIC=-2*log-likelihood+Degrees of freedom*ln(No. person-years).

c: Chi-square reported here is the average log-likelihood of 20 imputed datasets.