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DISCUSSION PAPER SERIES

IZA DP No. 10833

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ABSTRACT

Nonmarital and Teen Fertility*

This chapter explores trends, causes and consequences of nonmarital and teen fertility in the United States and in selected European countries. First, we describe some key factors, including changes in economic institutions and family planning technologies, that likely contribute to the large changes in patterns of marriage and fertility observed in developed countries in recent decades. Secondly, we observe that substantial empirical hurdles to credibly estimating the impacts of nonmarital and teen fertility on adults' and children's outcomes remain, though recent evidence suggests more modest impacts than early evidence. Finally, we explore new directions in this research area, arguing that the conventional comparison between nonmarital and marital births should be revised to more adequately incorporate the rapidly growing number of births to cohabiting partners. Additional directions include continuing analysis of the dynamic impacts of the Great Recession and an integration of biological considerations into the economic analysis of fertility.

JEL Classification: J12, J13

Keywords: nonmarital fertility, teen fertility, family economics, contraception, cohabitation, Great Recession, genetics

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* This research was supported by National Institute on Aging grant R01 AG0123456, the Eunice Kennedy Shriver National Institute of Child Health & Human Development grant T32 HD07014, and by core grants to the Center for Demography and Ecology at the University of Wisconsin-Madison (P2C HD047873) and to the Center for Demography of Health and Aging at the University of Wisconsin-Madison (P30 AG017266).

Introduction

There have been striking changes in rates of fertility across nearly all groups in the U.S. and Europe over the past half-century. In this chapter, we consider two fertility measures that have changed in particularly remarkable ways: nonmarital fertility and teen fertility. The U.S. nonmarital fertility rate has increased sharply, from 26.4 births per thousand unmarried women age 15-44 in 1970 to 43.4 in 2015 (Martin et al. 2017). The nonmarital fertility ratio also increased, with approximately 40% of births in the U.S. in 2015 to parents who were not married, compared to around 5% in 1960 (Solomon-Fears 2014, Hamilton, Martin, and Osterman 2016). Europe has seen similar increases in nonmarital fertility since the 1960s (Thomson 2014), albeit with substantial heterogeneity in the proportion of births outside of marriage by country. For example, as of 2014, nonmarital fertility was quite common in Sweden, with almost 55% of all births occurring outside of marriage, but less so in Italy, where the proportion was 29%. In 1960, these numbers stood at about 10% and less than 5% respectively (Thomson 2014, Eurostat 2017). While nonmarital fertility rates have generally increased over the long-term, more recently they have begun to decline. Part of this decline is explained by substantial decreases in teen fertility rates in both the U.S. and Europe. U.S. nonmarital fertility rates peaked in 2008 and then fell about 20% through 2015, while teen fertility rates declined 46% since peaking in 2007 and 64% since 1991 (Martin et al. 2017).

The first section of this chapter more fully examines trends in nonmarital and teen fertility. The second section explores how theory related to the underlying components of nonmarital fertility, namely marriage and fertility, has served to explain the trends outlined in the first section. Seminal theoretical models of marriage and fertility put forth by Gary Becker in the middle of the last century have required updating due to technological developments. Additionally, marriage market models have sought to account for educational and labor market changes, as well as the movement toward mass incarceration of males. Finally, we note how human capital theory has been applied to explain nonmarital fertility patterns that diverge by socioeconomic status.

In section three, we assess the recent evidence of the impacts of nonmarital and teen fertility on child and adult outcomes, focusing on methodological advances. Intuitively, many of the long-term trends away from marriage and toward cohabitation, combined with continuing

comparatively high rates of teen and unintended childbearing in the U.S. (in spite of recent declines), might suggest that children's overall outcomes may have suffered, as a higher proportion are raised by unmarried parents and in complex families. The evidence here is less clear. Indeed, a key implication of the major demographic and social forces outlined above is that the composition of adults who experience nonmarital fertility has changed and shifted towards cohabiting parents. While cohabitating parents are relatively disadvantaged compared to married parents, they are more advantaged than single parents. This suggests that children born to unmarried mothers are relatively less disadvantaged now than in the past and that selection into marriage has changed over time. It is not clear that selection into marriage is only occurring on observables, and thus we selectively summarize new quasi-experimental strategies that have been applied to address selection bias.

We conclude the chapter by focusing on future research. We first discuss how cohabitation impacts the measurement of nonmarital fertility to influence the research directions in which scholars can proceed. Then, we highlight two promising avenues for future work. We argue that understanding the complex and long-term effects of the Great Recession on marriage and fertility is one important area of focus. Another is to incorporate genetics and biology into social science and demographic models of causes and consequences of fertility.

