Non-marital and Teen Fertility and Contraception During the Great Recession

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I examine the effects of the Great Recession on non-marital and teen births. The Recession could have led to reductions in non-marital and teen fertility or the Recession could have had null effects if non-marital and teen fertility are disconnected from economic factors. Using a panel of state-level fertility and economic data, I find that worse macro-economic conditions are associated with lower rates of non-marital and teen fertility. I next analyzed data from the National Survey of Family Growth and find that worsening macro-economic conditions at the national level raise the probability of contraceptive use, of consistent contraceptive use, and of the efficacy of the contraceptive method employed among unmarried women. The results suggest that disadvantaged women moderate fertility in response to severe economic shocks.

Keywords: non-marital fertility, teen fertility, contraception, recession

The economic effects of the Great Recession have been readily apparent in high levels of unemployment and unprecedented levels of mortgage foreclosure. These economic effects have also had important social consequences for American families. Recent research suggests that elevated levels of unemployment and foreclosure led to a substantial reduction, on the order of 5 to 10 percent, in births in the United States (Schneider 2015; Currie and Schwandt 2014; Cherlin et al. 2013; Ananat, Gassman-Pines, and Gibson-Davis 2013).

Reductions in fertility around periods of recession are typically thought of as a rational response to increases in economic hardship and perhaps also to increased uncertainty about the future (Sobotka, Skirbekk, and Philipov 2011). On those grounds, we might expect the Great Recession to have had its largest effects on relatively disadvantaged women—those who are teens, or unmarried, or with limited educational attainment. However, ethnographic and demographic research on non-marital fertility among low-SES (socioeconomic status) women provides good reason to expect that the Great Recession would have relatively limited effects on the fertility of such women. This work finds that economic considerations are relatively disconnected from fertility among low-SES unmarried women and this disconnection may manifest in non-use or inconsistent use

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of contraception, or the use of ineffective contraception.

I examine how non-marital and teen fertility responded to the sharp economic shocks of the Great Recession. I first draw on a panel of state-level vital statistics records merged with data on state-level unemployment and foreclosure to estimate how the fertility rates of teen and unmarried women responded to the recession. There is clearly not a direct relationship between economic conditions and births—an important set of proximate determinants of fertility must necessarily have been the mediating processes. To test the pathways by which the recession might have affected fertility, I next draw on data from the 2006-to-2010 cycle of the National Survey of Family Growth (NSFG) to examine whether the recession affected patterns of contraception use among these same groups of women.

I find that at the state-level, non-marital and teen fertility declined significantly with rising unemployment and foreclosure during the years of the Great Recession. I also find that the likelihood of using contraception increased with unemployment and foreclosure over this same time period for unmarried women. There is some evidence that unmarried women exposed to worse economic conditions also used contraception more consistently and used more effective contraceptive methods. However, I find no evidence of a link between national economic conditions and the use of contraception among teenagers during the Great Recession. Together, these findings buttress other recent research finding recessionary reductions in non-marital and teen fertility. The results suggest that some disadvantaged women moderate fertility in response to severe economic shocks, a finding that supports a more nuanced understanding of the relationship between economic factors and fertility in this subpopulation.

FERTILITY IN THE GREAT RECESSION
The Great Recession resulted in substantial economic hardship and uncertainty at the house-

hold level. These effects are most broadly captured in the sharp increases in residential mortgage delinquency and foreclosure, the dramatic rise in unemployment, and the pronounced reductions in consumer confidence. Research has also shown that the Great Recession increased household economic hardship and poverty (Bitler and Hoynes 2010; Pilkauskas, Currie, and Garfinkel 2012).

Given the substantial investments that many Americans make in their children in the form of basics such as medical care, clothes, food, and shelter as well as other costs such as childcare, schooling, toys, books, and activities (to name just a few), we might well expect that at least in the short term, fertility would decline in the face of these economic shocks. Indeed, this common wisdom is formalized in economic theories of fertility (see Becker 1960) and borne out in a long line of demographic research in the United States that shows a negative effect of aggregate measures of unemployment on fertility (for example, Rindfuss, Morgan, and Swicegood 1988; Macunovich 1996; Schaller 2016; Currie and Schwandt 2014). Such recessionary effects are generally concentrated among younger women and on first births (Sobotka, Skirbekk, and Philipov 2011; Adsera 2004). Although recessions may then primarily serve to delay fertility (tempo effects), recent research suggests that exposure to poor economic conditions can also have a permanent effect over the life course, reducing number of children ever born (quantum effects) (Currie and Schwandt 2014).[1]

Recent research in the United States finds evidence of significant negative effects of the Great Recession on fertility using a variety of methodological approaches. One set of analyses simply tracks the time trend in fertility nationally, observing that general fertility rates (GFR) declined nationally with the onset of the Great Recession (Livingston and Cohn 2010; Morgan, Cumberworth, and Wimer 2011). A second set of analyses examines the relationship between area-level measures of fertility and

1. Notably, recent empirical research does not seem to bear out William P. Butz and Michael P. Ward's (1979) theory that although raising children is expensive, so is any time that women take off from work for pregnancy, birth, and parenthood—and so a time when the labor market is weak may actually be a very good time to have a child.

area-level economic indicators. Livingston (2011) reports that changes in state economic conditions between 2007 and 2008 were related to declines in fertility between 2008 and 2009 and similarly, S. Phillip Morgan, Erin Cumberworth, and Christopher Wimer (2011) show that the change in unemployment between 2007 and 2009 was negatively related to the change in fertility between 2007 and 2009. Andrew Cherlin and colleagues (2013) extend this series to show a negative relationship between the percentage-point change in unemployment between 2007 and 2009 and the percentage-point change in GFR between 2007 and 2011. More recently, Daniel Schneider (2015) assembles a panel of state-level data on fertility and unemployment and foreclosure for the period 2001 to 2013 and finds that worsening macroeconomic conditions are associated with lower general fertility rates and that these effects were largest for younger women.

Variation by Socioeconomic Status

These negative effects of recessionary conditions may not, however, apply to all women and couples equally. The economic hardship perspective on recessions and fertility would suggest that the fertility of women in already disadvantaged subgroups, such as those with lower levels of educational attainment or at risk of a non-marital or teen birth, might be most affected by the recession. In this scenario, the least-advantaged reduce their fertility the most in response to poor economic conditions.

Conversely, recent ethnographic work focused on young unmarried mothers in the United States suggests that for many young disadvantaged women, fertility is effectively disconnected from economic resources. Scholars such as Kathryn Edin and Maria Kefalas (2005) argue that, with few prospects for economic success, these young women see little reason to delay fertility. In these accounts, fertility is not the result of a careful economic calculus, but rather a natural part of the life course essentially removed from economic considerations (Gibson-Davis 2009). Some prior empirical research supports this idea. Cristina Gibson-Davis (2009) finds that in a sample of disadvantaged unmarried parents, improvements in economic

standing are predictive of marriage but not of having a birth. Other work has even shown a positive relationship between unfavorable economic conditions and non-marital fertility (Billy and Moore 1992) and between state-level income inequality and teen fertility (Kearney and Levine 2014). In essence, this work suggests that for disadvantaged and unmarried and teen women, economic factors may exert a weak influence on fertility. In the context of the economic shocks of the Great Recession, we might then expect to find little relationship between unemployment or foreclosure and the fertility of unmarried, teen, or otherwise disadvantaged women.

