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ABSTRACT

Short and Long-Term Effects of Unemployment on Fertility*

Scholars have been examining the relationship between fertility and unemployment for more than a century. Most studies find that fertility falls with unemployment in the short run, but it is not known whether these negative effects persist since women may simply postpone child bearing to better economics times. Using over 140 million U.S. birth records for the period 1975 to 2010, we analyze both the short and long-run effects of unemployment on fertility. We follow fixed cohorts of U.S. born women defined by their own state and year of birth, and relate their fertility to the unemployment rate experienced by each cohort at different ages. We focus on conceptions that result in a live birth. We find that women in their early 20s are most affected by high unemployment rates in the short-run and that the negative effects on fertility grow over time. A one percentage point increase in the unemployment rate experienced between the ages of 20 and 24 reduces the short-run fertility of women in this age range by 6 conceptions per 1,000 women. When we follow these women to age 40, we find that a one percentage point increase in the unemployment rate experienced at 20 to 24 leads to an overall loss of 14.2 conceptions. This long-run effect is driven largely by women who remain childless and thus do not have either first births or higher order births.

JEL Classification: J6, J11, J12, J13

Keywords: fertility, unemployment

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1. Introduction

Demographers have been examining the effect of economic conditions on fertility for more than a century (1-10). Although some find that fertility is counter-cyclical (8-10) most studies find pro-cyclical fertility; that is, fertility declines in times of rising unemployment. (1-7). These fertility reductions may represent mere postponement of fertility to better times (a tempo effect) or persistent long-term effects on completed fertility, i.e. on the total number of children a woman ever bears (a quantum effect).

Measuring long-term effects requires the analyst to follow the fertility of fixed cohorts of women over time. Tracking cohorts is feasible at the aggregate level of an entire country, but there are few periods of high unemployment to exploit at this level of aggregation, and strong social trends in fertility which may overshadow long-term effects of past economic fluctuations (11-13). An analysis within countries, for example at the state level, requires accounting for internal migration and immigration, both of which may be affected by economic conditions. For example, women giving birth to 3rd children in California in 1995 may not be the same women who gave birth to 2nd children in California in earlier years.

In this paper, we divide all births to U.S. born women over the past 35 years into cohorts defined by a mother's own state and year of birth. Since these mother characteristics are constant over time, we can follow the fertility of these cohorts regardless of where in the U.S. women subsequently gave birth. This approach provides us with both *annual* and *completed* fertility rates at the state level which are not affected by women's movements or by immigration.[1]

[1] We can also construct quarterly or monthly conception rates. However, there are strong seasonal patterns in conception rates (14) as well as in the unemployment rate which might confound an analysis at the quarterly or monthly level.

Using these data, we first analyze short-run fertility responses to economic fluctuations at the national and state level, and show that they are similar. We also investigate differences in fertility responses by age group. We then investigate the long run effects of unemployment fluctuations experienced at various ages on women's completed fertility and on the probability of remaining childless.

Our birth data comes from the U.S. Vital Statistics Natality data, and includes approximately 140 million individual birth records for all births in the U.S. from 1975 and 2010. These records provide information about the state and date of the child's birth, gestation length, the age of the mother, and the mother's own state of birth. In our sample of all live births to U.S. born women over this period, we focus on the year of conception rather than on the year of birth because economic conditions at the time of conception are likely more relevant to the decision to have a child. We also treat multiple births as a single conception (i.e. a single fertility choice). Thus, we are counting conceptions that resulted in a live birth. Cohorts are defined using the mother's own state and year of birth. To obtain rates we divide conception counts by population estimates which are also constructed at the level of women's state and year of birth using data from the decennial U.S. Census.

State-level unemployment rates are merged to cohorts' conception rates at the annual level. Most of our estimates use the weighted average of the unemployment rates in all states in which a cohort gave birth in a given year, with the number of births in each state as weights. Since the number of cohort members giving birth in each state may not be in proportion to the number of cohort members living in each state, we use Census date to check on the extent to which the spatial distribution of births reflects a cohort's overall migration behavior.