Trends

Underlying the large increase in the nonmarital fertility rate in the U.S. and Europe has been an ongoing retreat from marriage, characterized by increasing age at first marriage and a higher prevalence of divorce. The median age at first marriage in the U.S. was 20.3 years old for women and 22.8 years old for men in 1960, and by 2016, had increased to 27.4 and 29.5 years, respectively (U.S. Census Bureau 2016). In Europe, ages at first marriage have similarly increased. Among Swedish males, for instance, mean age at first marriage increased from 27.3 years in 1960 to 35.8 in 2014. Among Swedish females, mean ages were 24.3 and 33.3, respectively (Eurostat 2016, Statistics Sweden 2016).

This retreat has been uneven in the United States, with substantial gradations by socioeconomic status. For instance, among the U.S. population aged 33-44 in 2010, those with a bachelor's degree or higher were more likely to be married (almost 70%) compared to those with a high school degree (about 50%). Additionally, those with a bachelor's degree were less likely

to be divorced compared to those with some college or a high school degree. The shift away from marriage seems mostly to have been absorbed by a shift into cohabitation; among cohorts born from 1976–1984, those with a high school education are more likely to be currently cohabiting (21.5%) than those with a college degree or higher (14%) (Lundberg, Pollak, and Stearns 2016).

As of 2011, the socioeconomic gradations in partnership status for those 20 years old and over in Europe tell a slightly different story. On average, across the OECD-19[1], among those with at least some post-secondary education, greater proportions of people in households were married (51%) or cohabiting (11%) and a smaller proportion was not living with a partner (38%), compared to those with lower secondary education and below (47%, 8%, and 45%, respectively). Thus, educational attainment was positively associated with cohabitation. There was heterogeneity by country, however. For instance, in Spain those with higher education were less likely to be married and more likely to not be living with a partner compared to those with less education (OECD 2016).[2]

Over the same period, the number of children born to married women has fallen in the U.S. This is, in part, due to there being fewer married women of childbearing age in the population (United Nations 2016). Recently, the marital fertility rate has been increasing, but the number of children born to married women has continued to fall (Hamilton et al. 2015). This suggests that increases in births to married women are not large enough to make up for the declining number of married women.

Taken by itself, the decrease in marital births would increase the fraction of births that are nonmarital. At the same time, a set of processes have reduced nonmarital fertility. The widespread availability of more reliable contraceptive methods in developed countries has reduced the number of unplanned pregnancies, which are more typical of nonmarital pregnancies than marital pregnancies. Indeed, while the percentage of unintended births has fluctuated between 1982 and 2013 in the U.S., (with a high of 39.1% in 1988), a low of 34.5% was reached in 2013 (U.S. Centers for Disease Control 2015a).

[1] The 19 OECD member countries for which data is available include Austria, Belgium, Czech Republic, Estonia, France, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Luxembourg, Norway, Poland, Portugal, Slovenia, Spain, Sweden and the U.K.

[2] A more detailed exploration of the European educational gradient in marriage can be found in Kalmijn (2013).

The overall increases in use of contraception hide some shifting patterns of method of contraception, with a general movement towards more effective methods. In the U.S., while ever-use of contraception is almost universal, in a typical month, around 62% of women aged 15-44 were using contraception as of 2011-2013; this figure has remained relatively steady since 2002 (Daniels et al. 2015). The prevalence of contraceptive use in Europe stood at 69% of women aged 15 to 49 in 2015 (United Nations 2015). In both the U.S. and Europe, long-acting reversible contraceptives (LARCs) have become a more popular contraceptive option. Among U.S. women using contraception, the proportion using LARCs significantly increased from about 2% to almost 12% between 2002 and 2013, as the proportion of women using condoms and the Pill declined.[3] In comparison, as of 2014 in Sweden, LARC prevalence was estimated to be 24.3% among all women aged 15-49, and upwards of 30% among those using any form of contraception (Kallner et al. 2015). As of 2010, 24% of French contracepting women used LARCs (Moreau et al. 2014).

LARCs are highly effective (failure rate < .5%) and have the potential to reduce unintended pregnancies (Daniels et al. 2015). Recent studies have demonstrated this. Connolly et al. (2014) find that increased LARC use in England is associated with a decline in teen pregnancies. In the U.S., Schneider and Gemmill (2016) have found evidence that the increase in use of LARCs has contributed to a decrease in nonmarital fertility; Lindo and Packham (2015) provide similar evidence on the effect of the availability of LARCs on U.S. teen fertility.

Another key component of nonmarital fertility is teen fertility. Although births to teens make up only about 13% of all U.S. nonmarital births, the vast majority of teen childbearing is nonmarital: 88.9% of teen births in the U.S. in 2015 occurred to unmarried mothers (Hamilton, Martin, and Osterman 2016). The U.S. has had the highest rates of teenage pregnancy and childbearing in the developed world for many decades. Teen fertility rates in the U.S. and the U.K. differ substantially from those in other European countries, although these differences are narrowing. Teen fertility rates in the U.K dropped by about 50% between 1995 and 2014 to 15 births per 1,000 women aged 15-19, while teen fertility rates in the U.S. dropped by about 55% over the same period to 24 births per 1,000 women aged 15-19 (UNdata 2016). In comparison,

[3] Between 2002 and 2011-2013, the proportion of U.S. contracepting women aged 15-44 using condoms declined from 18% to 15.3% and the proportion using the birth control pill declined from 30.6% to 25.9%, marking the largest declines of any contraceptive category, although these declines were not statistically significant (Daniels et al. 2015).

the teen fertility rates in France, Spain and Sweden are respectively 9, 8, and 6 births per 1,000 women aged 15-19 (UNdata 2016).