This research complements a significant body of demographic work on how class and economic expectations shape how women use contraception. This research suggests that disadvantaged unmarried women and their partners do not so much set out to have children in the face of economic scarcity as "drift into parenthood" (Sawhill 2014, 3). Indeed, it is well established that many non-marital and teen births are unintended (Finer and Henshaw 2006), and such unintended births are much more common among less-educated women than among women with a college degree (Musick et al. 2009). The explanation for this mismatch between intentions and fertility is then inconsistent or ineffective use of contraceptive technology (Edin et al. 2007).

There is less consensus on why disadvantaged, unmarried, and teen women are inconsistent in their use of contraception. One explanation notes that although few pregnancies among low-SES unmarried women are explicitly intended, significant ambivalence exists about pregnancy (Augustine, Nelson, and Edin 2009; Edin and Kefalas 2005; Edin et al. 2007; Yoo, Guzzo, and Hayford 2014; Miller, Barber, and Gatney 2013). In their interviews with unmarried parents, Edin et al. (2007) found roughly 65 percent of pregnancies were neither completely planned nor accidental. Instead, the couples often wanted children, but were unsure if the current circumstances were ideal. This spectrum of ambivalence has also been found in national representative studies (Yoo, Guzzo, and Hayford 2014) and among fathers (Augustine, Nelson, and Edin 2009).

Fertility in the Great Recession: Disadvantage and Proximate Determinants

Despite these contrasting predictions, relatively little research has been done to investigate whether the effects of the Great Recession vary by women's socioeconomic or marital status. There are, though, some notable and useful exceptions. Cherlin and colleagues (2013) examine the time trend in births reported in the American Community Survey data and find that women living at less than 100 percent of the poverty line have the steepest negative gradient in fertility over the years of the Great Recession, through 2011. Elizabeth Oltmans Ananat, Anna Gassman-Pines, and Cristina Gibson-Davis (2013) draw on detailed county-level data from North Carolina merged with information on mass layoffs to examine the effects of the Great Recession on teen births. While we might expect that teen births would be relatively unresponsive to the Great Recession, or might even increase, Ananat, Gassman-Pines, and Gibson-Davis (2013) find the opposite, that births to black teens declined with communitywide job loss in North Carolina. Further, Melissa Kearney and Phillip Levine (2015) also find that teen births declined during the Great Recession. Finally, Schneider and Orestes Hastings (2015) draw on ACS data merged with state-level economic conditions to examine how the Great Recession affected non-marital fertility among low-SES women. They find that unmarried women with a high school degree or less who were exposed to higher rates of foreclosure and unemployment were significantly less likely to have a birth.

These results are somewhat surprising, both because prior theory suggests that fertility is likely to be disconnected from economic factors for unmarried, disadvantaged, and teen women and because prior empirical research shows that a substantial portion of births to these women are unintended and likely are due to inconsistent use of contraception. There are, however, several pathways by which the Great Recession could have affected fertility among these subgroups of women and not all are inconsistent with this existing theory and empirical work.

One such pathway would be an increase in stress-induced miscarriage. Prior research has found that miscarriage increases in response to maternal stress (Nepomnaschy et al. 2006) and the Great Recession, like prior economic recessions, could reasonably be expected to increase economic stress (see Conger, Reuter, and Elder 1999). If such a mechanism were at work in the case of the Great Recession, that could explain the puzzling discrepancy between the apparent decline in births among teens and unmarried women and the existing literature that suggests a weak connection between economic factors and fertility among disadvantaged women. However, I know of no research that has examined this issue in the context of the Great Recession, and the magnitude of fertility declines would appear to be much larger than would be expected from stress-induced miscarriage.

A possible alternative is that more women elected to terminate their pregnancies during the Great Recession due to economic pressure. Evidence of such behavior would not accord with the idea that fertility is disconnected from economic concerns, but would fit with the finding that unmarried, teen, and low-SES women have trouble adopting consistent and effective patterns of contraceptive use. There is relatively little work on how abortion changed during the recession. In one study, Ananat, Gassman-Pines, and Gibson-Davis (2013) infer an increase in abortion from the fact that economic conditions zero to four months after expected conceptions are related to observed teen births in North Carolina. However, nationally, abortions declined markedly during the years of the Great Recession, and reached a low for the period from 2002 to 2011 in 2011 (Pazol et al. 2014). Further, women under the age of twenty and unmarried women accounted for the large majority of all abortions, and rates of abortion declined markedly for these two groups, although the rate of decline among unmarried women was slower between 2007 and 2011 than between 2002 and 2006 (Pazol et al. 2014).

The Great Recession could also have induced more teen and unmarried women to use effective contraception as a means of avoiding births during a period of acute economic constraint. There is somewhat more evidence to support this idea. The strongest evidence to date is re-

ported by Ananat, Gassman-Pines, and Gibson-Davis (2013). Based on analysis of the Youth Risk Behavior Survey for the period 1995 to 2009, Ananat, Gassman-Pines, and Gibson-Davis find that white and black teens are more likely to report using contraception at last sex following mass layoffs in their state. More broadly, women steadily increased their use of long-acting contraceptives (Finer, Jerman, and Kavanaugh 2012) and men increased their use of vasectomy (Najari, Schlegel, and Goldstein 2014) over the period 2006 through 2009. Additionally, a 2009 survey found that 30 percent of female respondents reported using contraception more consistently as a result of the Great Recession (Gold 2009) and some reports based on market-research data suggest that the number of condoms and over-the-counter female contraceptives sold increased in the first months of 2009 as compared to the same period in 2008 (Gregory 2009).

PLAN OF ANALYSIS

I conduct two related empirical analyses. First, I draw on state-level vital statistics records on births to unmarried women and teen women joined with data from private and governmental sources on unemployment and foreclosure to examine whether the Great Recession really did have the effect of reducing births to these two groups of generally disadvantaged women, as found in North Carolina by Ananat, Gassman-Pines, and Gibson-Davis (2013) and nationally for unmarried women using ACS data by Schneider and Hastings (2015). This analysis advances existing work by considering both teen and non-marital fertility nationally during the period of the Great Recession.

Second, I use individual person-month data from the NSFG to examine if the high rates of unemployment and foreclosure found during the Great Recession changed the use of contraception by unmarried and teen women and, specifically, by unmarried and teen women of lower socioeconomic status. Here, I examine if the probability of contraceptive use, the consistency of contraceptive use, and the type of contraception employed was responsive to economic conditions. While Schneider and Hastings (2015) speculate that the Great Recession likely resulted in increased used of contracep-

tive technology among unmarried women, they do not actually test to see if recessionary economic conditions are associated with contraceptive use. Ananat, Gassman-Pines, and Gibson-Davis (2013) do show a relationship between economic conditions and contraceptive use among teens, but do not examine contraceptive practices by unmarried women or low-SES unmarried women.