Another issue is endogenous migration. Since prospective mothers might migrate to states with lower unemployment rates, using the actual locations of cohort members could cause fertility to appear more procyclical than it actually is. An alternative is to use the unemployment rate in the mother's own state of birth since the majority of mothers remain in the state in which they were born. However, this estimate will not apply to mothers who have moved, so using it introduces some measurement error. Our preferred specifications use the unemployment rate in a mothers' own state of birth as an instrumental variable for the average unemployment rate in the states where their cohort gave birth at each age.[2] However, our estimates are quite similar in all three specifications, as discussed further below. Our sample period covers five recessions that vary in strength and timing across states (Fig. 1), providing us with a rich source of variation in unemployment.

2. Materials and Methods

2.1 Birth data

We include birth records from the 50 U.S. states and the District of Columbia, provided by the Center for Disease Control (31). Birth records report birth dates by year and month of birth, while gestation is reported in weeks. We start with all conceptions that resulted in a live birth and calculate the year of conception by subtracting the rounded number of gestation months (gestation weeks*7/30.5) from the birth date. 0.49% of observations had missing values for gestation. Missing values for gestation length are imputed using linear regression with indicators of mothers' age and birth year. Results remain unchanged if we simply replace missing values by 40 weeks of gestation. We exclude conceptions in 1974 and 2010 because for these years only late and early conceptions are observed, respectively.

We assume that conceptions occur in the same state where the birth is observed. Multiple births are counted as one conception. Maternal age at conception is proxied by

[2] For a general reference on instrumental variable regressions see Angrist and Pischke (15), ch. 4.

maternal age at birth minus one, and mothers' year of birth is calculated subtracting age at conception from the conception year. For notational convenience conceptions before age 14 are counted as occurring at age 14. This affects 0.3% of the sample. Birth records report birth order which allows us to identify first conceptions. In turn, we subtract the number of first births ever observed in a cohort from the overall number of women in a cohort to measure the number of childless women. We divide conceptions into cohorts defined by mothers' state of birth (s^*) and year of birth (y^*).

2.2 Population estimates and unemployment rates

The number of women in each cohort comes from the decennial U.S. Census for 1970, 1980, 1990, and 2000 and from the American Community Survey 2010 (the 2010 U.S. Census was not yet available at the time of this writing), provided by the Integrated Public Use Microdata Series (IPUMS) (32). These data contain women's state of birth and their age. Female mortality is low in the fertile age range and there is no apparent negative trend in cohort size across Census waves. Therefore we combine the information from all Census waves that cover a cohort in the fertile age range (14 to 44) and use the average cohort size across waves as the population estimate. For example, the size of the 1955 birth cohort is calculated as the average cohort size across the Census waves 1970, 1980 and 1990. We use single race recodes for multi-race responses in 2000 and 2010 provided by IPUMS.

The cohort-specific **annual conception rate (CR)** is calculated as:

$$CR_{s^*,y^*,t} = \frac{C_{s^*,y^*,t}}{cohortsize_{s^*,y^*}} * 1000,$$

where $C_{s^*,y^*,t}$ is the number of conceptions (resulting in a live birth) in calendar year t of a cohort born in state s^* and year y^*. $Cohortsize_{s^*,y^*}$ is the number of women in cohort s^*, y^*, estimated from the decennial Census (see above). Calendar year and birth year determine age $CR_{s*,y*,t} = CR_{s*,age,t}$ with $age=t-y*$. The CR can be aggregated to the state ($CR_{s*,t}$) or national (CR_t) level.

The **completed conception rate (CCR)** at age 40 refers to the number of conceptions resulting in a live birth that occurred in a cohort prior to age 40 per 1,000 women in that cohort:

$$CCR_{s*,y*,40} = \frac{\sum_{a=14}^{39} C_{s*,y*,a}}{cohortsize_{s*,y*}} * 1000$$

where $C_{s*,y*,a}$ is the number of conceptions resulting in a live birth in cohort $s*$, $y*$ at age a, i.e. in calendar year $t=y*+a$.

