Period and Cohort Effects in Nonmarital Childbearing in the United States, 1970-2009

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We test two hypotheses to explain the rise in nonmarital childbearing in the United States since the 1970s. The cohort hypothesis posits that the historical rise in nonmarital childbearing resulted from changing norms about premarital sex, cohabitation, and single parenthood that successive cohorts of young adults have introduced and reinforced over time. The period hypothesis asserts that social change works not just through cohorts of young adults, but also through historical circumstances that affect all birth cohorts simultaneously. In the case of nonmarital childbearing, supporters of the period hypothesis point to structural changes during the last forty years that have reduced women's and men's incentives to marry regardless of their cohort membership. We use the age-period-cohort (APC) intrinsic estimator method to test our research hypotheses. Data come from six repeated cross-sections of the National Survey of Family Growth (NSFG), designed and administered by the National Center for Health Statistics.

During the last four decades, the United States has experienced dramatic changes in the context of childbearing and family formation. In 1970, 11 percent of births occurred outside of marriage, and nearly half of those births occurred to girls and young women between 15 and 19 years old. In 2009, 41 percent of all births occurred outside of marriage and only one-fifth of those nonmarital births occurred to teen parents, while two-thirds occurred to women between 20 and 29 years of age. Strikingly, the majority of births to women under 30 occurred outside of marriage in 2009 (Wildsmith, Steward Streng and Manlove 2011). The union status context of nonmarital childbearing has also changed profoundly, with more than half of nonmarital births occurring in cohabiting unions in 2009, compared to 29 percent in the early 1980s (Mincieli et al. 2007). Although nonmarital childbearing more often occurs to older, partnered women today than in earlier historical periods, the phenomenon continues to attract the attention of scholars and policymakers because of its persistent association with economic hardship and compromised physical health and wellbeing for parents and children (Brown 2010; Smock and Greenland 2010; Williams et al. 2011).

While the individual- and contextual-level factors that predict contemporary nonmarital childbearing are well-documented (Billy and Moore 1992; Manlove et al. 2010; Moore et al. 1998; Powers 2005; South and Crowder 2010; Upchurch, Lillard and Panis 2002), the historical and cohort mechanisms that have contributed to increasing rates of nonmarital childbearing at the population level are less well-understood. Much of the literature on nonmarital childbearing assumes that the rise in nonmarital childbearing is attributable to changing attitudes and behaviors among successive cohorts of adolescents and young adults about premarital sex, contraception,

abortion, and union formation. However, we note that important historical circumstances like universal access to contraception and abortion, economic restructuring, and growing economic inequality also potentially increase the likelihood of nonmarital childbearing for all unmarried women in recent periods, regardless of birth cohort. Here, we conduct an age-period-cohort analysis using Yang and Land's (2006) intrinsic estimator method to isolate the independent effects of historical period effects and birth cohort effects on the risk of experiencing a nonmarital birth between 1970 and 2009.

Our analysis focuses on two mechanisms to explain the rise in nonmarital childbearing at the population level since 1970. The *cohort* mechanism highlights changing norms and behaviors among young adults about premarital sex, cohabitation, and single parenthood coupled with increasingly long periods of remaining single in early adulthood. Cohort-based explanations of emerging patterns of behaviors in a population are derived from Norman Ryder's (1965) argument that younger cohorts are the engines of social change. Cohort hypotheses assert that the intersection of biological age and historical time create distinctive experiences in the life course that shape individual behavior in ways that are distinctive compared to earlier cohorts. Individual cohorts may stand out from those that come before or after them, as is the case in marijuana use among the baby boom cohort (Miech and Koester 2012), or cohorts may fundamentally reshape expectations and behaviors in ways that endure for subsequent cohorts, as is the case with migration from Mexico to the United States (Kandel and Massey 2002).

Support for a cohort explanation of nonmarital childbearing trends includes analyses of opinion and attitude data showing that successive cohorts of young adults have been increasingly supportive of childbearing outside of marriage (Barber and Axinn 2005; Gubernskaya 2010; Pagnini and Rindfuss 1993). As these young adults have aged and new cohorts of young adults have entered childbearing age, support for nonmarital childbearing has become increasingly pervasive. Complementing research on attitudes, England, Wu, and Shafer (2012) identified distinctive cohort patterns in nonmarital childbearing *behavior* among women born before 1965. They found that women born prior to the baby boom were more likely to have a nonmarital birth as a result of higher levels of nonmarital conception compared to later cohorts, while women born during the baby boom were more likely to have a nonmarital birth because of lower odds of responding to a nonmarital conception by marrying. These findings highlight the influence of factors like an early absence of contraception to regulate fertility in earlier cohorts compared to changing attitudes about childbearing in marriage in later cohorts. Together, this body of

research suggests that changes in behavior are the result of successive cohorts' contact with evolving norms at a point in the early life course when they are at risk of childbearing.