Determinants of Nonmarital Fertility: Theory and Evidence

Scholars have documented the numerous historical, policy, intergenerational, and sociodemographic determinants of nonmarital fertility in the U.S. and Europe for many years (e.g. Wu and Wolfe (2001)). We selectively recapitulate some of these sources, as well as describe recent work in this area.

An obvious place to begin in thinking about the determinants of nonmarital fertility is to recognize the two processes of interest that underlie the category—marriage and fertility decisions. Both of these processes have undergone considerable change in advanced countries. Although childbearing was normatively restricted to marriage in the 19th century and early 20th century, nonmarital fertility existed throughout British, European, and U.S. history, particularly among the poor, who could not afford legal marital recognition and entered into common-law marriages (Kiernan 2004, Cherlin 2004, Wu 2008). For example, in the United States, more than 8% of women in birth cohorts prior to 1925 had a child outside of wedlock by the age of 30 (Wu 2008). As noted above, the nonmarital fertility ratio was around 5% in 1960 (Solomon-Fears 2014). It is during this period of exceptionally low nonmarital fertility that the initial economic models concerning family and fertility were developed.

The seminal models that have structured the way economists think about marriage and fertility (and the intersection of the decisions) stem from work by Becker that began in the 1960s (Becker 1981, 1960, 1973, 1974, Becker and Tomes 1976). A key focus of these models is the enumeration of a set of constraints that (utility- maximizing) agents are faced with, namely, the tradeoff between own consumption and undertaking investments in children (the fertility decision, and especially the quantity-quality tradeoff in the number of children born) and the potential for specialization between spouses on market and household activities (marriage and time-use decisions). In general, these models rationalized some of the key facts on marriage and fertility in the early and middle 20th century.

While the intuition and predictions of the Beckerian models are still relevant, they have required updating to reflect technological developments (dishwashers, microwaves, and household services markets), as well as the dramatic increase in female educational attainment

and labor market participation that decreased the returns to complete specialization in household tasks. At the same time, the labor market opportunities of some men have stalled or declined, and there has been a large increase in the rate of male incarceration. These developments have fundamentally reshaped which, to whom, and when women marry, as well as decisions on the timing and quantity of children to have, leading to changing patterns of fertility (Lundberg and Pollak 2014, Bailey, Guldi, and Hershbein 2013).[4]

For instance, these changes have led to large reductions in the gains to marriage for some groups. The inability to achieve financial stability frequently delays or inhibits marriage, especially among those with lower incomes (Gibson-Davis, Edin, and McLanahan 2005). It is well-documented in the qualitative sociological literature that male financial stability and the economic package (wedding and house) it entails is an important precursor to marriage (Gibson-Davis, Edin, and McLanahan 2005, Edin and Kefalas 2005, Smock, Manning, and Porter 2005). Empirically, this is also supported in the economics literature. Adverse trade shocks to manufacturing industries have been shown to reduce the market-value of men and reduce the prevalence of marriage, while increasing the number of children born to unwed mothers (Autor, Dorn, and Hanson 2017). Further, marriage rates decrease when a typical woman is likely to earn more than a typical man in the marriage market (Bertrand, Kamenica, and Pan 2015).

The role of changes to the relative wages of men are also a key component of the marriageable men hypothesis, wherein black women are thought to face a declining pool of financially stable, marriageable men (Wilson 1987). More recently, the role of mass incarceration in shaping the relative numbers of men and women in a marriage market has been investigated, with evidence suggesting it impacts marriage rates. Charles and Luoh (2010) show that higher levels of male incarceration are associated with lower female marriage rates and increases in female education levels and labor supply. Incarceration is much more prevalent among low-education groups. For instance, of cohorts born in 1975-1979, 68% of black men and 28% of white men without a high school degree will spend time in prison by age 34 compared to just 6.6% and 1.2% of college graduates of the respective racial categories (Western and Pettit

[4] Beginning in the 1980s, economists presented household bargaining models that allow for more complex social interactions between family members (McElroy and Horney 1981), which have been further expanded to incorporate non-cooperative game theory (Lundberg and Pollack 1993, 1994). More recent work was focused more specifically on nonmarital fertility decisions. (Lundberg Pollack 2007; Willis 1999; Akerlof, Yellen, and Katz 1996). See Schaller (2016) for a recent use of the Becker model.

2010). This implies that low-education marriage markets are more likely to be disproportionately impacted. Interestingly, the Charles and Luoh study also suggests the possibility that incarceration may be compounding the relative wage problem in low SES marriage markets because women who pursue more education are also more likely to have higher wage rates relative to men.