DATA AND METHODS

State-Level Fertility Data

I create a panel of state-level general fertility rates (GFR) for the period 2003 to 2013. These data are drawn from the natality vital statistics published by the Centers for Disease Control and Prevention's National Center for Health Statistics. I create two key measures of interest. First, I calculate the non-marital GFR as the number of births to unmarried women within a state in a given calendar year divided by the number of unmarried women aged fifteen to forty-five living in the state in the same calendar year. The data for this denominator come from the single-year files of the American Community Survey. Second, I calculate the teen GFR as the number of births to women aged fifteen to nineteen within a state in a given calendar year divided by the number of women aged fifteen to nineteen living in the state in the same calendar year. The data for this denominator come from the National Cancer Institute's Surveillance, Epidemiology, and End Results Program (SEER).

I adjust the models for several time-varying measures of state demographic composition (each lagged on year): the percentage of women age fifteen to forty-four in the state who are black, non-Hispanic, and the percent who are Hispanic; the percentage of women with less than a high school education, with a high school degree or some college; the percentage of women aged twenty-five to thirty-four and the aged thirty-five to forty-four; and the percentage enrolled in school. Each measure is calculated from microdata form the March supplement to the annual Current Population Survey (CPS), collapsed with person-weights to the state-year level. These controls are designed to adjust for any nonlinear changes in state de-

mographic profiles that could drive both fertility patterns and labor market conditions.

My approach follows much existing work in aggregating fertility at the state-level (Schaller 2016; Schneider 2015; Lovenheim and Mumford 2013). As Kearney and Levine (2009) note, these state-level vital statistics data are well measured. Additionally, using state-level aggregates as the outcome allows me to express the effects in terms of the widely used metric of general fertility rates rather than individual likelihoods of having a birth. Finally, from a practical perspective, many of the most commonly used datasets (for example, the National Longitudinal Survey of Youth 1997, Add Health) that would allow for the estimation of the effect of state-level unemployment on individual-level fertility are cohort-specific and so are less useful for understanding the effects of the Great Recession.

National Survey of Family Growth

I complement the state-level fertility data with individual-level data from the 2006-to-2010 cycle of the National Survey of Family Growth (NSFG). The NSFG is a nationally representative survey of Americans aged fifteen to forty-five with oversamples of African Americans, Hispanics, and teenagers. It is conducted by the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS). The multistage stratified sample is constructed by first drawing 110 geographic entities called primary sampling units and dividing those into four subsets. Each subset is then used in turn in each of the four years of fieldwork (Groves et al. 2009). This strategy ensures that interviews that occur later in the interviewing period (2006 to 2010) are not biased in the direction of hard-to-reach respondents.

Separate surveys are conducted of men and women; following the convention in the demographic literature on fertility, I use data on women's reports. The interviews with women were conducted in person by trained female interviewers and lasted an average of eighty minutes. The survey had a 78 percent response rate for female interviewees.

This cycle of the NSFG was in the field from June 2006 through June 2010, spanning the years of the Great Recession. It contains interviews with 12,279 women aged fifteen to forty-five. Though fielded over four years, the NSFG contains only one interview with each respondent. However, because the NSFG collects detailed retrospective data on key variables, it is possible to construct a monthly time series for each respondent for many of the key measures of interest.

Contraceptive Use

The 2006-to-2010 cycle of the NSFG collects a detailed monthly calendar of contraceptive method use based on respondents' retrospective reports. This calendar is designed to collect information on the use of up to four different contraceptive methods during a given month for up to three years from the January before the interview date. Since interviews were conducted between July 2006 and June 2010, contraceptive method data is available from January of 2003 through June of 2010.

This data provide a comprehensive record of the use of contraception at the monthly level over the period from 2003 through mid-2010. I use this data to construct three key variables for analysis. First, I create a dichotomous measure of any contraceptive use in a given month. Second, I create a measure of consistent contraceptive use, which I define as the use of some kind of contraceptive technology in the current month and in each of the prior two months.

Third, I examine the effectiveness of the methods of contraception that respondents employed. Respondents reported using a large variety of contraceptive methods. Scholars have previously estimated the effectiveness of these different types of contraception at preventing pregnancy. Specifically, James Trussell (2011) provides estimates of the share of women experiencing an unintended pregnancy within the first year of typical use of the method. Table 1 provides a listing of these different methods as well as their associated failure rates. I construct a new variable that contains the failure rate corresponding to the contraceptive method used by the respondent. Since respondents can report up to four methods in a given month, I take the failure rate for the single most effective method used in the month.

Table 1. Contraceptive Methods and Percent of Women Experiencing Unintended Pregnancy Within the First Year of Typical Use

Contraceptive Method	Percentage Pregnant Within One Year Given Typical Use
No method	85
Foam	28
Jelly or cream	28
Rhythm method	24
Symptothermal method	24
Withdrawal	22
Female condom	21
Male condom	18
Sponge	18
Diaphragm	12
Contraceptive patch	9
NuvaRing	9
Birth control pill	9
Depo-Provera	6
Female sterilization	0.5
IUD	0.5
Male sterilization	0.15
Hormonal implant (such as Imlanon)	0.05

Source: Author's compilation based on Trussell 2011.

Notes: Methods are those listed by NSFG 2006–2010 respondents in contraceptive method calendar. Unintended pregnancy rates are taken from Trussell et al. (2011). Respondents in the NSFG reporting "emergency contraception" (0.02 percent of person-years), "Respondent sterile" (0.30 percent of person-years), "Partner sterile" (0.05 percent of person-years), "Lunelle" (0.08 percent of person-years), "Other" (0.06 percent of person-years) are set to missing.

Demographic Controls

To maintain parallelism with the state-level analysis, I stratify the NSFG analyses by marital status and by age. For marital status I use re-spondents' retrospective reports of dates of marriage and divorce or separation to construct a complete marital history, and I map that to marital status in a given person-month. I then construct a dichotomous measure of married or unmarried in each person-month. For age, I use respondents' month and year of birth to construct a dichotomous measure of being fifteen to nineteen years old.

Although the state-level vital statistics data cannot be easily stratified by socioeconomic status in addition to marital status or age, such data are available in the individual-level NSFG file.[2] I construct a measure of the respondent's mother's educational attainment, coding mothers as having less than a high school degree or at least a high school degree. This approach of using mothers' educational attainment as a proxy for respondents' social class is also employed by Paula England, Elizabeth McClintock, and Emily Fitzgibbons Shafer (2011) and Melissa Kearney and Phillip Levine (2014).