The **percent of childless women** at age 40 is calculated by subtracting the number of first conceptions resulting in a live birth in a cohort prior to age 40 from the overall number of women per cohort:

$$CLESS_{s*,y*,40} = \frac{cohortsize_{s*,y*} - \sum_{a=14}^{39} FirstC_{s*,y*,a}}{cohortsize_{s*,y*}} * 100$$

where $FirstC_{s*,y*,a}$ is the number of first conceptions of cohort $s*$, $y*$ at age a, i.e. in calendar year $t=y*+a$.

State-level unemployment rates are obtained from the Bureau of Labor Statistics and are available starting in 1976 (33). In every year we assign to the cohort $s*$, $y*$ the weighted average unemployment rate across the states in which women of the cohort $s*$, $y*$ conceive, with the number of conceptions as weights.

$$U_{s^*,y^*,t} = \frac{\sum_{s=1}^{51}\left(U_{s,t} C^{s}_{s^*,y^*,t}\right)}{C_{s^*,y^*,t}}$$

$C_{s^*,y^*,t}$ is the overall number of conceptions resulting in a live birth occurring in year *t* among cohort *s**, *y**. $C^{s}_{s^*,y^*,t}$ is the same cohort's number of conceptions occurring in state *s*. $U_{s,t}$ is the unemployment rate in state *s* in year *t*. For example, in a cohort of women born in New York in 1960 and delivering in 1981, 10% might have given birth in New Jersey while 90% might have given birth in New York (these numbers are purely illustrative). In this case, we would assign the unemployment rate $0.1^* U_{NJ} + 0.9^* U_{NY}$ to this cohort and year. We also use the unemployment rate from the woman's own state of birth and child's year of conception in some specifications, as discussed above.

2.3. Methods

The **short-term effects** of the unemployment rate on fertility are analyzed by plotting changes in the annual conception rate against changes in the annual unemployment rate. In these figures we fit regression lines corresponding to the regressions equations (I)-(III) below. Equation (IV) shows a level specification that is comparable to the long-term effect model.

(I) First differences (national aggregation): $\Delta CR_t = \alpha + \beta^* \Delta U_t + \varepsilon_t$

(II) First differences (state aggregation): $\Delta CR_{s^*,t} = \alpha + \beta^* \Delta U_{s^*,t} + \varepsilon_{s^*,t}$

(III) First differences (age groups): $\Delta CR_{s^*,A,t} = \alpha + \beta^* \Delta U_{s^*,A,t} + \varepsilon_{s^*,A,t}$

(IV) Levels: $CR_{s^*,a,t} = \alpha + \beta^* U_{s^*,a,t} + \delta_{s^*} + \theta_{y^*} + \omega_a + \tau_1 T + \tau_2 T^2 + \tau_3 T^3 + \varepsilon_{s^*,a,t}$

Here Δ refers to annual changes and $CR_{s^*,a,t}$ is the annual conception rate of women born in state *s** who are of age *a* in year *t*. CR_t , $CR_{s^*,t}$ and $CR_{s^*,A,t}$ are conception rates aggregated to the national, state and age group level, respectively. δ_{s^*}, θ_{y^*} and ω_a are state, cohort and age indicators ("fixed effects"), respectively. T is a time trend. Observations are weighted by the number of women in each group in year t. Standard errors are clustered at the state level. First differences absorb a linear time trend at the national level, as well as time constant differences between states in (II) and time constant differences between state-specific age groups in (III).