The implications of these findings for men with less education are stark. Between 1979 and 2014 in the U.S., men with a high school diploma saw their real wages drop by about 20%, while women with the same education saw a marginal increase in their real wages. On the other hand, among the college-educated, women have seen an over 30% increase in real wages and men a 15% increase from 1979 to 2014 (U.S. Bureau of Labor Statistics 2015). Greenstone and Looney (2012) demonstrate a steep divergence in marriage by earnings level. Between 1970 and 2011, the share of married men in the bottom quartile of annual earnings dropped by more than 30 percentage points, whereas the share of married men in the top decile dropped by only about 7 percentage points.

The rise in women's education and economic prospects and simultaneous fall in men's prospects has partially led to a set of marriage and fertility patterns that mechanically produce a greater share of nonmarital births and alter the composition of households that have nonmarital births. The increased share of nonmarital births can partly be explained by the continuing increase in age of marriage in the U.S. When combined with a relatively fixed biological fertility window[5], an increase in age of marriage implies the likelihood of an increase in nonmarital fertility simply through increased risk of pregnancies that occur prior to marriage.[6] Even as total fertility falls, if the age at first marriage increases fast enough, the share of nonmarital births could increase.

However, this mechanical risk is moderated by factors that induce a socioeconomic gradient to marriage and the timing of children. For instance, as of 2010 in the U.S., persons aged 33-44 with a bachelor's degree were almost 20 percentage points more likely to be currently married as compared to those with only a high school diploma (Lundberg, Pollak, and

[5] Assisted reproductive technologies (ART) are beginning to shift out the fertility window. Sunderam et al. 2015 report that ART now represents over 1.5% of all US births (but nearly 20% of all multiple-birth infants).
[6] This assumes that completed fertility remains constant, people engage in sexual activity prior to marriage, and there is some inefficacy in contraception.

Stearns 2016). Those with a bachelor's degree are also more likely to ever marry and less likely to divorce (Aughinbaugh, Robles, and Sun 2013). Further, the mean age at first marriage differs substantially by educational attainment.[7] In 2013, men (women) with a high school diploma or less enter their first marriage around 24-25 (20-22) years of age, on average, whereas men (women) with a bachelor's degree or higher enter their first marriage at over 27 (almost 26) years of age, on average (Aughinbaugh, Robles, and Sun 2013).

As of 2015, only 23.1% of recent births to women aged 30-34 were nonmarital compared to 65.9% of births to women aged 20-24 (Martin et al. 2017). In 2011, only 9% of recent births to women with a bachelor's degree were nonmarital, compared to 49% of births to women with a high school diploma (Shattuck and Kreider 2013). Women's age, education level, and marital status are correlated, and women with higher socioeconomic status wait longer to have children than women with lower socioeconomic status (Livingston 2015).

The trends in marriage and fertility by education suggest that the types of women who pursue more education are likely to overcome the increased mechanical risk of nonmarital fertility theoretically present and to delay fertility until after marriage. One reason this might occur is due to different child investment strategies based on parental education. Lundberg, Pollack, and Stearns (2016) contend that highly-educated parents have relatively more resources and are incentivized to intensively invest them in children because they expect high returns to human capital. For these parents, marriage functions as a commitment device to maximize cooperative joint investment in children. Because parents with less education typically invest fewer resources in their children, they have a weaker incentive to marry.

While this section has primarily focused on how changes to marriage patterns have impacted nonmarital fertility, changes in fertility behavior among unmarried and married women may also be affecting this measure. Researchers have disagreed about the extent to which changing fertility behavior has impacted nonmarital fertility. For example, Gray, Stockard, and Stone (2006) argued that the increase in the proportion of unmarried women was the major driver of the increase over time in the fraction of births to single women. This implies that marriage patterns were the key determinant of nonmarital fertility rates. However, Ermisch (2009) replicated the analysis by Gray, Stockard, and Stone (2006) and found that the increase in

[7] The mean is computed for ever-married men and women and thus does not account for proportions of never-married individuals, which differ substantially by education level.

the proportion of unmarried women does explain the rise in nonmarital births through the increase in population at risk of an unmarried birth. However, this relationship did not fully explain patterns in nonmarital fertility over time, suggesting that changes in fertility behavior in the unmarried population might also have impacted the nonmarital birth ratio. More work examining the impact of changing fertility behaviors on nonmarital fertility ratios is warranted.

Teen Fertility: Causes

While much of our focus in this chapter has been on broad patterns of marriage and fertility pattern changes, the U.S. has had the highest teen fertility rate among advanced countries for many decades (Kearney and Levine 2012, Jones et al. 1985). Like the more general topic of adult nonmarital fertility, several important volumes have been published over the past two decades that have summarized recent thinking (Hoffman 2008, Maynard 1997), so we focus attention on work done since 2010.