I also create a set of time-invariant background characteristics of respondents. These include race (white, black, Hispanic, or other), family structure at age 14 (living with both biological parents or not), foreign-born, and the religion in which respondents were raised (none, Catholic, evangelical Protestant, other Protestant, other non-Christian), educational attainment at interview (less than high school, high school graduate, some college, bachelor's degree or higher), and school enrollment. Finally, use of the information on the year and month of respondent's birth permits the construction a time-varying measure of age (included as age and age-squared) and of whether the respondent was cohabiting.

Macroeconomic Conditions

I merge both the state-year-level vital statistics data and the individual-level person-month NSFG data with exogenous macroeconomic data from government and private sector sources.

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2. The vital statistics data do contain a measure of mother's education, which could be crossed with marital status to generate a count of non-marital births to less-educated women. However, beginning in 2003, the states began to change the way in which education was reported, moving from the 1989 U.S. Standard Certificate of Live Birth to the 2003 U.S. Standard Certificate of Live Birth. However, the states undertook this change at different times, making harmonization across years very difficult.

First, I assemble data from the Bureau of Labor Statistics (BLS) Local Area Unemployment Statistics (LAUS) on the unemployment rate. This rate is calculated as the number of people looking for work divided by the number of people in the labor force. The BLS LAUS estimates are model-based and rely on data from the Current Population Survey, the Current Employment Statistics, and the Unemployment Insurance system. I use annual state-level rates of unemployment for my analysis of the state-year level vital statistics data. I use monthly national level unemployment rate data for my analysis of the person-month level NSFG data.

Second, I use quarterly data from the Mortgage Bankers Association (MBA) National Delinquency Survey on the foreclosure start rate. This is a measure of the percentage of residential mortgages starting the foreclosure process during the year. I sum the observed quarters in a given year to create an annual state-level measure of foreclosure starts for my analysis of the state-year-level vital statistics data. For the mortgage foreclosure start rate at the national level on a monthly basis, I use the Denton method for interpolating quarterly flow data into a monthly time series. The method allows for expression of the time trend of the quarterly flows in the imputed monthly time series (Bloem, Dippelsman, and Maehle 2001).
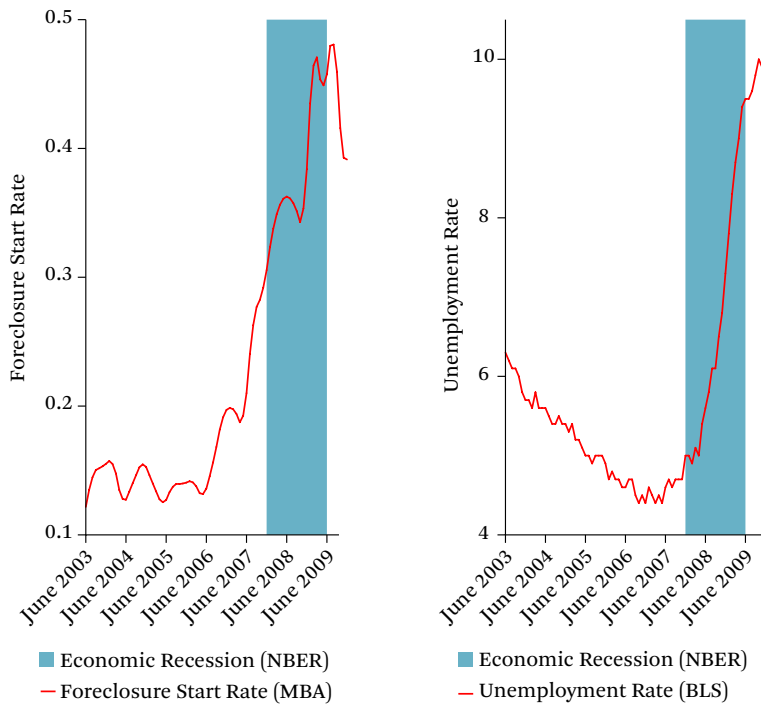
These state- and national-level measures of economic conditions likely capture a number of pathways by which poor macroeconomic conditions might affect individual behavior. Most directly, poor conditions serve as a rough proxy for the probability that an individual experiences unemployment or foreclosure. But state-level conditions also likely capture economic hardship short of unemployment and foreclosure, including reduced earnings and economic stress more generally. Even more generally, area-level economic conditions might capture the strain of recession on personal networks and, perhaps most broadly, feelings of economic uncertainty and insecurity, even among those who have not directly experienced economic hardship (Schneider, Harknett, and McLanahan 2016; Gassman-Pines, Gibson-Davis, and Ananat 2015). Recent scholarship on fertility and recession suggests that these feelings of uncertainty may also be important for shaping fertility behaviors (Schneider 2015; Sobotka, Skirbekk, and Philipov 2011). I do not attempt to disentangle the effects of realized economic hardship from feelings of uncertainty in these analyses, but I note that recent work that attempts to do so finds evidence that both hardship and uncertainty affected fertility and other demographic behaviors during the Great Recession (Schneider 2015; Schneider, Harknett, and McLanahan 2016). I also do not attempt to map these two different measures, unemployment rate and foreclosure start rate, onto different pathways of fertility influence. Rather, I treat both as incomplete but reasonable proxies for the events of the Great Recession.

Figure 1 charts the time trend in these two rates between 2003 and the end of 2009. The foreclosure start rate is relatively flat at a low level until 2006, when it begins to climb sharply. Notably, this increase begins well in advance of the official start of the Great Recession (shaded area), although the foreclosure start rate does peak right at the end of the official recession. The national unemployment rate falls from 2003 through mid-2007 and then begins an extremely sharp and rapid rise, increasing from about 5 percent to nearly 10 percent by the end of 2009. Were this graph to continue, we would see that although the official period of recession ends in mid-2009, the unemployment rate remained at or above 8 percent through the end of 2012.

Analytic Strategy

I first estimate the relationship between state-level economic conditions and state-level non-marital and teen GFR. I construct a state-year-level file merging the fertility rates from vital statistics, the demographic controls, and the measures of the state economy. I estimate an ordinary least squares (OLS) regression model of the relationship between economic conditions and fertility. The model includes a one-year lagged measure of state economic conditions as well as lagged measures of the time-varying state-level demographic attributes discussed earlier. I also include a set of state and year fixed effects as well as a state-specific linear time trend. The state fixed effects account for unobserved time-invariant character-

Figure 1. National Monthly Foreclosure Start Rate and Unemployment Rate (June 2003–January 2010)


Source: Mortgage Bankers Association National Delinquency Survey, available at https://www .mba.org/news-research-and-resources/research-and-economics/single-family-research/national -delinquency-survey, accessed October 20, 2016; Bureau of Labor Statistics Local Area Unemployment Statistics.

istics of the state and avoid problems of omitted variable bias arising from the failure to account for such characteristics, such as religiosity, that might be associated with both fertility and the economy. The year fixed effects account for unobserved period characteristics that are stable across states. The inclusion of state-specific linear time trends controls for state-specific time trends in unobserved variables that might bias the relationship between economic conditions and fertility. I also weight the regressions by the average state population over the period 2003 to 2013. The results are robust to omitting the demographic controls and the coefficients are larger without the state-specific linear time trends.