The second mechanism, which we call the *period* mechanism, asserts that social change works not just through cohorts of young adults, but through historical circumstances that affect all birth cohorts simultaneously. In the case of nonmarital childbearing, evidence for the period mechanism points to structural changes during the last forty years that have reduced women's and men's incentives to marry and increased their likelihood of a nonmarital birth *regardless* of cohort membership. These factors potentially work in countervailing directions to influence the probability that a woman would experience a nonmarital birth in a given historical period. On the one hand, factors pertaining to access to contraception and abortion predict a lower risk of a nonmarital birth over historical time. Access to reliable birth control and legal abortion is far more widespread than in 1970, three years prior to the Roe vs. Wade decision that disallowed many state and federal restrictions to abortion and two years before oral contraceptives were made legally available to unmarried women in all states. The adoption of contraceptive methods in the United States has been nearly universal: about 89 percent of women at risk of an unintended pregnancy used some form of contraception in 2008, and nearly all women of childbearing age in 2008 reported having used contraception at some point (Mosher and Jones 2010). However, contraceptive non-use remains higher among African-American women and women with relatively low levels of education. As a result, the unintended pregnancy rate has remained stable at about 50 pregnancies per 1000 women since 1994, but has become increasingly concentrated among poor and low-income women (Alan Guttmacher Institute 2012). Abortion rates climbed steadily during the first decade after Roe vs. Wade and has declined steadily since then, plateauing around 19.6 abortions per 1000 women in the 2000s (Alan Guttmacher Institute 2011). Together, these factors may predict that the risk of nonmarital childbearing has *declined* for all unmarried women over historical time.

On the other hand, a number of structural and macro-economic factors potentially signal an *increasing* risk of nonmarital fertility since the early 1970s. McLanahan and Percheski (2008) have argued that increasing income inequality contributes to nonmarital childbearing by lowering opportunity costs and reducing the likelihood of finding a marriageable partner among young adults with low educational attainment and limited career prospects. Since 1973, a number of structural factors have contributed to an extended period of economic

growth in the upper tail of the income distribution, while wages for households in the lower tail of the distribution (i.e., households with income at or below the median) have largely stagnated. The returns to a college education have increased steadily since 1979 (Goldin and Katz 2007), leaving those with some college, a high school diploma, or less education in occupational sectors characterized by low wages, part-time employment, job instability, and limited career advancement. In a context of growing income inequality, Edin and Kefalas (2005) have argued, the marriage appears like an increasingly unattainable luxury, while childbearing is perceived as a means to gain status in one's community, to cement a relationship with a romantic partner, and to establish a strong, singular bond in a parent/child relationship.

Period and cohort mechanisms may operate together to influence the increase in nonmarital childbearing observed since 1970. That is, women may encounter different sets of norms and attitudes about nonmarital childbearing when they enter their childbearing years depending on the cohort into which they are born, but in any historical moment, all unmarried women of childbearing age are exposed to a common set of opportunities and constraints on nonmarital childbearing. In the same historical period, a woman born into a cohort with more tolerant norms about nonmarital childbearing will have a greater risk of a nonmarital birth compared to a woman born into a less tolerant cohort, but the two women will share an increased or diminished risk of nonmarital fertility compared to women residing in an earlier period, depending on how the opportunities and constraints on nonmarital childbearing have changed.

In conducting our analysis, we consider the impact of period and cohort mechanisms in the U.S. population of women of childbearing age overall and for white, black, and Hispanic women separately. These race/ethnic groups diverge on factors related to both cohort and period mechanisms. Level of support for nonmarital childbearing varies by race/ethnicity. White and Hispanic women are more likely to contracept and less likely to experience an unintended pregnancy than are black women, and white women are more likely to have an abortion after experiencing an unintended pregnancy compared to black and Hispanic women (Alan Guttmacher Institute 2011, 2012). On average, black, Hispanic, and white women also differ in their social and economic position in the context of economic inequality, with black and Hispanic women more likely to not to have completed college and more likely to be in unstable or low-wage work compared to white women (Browne and Askew 2005). Hence, we anticipate that period effects may be stronger for black and Hispanic women compared

to white women if they are more negatively influenced by rising inequality; or period effects may be smaller if non-white women are less likely to adopt new methods of contraception as they are introduced or to use abortion to terminate an unwanted pregnancy.