We first note that, unlike the broader patterns of nonmarital fertility, some of the demographic forces related to teen fertility are more constrained. The definition of a teenager has not changed over time,[8] so the more general changes to age at first marriage and age at first birth that we document above are not key explanations of the relatively high U.S. teen fertility rate, although they may help explain why teen fertility is overwhelmingly nonmarital.[9] Instead, a key hypothesis in the literature is related to social marginalization and lack of economic opportunity for a fraction of adolescents in the U.S. Adolescents who perceive a lack of opportunity in the labor market will also perceive a lower opportunity cost of having a child than adolescents who perceive strong future labor market opportunities. Kearney and Levine (2014) present strong evidence that higher levels of income inequality across U.S. states are linked to high teen fertility; since the U.S. has much higher inequality than other advanced countries, this is a possible partial explanation that fits the macro-data.[10] The authors hypothesize that an uncertain future, or one expected to be relatively disadvantaged, may lead some teenagers to "drop out" of the economic mainstream and one of these actions is early nonmarital fertility. They show, for

[8] See Deming and Dynarski (2008) for a discussion of how we conceptualize "childhood".
[9] Akerlof, Yellen, and Katz (1996) present a game-theoretic analysis of how the introduction of abortion and contraception changed the relative bargaining power of men and women about pre-marital sex, pregnancy, and marriage, leading to a decline in shot-gun marriages. See also Hoffman (2017) for a reinterpretation of their model.
[10] Related evidence is presented in Ananat et al. (2013), which uses large employer closures to estimate the impacts of large job loss shocks on teenage fertility, especially for black teenagers.

example, that the effect on teen fertility of growing up in a poor family is much greater in high-inequality states than in states with less inequality. The policy response to this hypothesis is less clear. Indeed, in follow-up work, Kearney and Levine (2015a) find limited effects of shifts in the age composition of teenagers (a larger share of teens aged 18-19 making up the total teen population around 1990), changes in unemployment rates, and small effects of welfare benefit and family service policies.[11] Alternatively, policies that attempt to raise the hopes/optimism of some teenagers as well as focusing attention on social processes and social norms that might explain some of the large spatial variation in teen fertility are still largely untested (Yakusheva and Fletcher 2015).

A second research direction in understanding the causes of teen fertility has resurrected the long-standing interest in how information and social norms shape teen decisions. One explanation for high spatial variation in teen childbearing rates within the U.S. is that local social norms and social influences have produced multiple equilibria. Indeed, several papers have presented evidence that adolescent sexual behavior decisions "spill over" onto the decisions of their peers. Identifying peer effects can be difficult, due to what Manski (1993) characterizes as the *reflection problem* wherein researchers are faced with the task of unwinding the influences of an adolescent on her friends with the influences of her friends on her. To address the reflection problem, Fletcher (2007) uses instruments that are assumed to impact peer behaviors only through own behavior, finding that adolescent sexual initiation decisions are associated with the decisions of their classmates. Fletcher and Yakusheva (2015) provide a more recent analysis that takes advantage of friend miscarriage events to examine the spillover effects of adolescent friend childbearing.[12] The authors find novel evidence of *negative* peer effects, where the effect of a teenager having a child is to lower the chances of her friends having a child as a teenager. The authors suggest that a key mechanism of this effect is that friend childbearing allows others to learn how difficult it is to have a child as a teenager. Potential policy implications of this finding are also interesting, suggesting that interventions that reduce teenage childbearing among some teens could possibly increase the likelihood of other teens having a child due to the reduction in learning about the difficulty of having a child as a teenager.[13]

[11] Bullinger (2017) finds small effects of the minimum wage on teenage fertility. Bifulco, Lopoo, and Oh (2015) find little evidence of school desegregation on teen fertility.
[12] Richards-Shubik (2015) and Fletcher and Yakusheva (2016) are other recent examples.

Another recent influential example of the impacts of social norms and social learning on teen childbearing is from Kearney and Levine (2015b), who show evidence that the MTV show *16 and Pregnant* may account for one-third of the overall decline in teen births over an 18 month period between 2009 and 2010. The main idea is that the show provided information to a large number of teenagers about the financial and social costs of childbearing, as well as directed attention to methods of reducing pregnancies. Specifically, the paper exploited geographic variation in viewership and teen childbearing rates, and used MTV ratings by geographic area prior to the release of *16 and Pregnant* as an instrument to predict the show's rating. The authors provided evidence of greater internet searches for "birth control" and related terms following episodes in places where the show had higher ratings. A second potential effect of the show is the possibility of breaking norms in some places that had low social penalties for teenage fertility.

While the potential effectiveness of providing information and changing social norms appears strengthened by this work, it is important to note that there is ongoing disagreement over the robustness of the findings. Jaeger, Joyce, and Kaestner (2016) show evidence suggesting that the parallel trends assumption that is required to use the spatial variation in the popularity of the show is not met. A reply by the original authors claims that the critique does not pose a serious challenge to the original paper (Kearney and Levine 2016). In related work on the impacts of media access on fertility, Guldi and Herbst (2017) find that broadband access explains at least 7% of the decline in the teen birth rate between 1999 and 2007 and La Ferrara et al. (2012) show an impact of Brazilian soap operas on adult fertility.