Next, I estimate the relationship between national-level economic conditions and individual-level use of contraceptive technology. I construct a person-month file from the

retrospective questions on contraceptive use in the NSFG. I estimate three sets of regression models; in each I use the national foreclosure start rate and the national unemployment rate six months prior to the reporting month as the key predictors. First, I examine how each measure of economic conditions is related to the use of any contraceptive method in the reporting month. Second, I examine how each measure of economic conditions is related to consistent use (defined as using some kind of contraception in the reporting month and in both of the two months prior) of contraception. Third, I examine the relationship between economic conditions and the specific contraceptive method. For each set of models, I also examine whether the findings hold when only examining native-born women and if there is variation in the effect of national economic conditions by co-

Figure 2. Annual Non-marital and Teen Fertility Rates for Three States with Large Recessionary Increases in Unemployment and Three States with Small Increases (2003–2013)
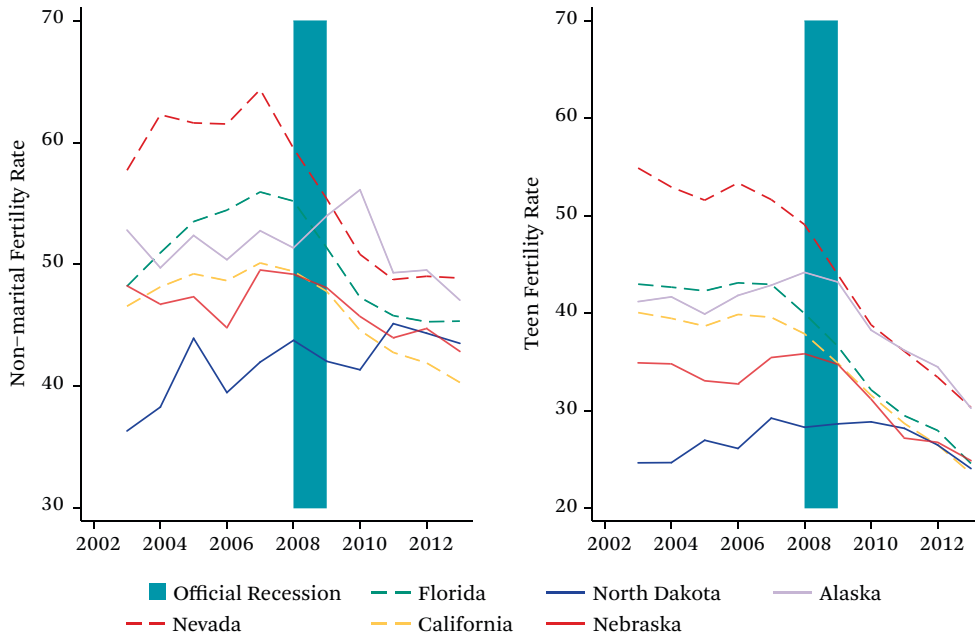
Source: Author's calculations based on data from the vital statistics.

residential status (cohabiting versus single) and by race or ethnicity.

The first two sets of models are estimated using logistic regression. The third set of models, of method effectiveness, is estimated with OLS. In all models I adjust for respondents' age, age-squared, race or ethnicity, family structure at age fourteen, religion raised in, and foreign- or native-born status. I also include year fixed effects and adjust the standard errors for repeated observation of respondents. This strategy reduces the risk of omitted variables bias by using area-level economic conditions, rather than individual-level hardship, to proxy for the effects of the Great Recession. This approach also reduces the risk of reverse causality (wherein a woman might reduce labor force involvement in advance of a birth or pregnancy). I define the "at risk" population to be all female respondents who have ever had sex and are not currently pregnant, according to their retrospectively reported pregnancy and conception calendar data. I then estimate the models separately for unmarried women and for teenage women and then again for unmar-

ried women with less-educated mothers and for teen women with less-educated mothers.

I also conduct several robustness tests. I examine if the results are sensitive to the choice of lag on the measure of macroeconomic conditions. I also estimate a set of person fixed effects models that exploit within person changes in contraceptive behavior to estimate the effects of economic conditions on use of contraceptives. I also run a set of "placebo" regressions, using future macroeconomic conditions to predict past contraceptive use. Here, I expect to find no significant relationship. Finally, I examine if error in respondent's recall of events for the construction of the retrospective contraceptive calendars might affect the results.

RESULTS

Time Trends in Non-marital and Teen Births

Figure 2 charts the fertility rates for unmarried women (left panel) and for teen women (right panel) over the years leading up to and following the official dates of the Great Recession

Table 2. State-Level General Fertility Rate by Subgroup and State Macroeconomic Conditions (2003–2013)

	Marital Fertility Rate	Non-marital Fertility Rate	Teen (15–19) Fertility Rate
State foreclosure start rate	−0.32**	−0.38*	−0.41***
State unemployment rate	−0.48*	−0.57*	−0.23
Number of observations	561	561	561

Source: Author's calculations based on data from the vital statistics.
Notes: All models include state and year fixed effects, a state-specific linear time trend, and a set of demographic controls. Standard errors are adjusted for clustering.
*p < .05; **p < .01; ***p < .001

(December 2007 to June 2009) (shaded bar) in six U.S. states: Nevada, Florida, California, North Dakota, Nebraska, and Alaska. The first three (dashed lines) saw the largest absolute increases in unemployment between 2006 and the peak of unemployment recorded during the recession and postrecession period (an average of 7.8 percentage points). The latter three (solid lines) saw the smallest absolute increases in unemployment (an average of just 1.5 percentage points).

For non-marital fertility, there appear to be some clear contrasts in the trend between the states with the largest increases in unemployment and the states with the smallest. In Nevada, Florida, and California, non-marital fertility had been rising in the years prior to the Great Recession and then declined markedly. It is difficult to date the beginning of the decline precisely, but it does appear to begin before the official beginning of the Great Recession. These declines continued through 2011 in all three states and then leveled out in Nevada and Florida, whereas the decline continued through 2013 in California. In contrast, in Nebraska, North Dakota, and Alaska, the patterns appear much less regular.

The time trend is less revealing for teen fertility (right panel). In the three hardest-hit states, teen fertility appears to have begun a sharp decline in 2006 or 2007, with that decline continuing through the Great Recession and beyond. In the less-affected states, teen fertility remained flat through the Great Recession and then declined in Nebraska and Alaska, while remaining basically flat in North Dakota.

Effects of State Economic Conditions on Non-marital and Teen Births

In table 2, I turn from these descriptive charts of change over time to analysis of the relationship between state-level economic conditions and state-level fertility rates. These models estimate, in six separate regressions, the relationship between the state foreclosure start rate and the unemployment rate in the prior year and marital, non-marital, and teen fertility rates. All of the models include state and year fixed effects, a state-specific linear time trend, and demographic controls.