Long-term effects of the unemployment rate at different points in women's fertile life cycles on completed fertility at age 40 are estimated by:

$$CCR_{s*,y*,40} = \alpha + \beta_1 \overline{U(15to19)}_{s*,y*} + \beta_2 \overline{U(20to24)}_{s*,y*} + \beta_3 \overline{U(25to29)}_{s*,y*} + \\ + \beta_4 \overline{U(30to34)}_{s*,y*} + \beta_5 \overline{U(35to39)}_{s*,y*} + \delta_{s*} + \theta_{y*} + \varepsilon_{s*,y*,40}$$

Where $\overline{U(15to19)}_{s*,y*}$ is the average unemployment rate which cohort $s*,y*$ faced at ages 15 to 19 and the other unemployment rate variables are defined similarly. The θ_{y*} are cohort indicators which absorb nation-wide differences between birth cohorts, such as the trend towards later child bearing. The δ_{s*} are state indicators which absorb time constant differences between states, such as permanent differences in the unemployment and the fertility rate that are not driven by temporary economic fluctuations. Observations are weighted by cohort size and standard errors clustered at the state level. We use the same specification to estimate long-term effects on cohorts' fraction of childless women, the fraction of never married women, and the average maternal age at conception.

3. Results

Restricting our analysis to U.S. born mothers yields a sample of 111.9 million births, which resulted from 110.3 million conceptions between 1975 and 2009 (the difference is due to multiples). Table 1 shows descriptive statistics for our study sample as well as for all births in the United States. The annual conception rate is expressed per 1,000 women age 14 to 43, in order to be comparable to birth rates which are commonly expressed per 1,000 women age 15 to 44. The conception rate of 62.2 in our sample is somewhat lower than for the overall U.S., due to the relatively high fertility of immigrants. About one-third of U.S. born mothers give birth outside their own state of birth, indicating considerable internal migration. Our measure of completed fertility is the number of conceptions resulting in live births before age 40 per 1,000 women and averages 1,916. We also find that 18.44 percent of women are childless at age 40, i.e. they have not had any live births. These measures can be constructed only for U.S. born women because births to foreign born women are not observed prior to immigration.

Fig. 2*A* shows the annual conception rate for U.S. born women and the overall unemployment rate. Shaded areas indicate recession periods. This figure shows that changes in the unemployment rate are negatively correlated with changes in the conception rate. For example, between 2008 and 2009, at the height of the Great Recession, the unemployment rate surged by 3.5 percentage points while the number of conceptions per 1,000 women decreased by 1.7.

Fig. 2*B* uses the same data as Fig. 2*A* but plots annual changes in the conception rate against annual changes in the unemployment rate. The straight line is fitted using ordinary least squares (see Table 2*A* for corresponding regression results). It has a slope of -0.48 which is statistically significant at the 1 percent level, indicating that a one percentage point increase in the national unemployment rate is associated with a fertility decrease of about 0.5 conceptions per 1,000 women. Plotting conception and unemployment rate changes at the state level in Fig. 2*C* yields a slope of -0.46 ($p<0.001$, Table 2*A*). A similar effect is also observed within sub-periods, when focusing on the years around individual recessions (Fig. 10).

In Fig. 3 we repeat the state-level analysis separately for six age groups (see Table 2 *B*). The fertility response to changes in the unemployment rate is strongest for women 20 to 24 of age. The negative effect in this age group is more than twice as large as the average effect across all age groups. With increasing age, the relationship becomes weaker and it is virtually zero for women 40 and older. Models estimated in first differences are extremely transparent but not directly comparable to the long-run models we show later that include indicators for each cohort of mothers. Therefore we also estimate these models in levels with cohort fixed effects and flexible time controls. These models yield very similar estimates (Fig. 4; Table 3). The point estimate for the 20 to 24 age group is -1.20 in this specification compared to -1.27 in first differences.

Baseline fertility in the early 20s is high with about 100 annual conceptions per 1,000 women (Fig. 5). At the same time, these young women have almost 20 years of fertility ahead of them so that a temporary reduction in fertility could be compensated for by increasing fertility at later ages. The question of whether this postponement takes place cannot be investigated using data on annual conception rates. Instead we need to look at completed fertility measures.