The Consequences of Nonmarital and Teen Fertility

There are standard issues in estimating the consequences of marriage and fertility decisions that people make on their (and their children's) future outcomes. As both marriage and fertility are not randomly assigned to individuals, but instead chosen based on preferences and constraints, individuals who decide to marry/have children may be different than those who do not in ways that affect the outcomes. This is a standard omitted variables problem and potentially leads to biased estimates of causal effects.

Parents' Outcomes

The literatures on the impact of nonmarital fertility and teen fertility on parents' future outcomes have approached this issue using three broad methodologies.[14] Initially, studies used OLS regression with an extensive set of controls to estimate the effects of teen and nonmarital childbearing on educational attainment (Moore and Waite 1977, Mott and Marsiglio 1985). This line of research considered fertility as exogenous to educational attainment, and found large negative associations. But because the available explanatory variables are inherently limited, this approach likely has overstated the negative impacts. A related approach that still treats fertility as exogenous but has attempted to provide better control for unmeasured variables used fixed-effect models based on sister differences in fertility and outcomes (see Hoffman, Foster and Furstenberg Jr. 1993). Studies using this approach typically have found smaller, but still negative impacts. A second set of studies has used instrumental variable methods to account for the endogeneity of fertility and found a smaller, but still negative effect, on schooling outcomes (e.g., Rindfuss, Bumpass, and St. John (1980), Ribar (1994)). Subsequent studies have employed a natural experiment approach, comparing women who were pregnant but miscarried to women who gave birth. For instance, using this approach Hotz, McElroy, and Sanders (2005) found a counter-intuitive positive effect from giving birth as a teen on earnings.

Teen Outcomes

More recent literature has focused considerable effort in defining the appropriate counterfactual group for teen mothers. Ashcraft and Lang (2006) and Ashcraft, Fernández- Val, and Lang (2013) showed evidence of the susceptibility of the results to bias due to not establishing an accurate comparison group. They showed that using miscarriage as an instrument is biased towards a 'benign view' because a miscarriage is unobserved if it is preceded by an abortion (Ashcraft, Fernández-Val, and Lang 2013).[15] As a result, the IV estimator using miscarriage as an instrument underestimates the real effects of childbearing and results in a

[14] Kane et al. (2013) provide an up-to-date survey of the empirical methods used in this literature and introduce alternative methods to control for "type" heterogeneity as well as a reintroduction of matching methods to this literature. See also Diaz and Fiel (2016) for an example that uses inverse probability weights.
[15] In a separate study, Fletcher and Wolfe (2009) also provide evidence that girls who miscarry come from more disadvantaged backgrounds.

biased (downward) estimate. On the other hand, the OLS estimates of effects from childbearing are biased upward.[16] The upshot of these analyses is a recommendation to drop women with abortions from the sample and compare miscarriages (especially "late" miscarriages) to live births.

This empirical direction has been pursued in a set of papers. Researchers have shown modest negative impacts of teen childbearing on education and labor market outcomes (Fletcher and Wolfe 2009), mixed effects on mothers' risky health outcomes (Fletcher 2012), and negative effects on the development of non-cognitive skills of mothers (Fletcher and Padrón 2016).[17] Additional research using a miscarriage approach found that teenage fatherhood led to some reductions in labor market outcomes (Fletcher and Wolfe 2012).[18] More recently, Lang and Weinstein (2015) have explored longer-term outcomes of early cohorts of teen mothers. The authors find an important difference in effects of childbearing on maternal outcomes based on marital status at the time of birth, showing that unmarried teens faced lower rates of subsequent marriage and lower human capital outcomes.

Children's Outcomes

While the above studies and methods were centrally focused on estimating the effects of fertility on the parents, a larger literature has examined the impacts of family structure on children's outcomes. This is a difficult undertaking because of the endogeneity of children's nonmarital versus marital birth status and also the potential confounding of nonmarital status with other characteristics of the family. Because of the large (and changing) differences in the characteristics of parents who have nonmarital versus marital births, as discussed above, the sources of confounding could be severe enough to suggest the possibility of a lack of "common support" (in the sense of matching estimators) between family types. One way to see this is to recognize that analyses of children's outcomes take the children as the relevant "cohort" rather

[16] Intuitively, this is because women who miscarry could be either 'abortion types' or 'non-abortion types' and therefore belong to a more favored population than women who gave birth (strictly 'non-abortion' types). Women who have abortions were found to be of more privileged backgrounds in both Fletcher and Wolfe (2009) and Ashcraft, Fernandez-Val, and Lang (2013). Further discussion on the direction of the bias in these estimates can be found in Ashcraft, Fernandez-Val, and Lang (2013).