These results show that higher rates of unemployment and foreclosure translated to lower rates of fertility among unmarried women. The coefficient on the state-level foreclosure start rate is negative and significant (b = −0.38, p < 0.05), as is the coefficient on unemployment (b = −0.57, p < 0.05). Based on these estimates, the non-marital fertility rate would be predicted to decline from approximately 49 per 1,000 when unemployment was 3 percent to 44 per 1,000 when unemployment was 11 percent. To size these effects, consider that the non-marital fertility rate increased from 26 per 1,000 in 1970 to a peak of 52 per 1,000 in 2008, an increase of approximately 0.67 births per 1,000 per year. These effects then are comparable in size to about 7.5 years of change in the historical increase in the non-marital fertility rate.

This evidence supports the hypothesis that recessionary economic shocks served to discourage births among unmarried women. Further, it appears that the effects of the Great Re-

Figure 3. Average Marginal Effect of State-Level Unemployment over Time (1990–2013)
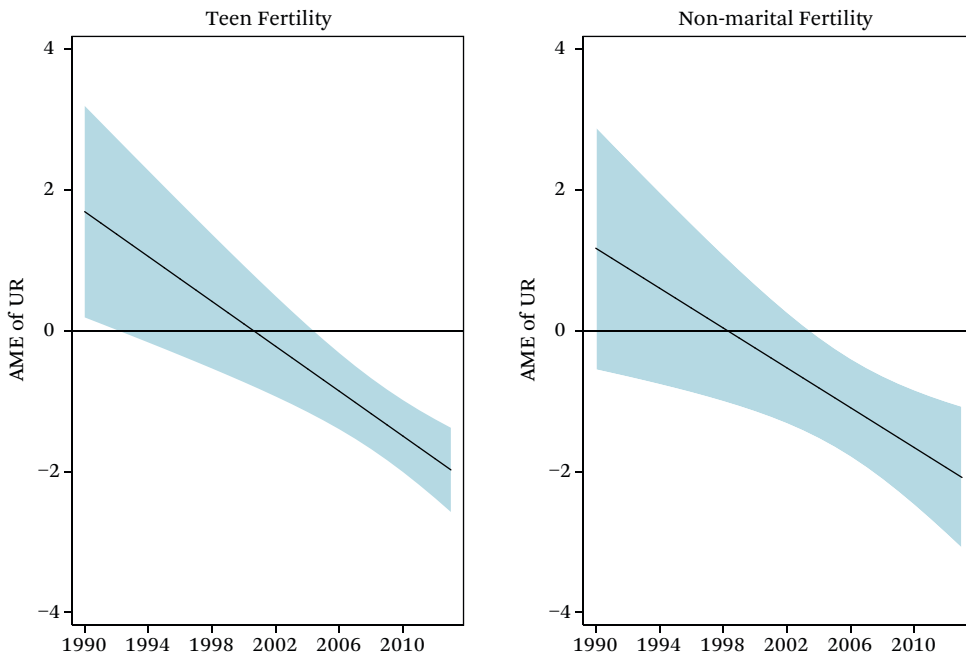
Source: Author's calculations based on data from the vital statistics.
Notes: Plot is based on models that include state and year fixed effects, an interaction between year and unemployment, and a set of demographic controls. Standard errors are adjusted for clustering.

cession were at least as large on unmarried women as on married women (b = –0.32 and b = –0.38, for unemployment on marital and non-marital fertility, respectively, and of –0.48 and –0.57 for foreclosure starts on marital and non-martial fertility, respectively).

The results are similar for teen fertility. The mortgage foreclose start rate (b = –0.41, p < 0.001) is significantly negatively related to the teen fertility rate. The unemployment rate is also negatively related to the teen fertility rate (b = –0.23), but is not significant at conventional levels (p < 0.10).

The non-marital fertility rate includes all births to unmarried women age fifteen to forty-four. Some of these women are teenagers, making it somewhat difficult to distinguish the two measures analyzed above. I re-estimated the models using the non-teen non-marital fertility rate, that is the number of births to unmarried women age twenty to forty-four in each state-year divided by the number of unmarried women age twenty to forty-four in each state-year. The results are entirely consistent with

those above. The coefficient on the state-level foreclosure start rate remains negative and significant (b = –0.36, p < 0.005) and is very similar in magnitude to the models that include non-marital births to women age fifteen to forty-four. The coefficient on the state-level unemployment rate is also little changed (b = –0.55, p < 0.05).

These results support the idea that non-marital and teen fertility are pro-cyclical, declining as economic conditions worsened during the Great Recession. However, this result runs contrary to the idea that economic considerations are disconnected from non-marital and teen fertility or that poor economic conditions might even increase such fertility. One possible explanation for the divergence between these results and prior research is that different periods are being studied. I supplement the main results above with a longer panel of state-level data for the period 1990 to 2013. I re-estimate the models just discussed, but allow the relationship between state-level unemployment and non-marital and teen fertility to vary over time.

Table 3. Relationship between Contraceptive Use by Unmarried and by Teenage Women and National Macroeconomic Conditions (2003–2010)

	Use of Contraception		Consistency of Contraception		Effectiveness of Contraception	
	(1)	(2)	(3)	(4)	(5)	(6)
	All	Low-SES	All	Low-SES	All	Low-SES
Panel A: Unmarried Women						
National foreclosure start rate	0.15**	0.29*	0.13*	0.32*	−0.12*	−0.18*
National unemployment rate	0.01*	0.02	0.01*	0.02	−0.01*	−0.01*
Person-months	239,085	55,668	228,361	53,191	197,103	48,905
	(7)	(8)	(9)	(10)	(11)	(12)
Panel B: Teenage Women						
National foreclosure start rate	0.05	0.33	−0.05	0.07	−0.06	−0.15
National unemployment rate	0.01	0.03	0.02	0.00	−0.01	−0.02
Person-months	41,950	8,102	39,960	7,732	34,851	7,181

Source: Author's calculations from the National Survey of Family Growth 2006–2011 Cycle (CDC).
Notes: All models include year fixed effects, age, age-squared, race or ethnicity, family structure at age fourteen, religion raised in, and being foreign-born. Standard errors are adjusted for clustering. Models 1 to 4 and 7 to 10 are estimated with logistic regression. Average Marginal Effects are reported in the table. Models 5 to 6 and 11 to 12 are estimated with OLS, and coefficients are reported.
*$p < .05$

I find a significant interaction that suggests that the negative effect of unemployment is much more pronounced in the later part of this period. Figure 3 plots the average marginal effect of unemployment on teen fertility (left panel) and on non-marital fertility (right panel). In short, the relationship is essentially null in the 1990s and then grows increasingly negative through the Great Recession.

In sum, it does not appear that fertility and economic considerations are disconnected for these more disadvantaged groups of women. However, these estimates do not reveal the extent to which this relationship between recessionary conditions and birth rates is the result of conscious action. To examine the proximate determinants of these fertility declines, I next turn to analysis of data from the 2006-to-2010 cycle of the NSFG.