Data and Methods

We use pooled data on live births to female respondents from the six most recent cycles of the National Survey of Family Growth (NSFG, 1976, 1982, 1988, 1995, 2002, and 2006-2010). The NSFG is a nationally-representative study of reproductive behavior and health, childbearing, and union formation in the United States. Until 2002, the NSFG was conducted periodically; it is now ongoing. It is based on a multistage sampling design and is nationally-representative of adults between 15 and 44 years old. In the first five cycles, the sampling design included only female respondents; the last two cycles have added male respondents. Respondents provide a complete fertility history, including live births, stillbirths, miscarriages, and abortions. Our unit of analysis is live births reported by female respondents. Respondents reported the month and year of each child's birth, which we converted to century-months. Respondents also provided a complete union history. In 1976, no information on cohabiting unions was collected; hence, our analysis cannot distinguish between nonmarital births that occurred within or outside of cohabitation.

For each birth, we obtained or constructed four variables required for an age-period-cohort analysis: the year in which the birth occurred (PERIOD); mother's age when the birth occurred (AGE); mother's year of birth (COHORT); and whether the birth occurred within or outside of marriage. The last variable was constructed by comparing the date of birth to the mother's reported union history. We retained births occurring between 1970 and 2009 to women born between 1935 and 1994. This yields a nationally-representative sample of births occurring to women who were between 15 and 39 years old in the period of observation. We excluded births occurring to women who were 40 to 44 years old because the 6 to 7-year gap between NSFG cycles did not allow us to observe births to women in that age group in all years. Our sample includes information on 59,293 live births.

The intrinsic estimator approach to age-period-cohort (APC) analysis estimates the independent effects of birth cohort, historical period, and chronological age on the likelihood of experiencing a nonmarital birth. While chronological age is not of central interest in this study, the method controls for this dimension in order to isolate the independent effects of the other two factors.

The probability that a birth is nonmarital is expressed as the following logit function:

$$\text{Logit}(Y_{ij}) = \alpha + C_k + P_j + A_i + e_{ij}$$

where logit(Y_{ij}) represents the log-odds that a birth is nonmarital vs. marital; the effect of the k-th cohort is given by C_k, the effect of the j-th period by P_j, and the effect of the i-th age group is given by A_i; where α is a constant and e_{ij} is random disturbance. The intrinsic estimator requires periods of time measured in equal intervals. We converted the single-year measures of age, period, and birth cohort into 5-year categories, consistent with demographic custom. Age consists of five 5-year age groups (15-19 to 35-39 years); cohort consists of 12 groups (1935-39 to 1990-94); and period consists of eight groups (1970-74 to 2005-09).

The intrinsic-estimator approach is a principal components estimator that provides a unique solution to the equation above to address issues of empirical identification that make it challenging to find a single solution for this model (Glenn 2003). Coefficients produced from the instrinsic estimator model can be interpreted in terms of their relative magnitude. A positive age, period, or cohort coefficient indicates that the independent log-likelihood that a birth occurred outside of marriage is greater compared to the overall mean of the effect for that dimension of the analysis, and a negative coefficient means the log-likelihood is lower compared to the respective overall mean effect. We use the publicly available add-on file for the "intrinsic estimator" algorithm (Yang 2008) available in StataSE version 11.0. All analyses are weighted using a normalized version of sampling weights pooled from cycles 2 through 7.

Preliminary findings

Table 1 describes the percentage of all births that occurred outside of marriage between 1970 and 2009 to women who were between 15 and 39 years old at the time of birth. Reading across the rows, it is evident that the probability that a woman experienced a nonmarital birth compared to a marital birth has increased for all age groups since 1970.Thirty-three percent of the births to the youngest women observed in 1970 were nonmarital, compared to 88 percent in 2005-09. Nonmarital births increased from 11 percent to 18 percent of all births among the oldest women over the same period.

Looking down the columns, it is clear that while the proportion of births that is nonmarital births has increased for all age groups over time, the same age pattern coheres within each historical period, with the

proportion of nonmarital births decreasing at each age group. Following parallel diagonals in the table, we see that each successive cohort of women had a higher proportion of births that were nonmarital at each group compared to the younger cohort.