[17] Yakusheva and Fletcher (2015) and Fletcher and Yakusheva (2016) examine an alternative question with "miscarriage as a randomizer" to explore spillover effects of teen childbearing on friends.

[18] See also Carlson, VanOrman, Pilkauskas (2013) for an analysis of predictors of nonmarital fatherhood.

than the parents. Thus, nonmarital births will have younger, less-educated parents and will more likely be a racial/ethnic minority (Wu 2008). This issue of confounding is likely time-varying, as the median age at first marriage has been increasing over time, whereas age at first birth has not been delayed to the same extent, implying that the age structure of nonmarital and marital births is different and changing over time.

Like the literature on fertility effects on parents, the literature on children's outcomes often uses regression-adjusted comparisons between children in married versus unmarried households, either measured at the time of birth or a later time. A smaller number of studies use sibling comparisons or within-child comparisons in order to attempt to reduce the time-invariant parental and/or family factors that might bias comparisons. Sandefur and Wells (1999) find that adding controls for common family environment reduces the association between family structure and educational attainment.[19] Buckles and Price (2013) examine sibling differences in exposure to alternative family structure on children's health and find evidence that children born to married parents have higher birth weights, APGAR scores and other positive birth outcomes, though the authors also show that a large fraction of these effects are due to selection into marriage. Gruber (2004) is one of a small set of studies which consider an instrumental variable approach, using state divorce laws for quasi-experimental variation in divorce, to estimate the impacts of family structure on children's outcomes. Unfortunately, but pragmatically, he concludes that these laws do not satisfy the requirements of the approach. Reinhold, Kneip, and Bauer (2013) use the same type of policy instruments in the European context to show evidence of reductions in children's outcomes.[20] More recently, male incarceration rates have been suggested for use as an instrumental variable by Finlay and Neumark (2010). Overall, the evidence of causal effects of family structure on children's outcomes is inconclusive. Like the evidence on the effects of fertility on parents' outcomes, the effect sizes have largely fallen over time as estimation strategies are improved. At the same time, not all mediating mechanisms between marriage and child outcomes have been rigorously explored, and mechanisms such as net wealth, borrowing constraints, and inefficiencies associated with living apart may warrant further investigation (Ribar 2015).

[19] See McLanahan, Tach, and Schneider (2013) for a recent review on the effects of father absence on children's outcomes.

[20] Buckles, Guldi, and Price (2011) uses state level policies related to blood test requirements for marriage. Bharadwaj (2015) uses a set of marriage license requirements in Mississippi.

Future Research Directions

In concluding our chapter, we raise three issues that are important for future studies of these topics. First, the large and increasing group of children born to cohabiting parents do not fit well into the historical marital versus nonmarital dichotomy. Second, the longer term and dynamic effects of the Great Recession on nonmarital and teen fertility are worthy of additional focused attention. Third, social science and demographic models and methods of understanding nonmarital fertility may provide additional insights as they are integrated with theories and data from the biological sciences.

Measures of nonmarital fertility, such as those published by the U.S. National Vital Statistics System, capture a mother's legal marital status at the time of a birth. However, this measure increasingly masks substantial heterogeneity in family "type" by combining births to cohabiting mothers (which have been growing as a proportion of nonmarital births) with births to single mothers, making the binary categorization increasingly costly as a tool to reduce complexity in the data. For instance, it is difficult to distinguish between the causal effects of a marriage contract versus a family "type". Indeed, we suggest that demographic changes over the past decades have made this binary categorization insufficient for understanding the driving forces behind nonmarital fertility and its consequences for child and adult outcomes.

As noted previously, the proportion of children born to unmarried, cohabiting couples has grown tremendously. For instance, based on the 1980-84 cycle of the National Survey of Family Growth (NSFG), 71% of nonmarital births in the U.S. were to single mothers, but by the 2011-13 cycle, 59% of nonmarital births were to cohabiting couples (Lundberg and Pollak 2014, Curtin, Ventura, and Martinez 2014, U.S. Centers for Disease Control 2015b). The 20 percentage-point increase in the nonmarital birth ratio between 1980-1984 and 2013 in the U.S. has been due almost exclusively to the increase in nonmarital births to cohabiting partners (Manning, Brown, and Stykes 2015). Europe has witnessed widespread increases in childbearing to cohabiting couples over the past few decades as well, with substantial increases occurring in countries such as Austria, France, Norway, the Netherlands and the UK. For example, in France in 1975-1984, 12% of first births occurred to cohabiting couples, whereas this figure stood at 46% in 1995-2005 (Perelli-Harris et al. 2009).

U.S. women in cohabiting relationships at the time of their child's birth look like those who are unmarried and not cohabiting in some regards, such as age, educational attainment and poverty level, but less so in others, such as race/ethnicity; African-American mothers are much more likely to be single than cohabiting or married (Martinez, Daniels, and Chandra 2012). In spite of some similarities, grouping cohabiting and single women together into a nonmarital fertility measure makes it difficult to understand key research questions. We argue that scholars should make a greater effort to include three groups (children born to married parents, to cohabiting partners, and to single mothers) in their analysis of family and fertility wherever possible. This will give researchers more opportunity to measure patterns in parental sorting into marriage, cohabitation, and single parenthood across time, which enables three additional lines of research.