Contraceptive Use

Table 3 presents the results from a set of models that examine the association between the national foreclosure start rate and the national unemployment rate and the use of contraception by unmarried women and teen women. Panel A of table 3 presents the results for unmarried women. Models 1 and 2 focus on the use of any contraception, models 3 and 4 on the consistency of contraceptive use (using contraception for three consecutive months), and models 5 and 6 on the efficacy of the contraceptive method employed. For each outcome I present results for all unmarried women and then for unmarried women whose mothers did not graduate from high school.

Contraceptive Practices Among Unmarried Women

Both the foreclosure start rate and the unemployment rate are positively associated with unmarried women using any contraception (model 1), and these results are generally stronger for unmarried low-SES women. As a rough estimate of the size of these effects, I take the predicted probability that an unmarried woman

would use any contraception given foreclosure start rates of 0.13 and of 0.45 (corresponding to the 5th and 95th percentiles of the observed values). The model estimates suggest that the probability of use would increase from 66 percent to 70 percent.

Higher rates of foreclosure are also associated with more consistent contraceptive use among unmarried women (model 3). Again, this relationship appears somewhat stronger for low-SES unmarried women (model 4). Here there are no significant relationships between consistency of use and national unemployment rates. Finally, model 5 shows that higher foreclosure rates and higher unemployment rates are associated with using contraceptive methods that are associated with a lower risk of unintended pregnancy (thus the negative coefficient). We again see a slightly larger coefficient on foreclosure for low-SES unmarried women, but no significant relationship for unemployment. In all, it appears that worse economic conditions—particularly higher rates of foreclosure starts—are associated with more contraceptive use, more consistent use, and the use of more effective methods among unmarried women and among low-SES unmarried women.

These models control for cohabitation among unmarried women, but do not allow the effects of the economy to vary by coresidential union status. While cohabitation functions very differently than marriage in the contemporary United States, it is possible that cohabiting women behave differently than women who are not in coresidential unions when it comes to contraceptive behavior. I tested an interaction between cohabitation and macroeconomic conditions and find no evidence of any significant interactions for the unmarried subsample, approximately 30 percent of whom were cohabiting in the average person-month in the analysis.

The control variables generally have the expected relationships with contraception. Taking the model of any contraceptive use for unmarried women, women with less than a high school education are also significantly less likely to use contraceptives than women with more education, with the largest gap being between women with a BA or higher level of education. Women who were enrolled in school at the time of interview were also significantly more likely to use contraception than women out of school. Foreign-born women are less likely to use contraception than native-born women, and members of racial and ethnic minorities are less likely to use contraception than non-Hispanic white women.

Prior research on the Great Recession and fertility suggests that changing patterns of immigration, which affected the composition of the immigrant population, can account for some of the apparent recessionary declines in fertility (Cherlin et al. 2013). Schneider and Hastings (2015) find negative effects of state economic conditions on non-marital fertility among low-SES women, even after excluding foreign-born women who migrated to the United States following the Great Recession. I conduct a similar test, excluding foreign-born women from the NSFG analysis sample and re-estimating the models. For the models of contraception use among unmarried women, the results change very little—if anything, the effects are somewhat stronger.

The models described control for race and ethnicity, and the main effects of these variables indicate that compared to their non-Hispanic, white counterparts, non-Hispanic black, non-Hispanic others, and Hispanic women are less likely to use contraceptives and to use them consistently, and are more likely to use less effective methods. It could also be the case that women who are racial and ethnic minorities might be differentially responsive to the Great Recession. In prior related research, Ananat, Gassman-Pines, and Gibson-Davis (2013) find that black teens exhibited the largest reductions in fertility in response to job displacements in North Carolina during the Great Recession, but Schneider and Hastings (2015) find that non-Hispanic, black, non-Hispanic white, native-born Hispanics, and foreign-born Hispanic low-SES unmarried women all exhibit a similar negative fertility response to state-level economic conditions.

I assess whether these relationships between national economic conditions and contraceptive practices hold in four different subgroups of unmarried women: non-Hispanic white native-born women; non-Hispanic black native-

born women; Hispanic native-born women; and Hispanic foreign-born women. The effects of national economic conditions on contraceptive behavior are evident among native-born white and Hispanic women and among foreign-born Hispanic women. Of these three groups, the effects appear largest for native-born Hispanic women. There are no significant relationships between national foreclosure rates and contraceptive behavior for native-born unmarried non-Hispanic black women. The national unemployment rate is positively related to any use and to consistent use and is negatively related to efficacy, but only for white, non-Hispanic native-born women.

Robustness

I next test the robustness of the key results in panel A of table 3. In the main models just described, I use a six-month lag on macroeconomic conditions. I first test several alternative lags. For the first outcome variable, any contraceptive use, I tested lags of seven to one months prior to the outcome month. The results were substantively similar to the preferred model. For the second outcome variable, consistent contraceptive use, which uses data from the current and prior two months, I tested lags eight and four months prior to the outcome variable; again, the results were substantively similar to the preferred model. For the third outcome variable, effectiveness of contraceptive method, I tested lags of seven to three months (I did not test lags of one to two months on the basis of the rationale that obtaining a new method takes time). Here, the results were substantively similar when using lags of seven, five, and four months but were not significant when using lags of two or three months.

Second, I conduct a set of "placebo tests," in which I use future economic conditions to predict past contraceptive behavior. Here I do not expect to find any significant relationships between economic conditions and the key outcomes. I tested using a three-month and a six-month lead on the national foreclosure start rate to predict each of the three outcomes for unmarried women. In each case, the coefficient is small and far from conventional levels of statistical significance. (The p-value ranges from 0.619 to 0.959.)

Third, I re-estimate the three key models with individual fixed effects in addition to the year fixed effects that I include in the main models. Because my key predictor, the national foreclosure start rate, is exogenous to unobserved individual-level characteristics, the individual fixed effects are less likely to correct problems of omitted variables bias. However, these models focus squarely on individual respondents who change their use of contraception. In contrast, the main models use between individual comparisons. The advantage of the former is that this process of individual change may be a bit closer to the behavioral model that we have in mind for recessionary effects. I estimate fixed effects logistic regression models to examine the first two outcomes—any contraceptive use and consistent contraceptive use. In both models the coefficients are larger than in the main models and highly significant. However, the relationship between national foreclosure starts and the effectiveness of the contraceptive method is smaller and not significant in the third individual fixed effects model.

Fourth, the NSFG data rely on retrospective reporting of contraceptive use with respondents' being asked to recall practices that took place as long ago as forty-eight months prior to the interview. It is possible that this procedure introduces error into the estimates if respondents recall practices that took place longer ago less accurately. In my main estimates I make use of all available retrospective information on contraceptive practices as well as on marital status. One way to test the sensitivity of these estimates of errors in recall is to restrict the analysis sample to person-month cases that occurred relatively recently prior to the interview month. For instance, we can constrain the analysis sample to include only person-months that occurred up to twelve months before the interview. Here I assess the robustness of the main result to a set of such restrictions, limiting the analysis in turn to person-months that occurred six, twelve, eighteen, and twenty-four months before the interview. Note that this test also serves to limit the period under consideration, since person-months in 2003, 2004, and 2005 are

reported at least six months retrospectively and so partially confounds recall with period.