While this two-dimensional view provides a descriptive picture of the rise in nonmarital childbearing, we cannot disentangle the effects that are due to age, period, or cohort mechanisms. The intrinsic estimator simultaneously uses all information in table 1 to produce estimated independent effects for each dimension of time.

Figures 1a to 1c present the exponentiated coefficients for period, cohort, and age from the intrinsic estimator model predicting that a birth occurred outside of marriage for the full sample. In each figure, the y-axis is on a logarithmic base *e* scale. Each bar represents the odds of a nonmarital birth in a given period, cohort, or age compared to the predicted odds at the mean for that dimension. Figure 1a indicates that the odds that a birth occurred outside of marriage increased steadily until the 1990-94 period, when the odds of a nonmarital vs. ital.tal birth were 1.35 times higher than in the average historical period. The influence of period diminished in the next two intervals and began to rise again in 2005-09.

Figure 1b shows very strong cohort effects relative to the magnitude of the observed period effects. The odds of a nonmarital birth were about 1.5/1 in the earliest cohort, and then declined steadily among 5-year baby boom cohorts, reaching a low point in the 1955-59 cohort. Since then, the odds that a birth occurred outside of marriage has increased steadily, and for the 1990-94 cohort, the odds of a nonmarital birth were about 3.25 times higher than in the average cohort. Figure 1c demonstrates age effects of similar magnitude to cohort effects. The bars indicate that regardless of historical period or cohort, the odds of a nonmarital birth are highest among women 15 to 19 years old, with women 20-24 years old experiencing the next highest odds. Overall, the results for the full sample suggest that patterns of nonmarital childbearing are driven largely by cohort effects, but nonlinear patterns of change in the period effects suggest susceptibility to factors like income inequality and access to abortion, which have fluctuated over time.

Next Steps

We will assess race/ethnic variation in period and cohort effects on the odds that a birth occurs outside of marriage using stratified intrinsic estimator models and hierarchical APC models that permit interactions between

individual characteristics and age, period, and cohort membership. We will also interpret our results in light of historical trends in the regulation of fertility and social and economic inequality that are likely to influence the risk of nonmarital childbearing through cohort and period mechanisms.

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Table 1 Proportion of all births occurring outside of marriage, 1970-2009 (National Survey of Family Growth, cycles 2 through 7).

	Period of birth							
Mother's age at birth	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09
15-19	0.338	0.46	0.596	0.647	0.731	0.776	0.781	0.884
20-24	0.133	0.177	0.245	0.33	0.413	0.47	0.535	0.627
25-29	0.059	0.084	0.103	0.161	0.201	0.218	0.243	0.305
30-34	0.067	0.08	0.082	0.1	0.13	0.159	0.124	0.198
35-39	0.11	0.109	0.079	0.09	0.155	0.085	0.107	0.179

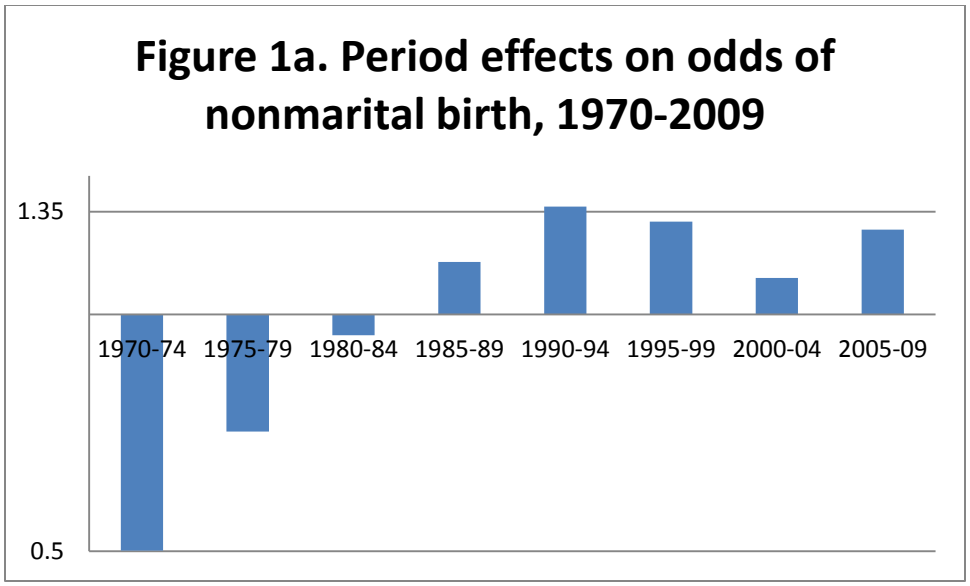
Figure 1a. Period effects on odds of nonmarital birth, 1970-2009
1.35
0.5
1970-74
1975-79
1980-84
1985-89
1990-94
1995-99
2000-04
2005-09