First, a three-group measure provides better opportunities to decompose the underlying causes of nonmarital fertility: for example, whether economic forces are constraining marriage for committed couples, or whether certain 'types' of people are differentially sorting into marriage, cohabitation, or single parenthood. Second, analysis of three groups gives further insight into the mechanisms through which nonmarital fertility might have consequences for children. For example, a growing body of literature has shown that father absence likely has important implications for children's educational attainment and socio-emotional health (McLanahan, Tach, and Schneider 2013), though much of this work is unable to estimate causal relationships. A three-group measure of fertility would distinguish paternal presence or absence within and outside of marriage. Third, such a measure can contribute to the increased validity of studies of nonmarital fertility. The rapidity with which the share of cohabiting families is growing in comparison to the share of married families poses external validity concerns in studies analyzing the impact of marriage, marital fertility, and family structure on child outcomes. Indeed, some scholars have questioned whether causal claims from even a few years ago would be generalizable to these populations today (Waldfogel, Craigie, and Brooks-Gunn 2010). If more social surveys and government entities distinguished between cohabiting and single-parent family types in their measures of fertility, scholars would have better chances of accessing 'real-time' data to reduce external validity problems.

Another direction of interest will be in understanding the dynamic effects of the Great Recession on fertility and marriage. In the U.S., both marital and nonmarital birth rates declined

beginning in 2008 and 2009 respectively (Hamilton et al. 2015). Birth rates in Europe similarly declined in response to the Great Recession, marking a trend reversal in over half of the 27 countries in the European Union (Sobotka, Skirbekk, and Philipov 2011). Schneider and Gemmill (2016) find that the Great Recession is an important explanatory factor of recent declines in the U.S. nonmarital fertility rate. Schneider and Hastings (2015) use quasi-experimental variation in the severity of the Great Recession and find that unmarried, low-SES women reduce their fertility in response to worse economic conditions, even when accounting for a recession-induced reduction in probability of marriage. With regard to teen childbearing, Kearney and Levine (2015a) find that 16% of the reduction in teen births can be attributed to increases in unemployment rates since the Great Recession began. Further, Ananat, Gassman-Pines, and Gibson-Davis (2013) suggest that the reductions in teen childbearing may have a racial gradient whereby job losses due to the Great Recession predict reductions to the black teen birth rate, but not the white teen birth rate.

However, while unemployment rates for those ages 16-19 and those aged 16 and over have returned to pre-recession levels (U.S. Bureau of Labor Statistics 2017a, b), nonmarital and teen fertility rates continue to decline. This may partly be explained by the fact that unemployment rates do not fully capture the impact of the Great Recession, which was likely operating through multiple mediating pathways that may not have fully recovered. For instance, Schneider (2015) demonstrates that the foreclosure rates, consumer confidence and press coverage of the recession mediated the impact of the Great Recession on fertility rates. While this may offer a partial explanation, it is clear that the full impacts of the Great Recession on fertility have not been elucidated, and potential scarring effects could even influence generations that did not experience the recession.

A third potential direction in furthering our understanding of the causes and consequences of shifts in fertility lies in integrating demographic and social science models with findings from genetics and biology. While social and economic factors have likely been substantial determinants of the shifts in age at first birth in advanced countries, there is also emerging evidence of important biological/genetic contributions to a range of fertility outcomes, including age at first birth and completed fertility. For instance, overall genetic heritability[21] of

[21] Genetic heritability is measured as genetic variance divided by the overall phenotypic variance (the sum of genetic and environmental variance) of a trait (Tropf, Stulp, et al. 2015).

age-at-first-birth has been estimated at approximately 25% in several large twin and family studies (Tropf, Stulp, et al. 2015, Tropf, Barban, et al. 2015), suggesting that a non-trivial fraction of population variation in fertility outcomes has genetic sources. Indeed, recent studies have begun to uncover specific genetic targets for age-at-first-birth and the number of children ever born (Barban et al. 2016). Social scientists have begun to contribute to this area by working with genetics in a number of ways, for instance, by exploring gene-environment interaction.

Preliminary evidence of gene-environment interaction shows the lack of similarity in genetic effects across countries, which Tropf et al. (2016) interpret to suggest gene-environment interactions. Related research has begun to address the genetic factors in common between spouses (Domingue et al. 2014, Conley et al. 2016), which could have downstream impacts on children's outcomes through the transmission of psychiatric risks and other pathways (Conley and Fletcher 2017, Plomin, Krapohl, and O'Reilly 2016). While the policy implications of these findings are not straightforward, they do suggest a need for interdisciplinary collaboration on economic and demographic models that incorporate genetic factors to more fully understand fertility dynamics.

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