In the models of any contraceptive use, the estimated coefficient on foreclosure is between 1 and 5 percent larger with the shorter recall windows, with the exception of twelve months, where it is 25 percent smaller. The coefficient is significant with the eighteen- and twenty-four-months windows, but not with the six- and twelve-month windows. For consistency of use, the coefficient on foreclosure is between 25 and 35 percent larger with the shorter recall windows, with the exception of eighteen months, where it is only 5 percent larger. The estimate is significant for the twelve-, eighteen-, and twenty-four-month recall windows. For efficacy of use, the coefficient is between 10 percent smaller and 10 percent larger for the windows between twelve and twenty-four months, but it is just two-thirds as large for the six-month window. The estimate is significant of the eighteen- and twenty-four-month windows.

Finally, I use restricted-access geocoded data from the NSFG to re-estimate the main models using state-level economic conditions (and state and year fixed effects) in place of national-level economic conditions. Here I also find consistent evidence of significant positive effects of state-level foreclosure starts and unemployment on contraceptive use and consistency of contraception. Foreclosure and unemployment are also significantly related to the effectiveness of the contraceptive method employed. In general, the effect sizes are larger, likely reflecting that state-level economic conditions more closely proxy for household hardship than national conditions (while still capturing something of the climate of uncertainty).

Contraceptive Practices Among Teens

Panel B of table 3 presents the results of similar main models, but now for teenage women. Here the results are much weaker. There are no significant relationships between macroeconomic conditions and teens' use of contraception, their consistency of use, and their use of more effective methods. Restricting the sample to native-born women does not appreciably change these null effects. However, disaggregating by race and nativity shows modest effects of national foreclosure and unemployment on the contraceptive practices of white native-born teens who are more likely to use any method, to use the method consistently, and to use effective methods when conditions are worse.

I also tested alternative recall windows, as I did earlier for unmarried women. In general, the effects are null for both foreclosure and unemployment. The only exception is a twelve-month recall window with the use of national unemployment. There, worse economic conditions are significantly associated with the use of more effective contraceptive technology, more consistent use, and the use of any contraception. In general, the results for teenagers are weaker and less consistent than for unmarried women, though present under some model specifications.

DISCUSSION

The Great Recession's effects on Americans did not stop at increased joblessness and foreclosure or lost hours and depressed income. These economic effects reverberated through households to shape fundamental aspects of the life course. A growing body of research makes a convincing case that the Great Recession depressed fertility. In this article I show that these effects extended to unmarried and teenage women. Most narrowly, this analysis of the fertility effects of the Great Recession is useful because it is important to assemble an empirical record of how this economic downturn affected Americans' lives. More broadly, I argue that the events of the Great Recession provide a kind of social laboratory to investigate more general questions of sociological and demographic interest.

I use these events to test the idea that the fertility of unmarried and teen women, and particularly socioeconomically disadvantaged women, is fairly disconnected from economic concerns. This prior research would suggest that the economic shocks of the Great Recession might have had few effects on these women's fertility. However, I find that the Great Recession did have pronounced negative effects on non-marital and teen fertility, a finding in accord with recent prior work by Schneider and Hastings (2015), Ananat, Gassman-Pines, and Gibson-Davis (2013), and Melissa Kearney and Phillip Levine (2015). Existing theory further

suggested that one reason for the relative disconnect between economic concerns and fertility is the difficulty that many unmarried, teen, and low-SES women face in effectively using contraception. However, I find that at least some members of these subgroups did increase contraceptive use in response to the Great Recession, with national economic conditions correlated with use of contraception, consistency of use, and efficacy of method.

Notably, I do not find effects of either foreclosure or unemployment on the contraceptive practices of non-Hispanic native-born unmarried black women. This is surprising in part because black women experienced large percentage-point increases in unemployment during the Great Recession. One interpretation is that these results suggest some continued support for the idea that poor economic conditions might not much affect disadvantaged women's fertility.

However, other recent research finds negative effects of the Great Recession on the fertility of unmarried black women (Schneider and Hastings 2015) and on black teens (Ananat, Gassman-Pines, and Gibson-Davis 2013). One possibility is that, as Ananat, Gassman-Pines, and Gibson-Davis (2013) suggest, the Recession's effects on black women's fertility operated through other proximate determinants such as changes in sexual activity, miscarriage, or abortion.

This research is subject to some important limitations. First, in the state-level analysis, I am unable to specifically examine low-SES unmarried and teen women's fertility rates. However, the very large share of births to women in these groups is known to be to socioeconomically disadvantaged women. Second, in the person-level analyses of the NSFG, I reply on national-level variation in economic conditions and examine only the period through 2010. Future work could usefully exploit state-level variation in economic conditions to identify the effects of the Great Recession on contraceptive use and could employ the 2011-to-2013 cycle of the NSFG to extend this work through the period of high unemployment following the official end of the Great Recession. Third, this work documents the relationship between economic conditions and fertility and shows a

plausible proximate determinant of this relationship; it does not examine women's thinking about the relationship between recessionary conditions and fertility.

Finally, this work does not tell us whether these reductions in teen and non-marital fertility will be temporary or more permanent. Recent research suggests that cohorts of women exposed to higher levels of unemployment may experience permanent reductions in lifetime fertility (Currie and Schwandt 2014), but much other demographic work finds that effects of recessions are generally temporary. For the cohort of teenagers exposed to the Great Recession, it would seem very likely that their lifetime teen fertility will be depressed, if only because most of their teen years played out during the long Great Recession. A somewhat different but also interesting question is whether the low rates of teen and non-marital fertility caused by the Great Recession will remain or will rise. The recovery from the Great Recession has been quite slow and the economic situation of many less-skilled workers remains quite precarious. These factors suggest that there could indeed be some more lasting and permanent effects of the Great Recession and its aftermath on fertility and perhaps a lasting reduction in non-marital fertility. Further, the Affordable Care Act's requirement that health insurance plans provide contraception at no cost to the insured may also function to maintain these low rates of non-marital and teen fertility.

In all, this research suggests that there is a need for a more nuanced understanding of the relationship between economic constraints and non-marital and teen fertility. One explanation of the discordance between this finding a negative effect of poor economic conditions on non-marital fertility and prior research suggesting a null or positive effect is that the nature of the relationship between economic hardships and non-marital and teen fertility has changed—that a positive or null relationship has become negative in an era of rising inequality, increasingly precarious work, and ongoing substantial macroeconomic shocks. Perhaps it is the case that in normal economic times, a steady diet of economic deprivation really does become disconnected from fertility

decision-making but that extraordinary economic shocks, as seen in the Great Recession, can trigger conscious fertility avoidance behavior.

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