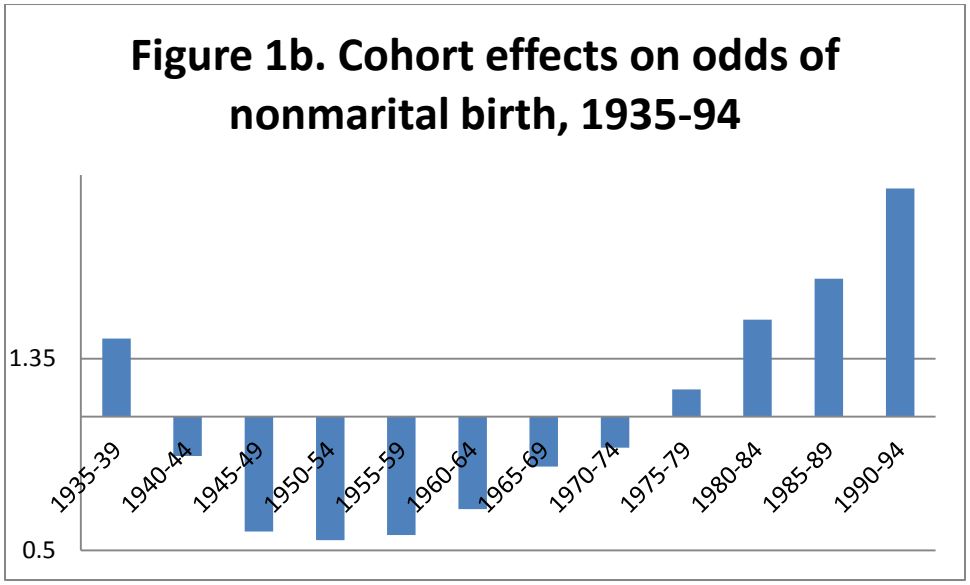
Figure 1b. Cohort effects on odds of nonmarital birth, 1935-94
1.35
0.5
1935-39
1940-44
1945-49
1950-54
1955-59
1960-64
1965-69
1970-74
1975-79
1980-84
1985-89
1990-94

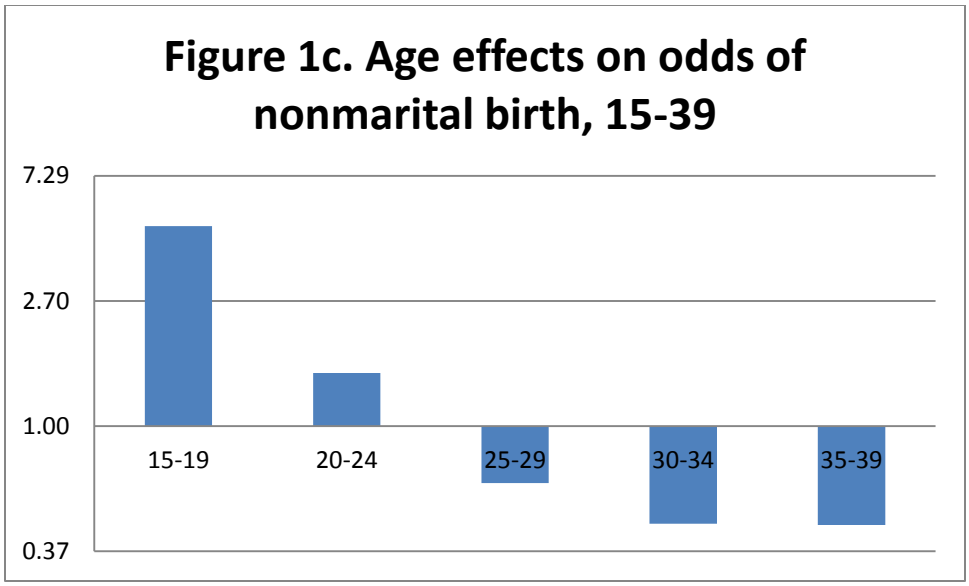
Figure 1c. Age effects on odds of nonmarital birth, 15-39
7.29
2.70
1.00
0.37
15-19
20-24
25-29
30-34
35-39