The first column of Table 4 shows the relationship between completed fertility per 1,000 women at age 40 and the unemployment rates that women have faced at different points in their fertile lifecycle. The sample includes women born in 1961 through 1970 for whom we observe fertility up to age 40 (Fig. 6). There is no significant effect of high unemployment before age 20 or after age 24. However, the average unemployment rate between age 20 and 24 has a statistically significant coefficient of -14.21 ($p=0.022$) indicating that a one percentage point increase in the unemployment decreases the completed fertility rate at age 40 by about 14 conceptions per 1,000 women.

Given a baseline of 1,916 conceptions resulting in a live birth prior to age 40, an effect of -14.21 is small in percentage terms (0.7%) as well as compared to the society-wide changes in fertility observed over the past century (12). Compared to the short-term estimates, however, this is a large effect. A one percentage point increase in the annual unemployment rate decreases the short-term fertility rate by 1.2 conceptions for 20 to 24 year olds. Multiplying this annual effect by 5 to make it comparable to effects of the 5-year average unemployment rate between age 20 and 24, results in an overall short-term effect of -6.0. Thus the long-term effect on completed fertility of -14.21 is more than twice as large as the short-term effect. In other words, among women 20-24, the initial negative effect of unemployment on conception accumulates over time rather than being fully compensated for by later conceptions.

Columns (2) to (5) of Table 4 show the estimated effects on completed fertility for the same cohorts of women as in column (1), but at earlier ages. The pattern of effects at ages 35 and 30 is very similar to the estimates in column (1), though the coefficient on the unemployment rate at age 20 to 24 decreases slightly between column (2) and column (1) which suggests that there may be a small amount of "catch up" but not sufficient to make up for the initial reduction in fertility. This pattern suggests that most of the long-term effect accumulates within the first 10 years after a young woman is exposed to high unemployment rates. At age 25 the effect of the age 20 to 24 unemployment rate is -7.8 which is only slightly larger than the corresponding short-term effect of -6.0. This comparison suggests that the accumulation of the long-term effect occurs largely between age 25 and age 30. Columns (4) and (5) show that unemployment during a woman's teen years also has a strong negative effect (of -9.6) on the number of conceptions resulting in a live birth up to age 25. However, this effect disappears at higher ages (though the point estimates remain negative), indicating that women largely make up for these fertility reductions in later years. Column (5) shows a model of completed fertility at age 20. Fertility at this age should not be affected by later unemployment, and column (5) shows that in fact it is not affected by the unemployment rate at age 20 to 24.

The results in Table 4 are robust to alternative specifications of the unemployment rate. Using the unemployment rate in women's own state of birth as an instrumental variable for the unemployment rate used above hardly affects the point estimates and leaves significance levels unchanged (Table 5). Another alternative is to use the unemployment rate in a women's own state of birth not as an instrumental variable but as the regressor of interest (Table 6). This substitution decreases the estimated effect size by about one-third, which is plausible given that one-third of mothers give birth outside their own state of birth so that the unemployment rate in these women’s state of birth is a noisy measure of the unemployment rate that they actually experienced. Results are also robust to the exclusion of African-American women (Table 7) who have very distinct fertility patterns (Fig. 7). The accumulated long-run effect is also observable when including more recent cohorts of women who can only be followed to younger ages (Table 8). Including more recent cohorts diversifies the time periods and economic conditions that feed into the unemployment rates at the different age intervals (see Fig. 6). The robustness of the estimates indicates that effects are not driven by economic conditions during one particular recessionary episode.

The strong and accumulating negative effects of the unemployment rate experienced in a women's early 20s on her completed fertility could be driven by women cutting back on higher order births. Alternatively, some women who face high unemployment in their early 20s might end up not having children at all.

The effect on the percent of childless women of unemployment at various ages is investigated in Table 9, using the same specifications as in Table 4. The estimates in column (1) of Table 9 show a significant long-run effect of the unemployment rate experienced at age

20 to 24 but not of unemployment rates experienced at other ages. The initial effect at age 25 in column (4) amounts to about half a percentage point. This effect accumulates to 0.68 at age 30 (column 3) and then decreases back to 0.51 at age 40 indicating some catch up at higher ages. As for completed fertility, there is an effect of unemployment experienced during teen years on the fraction of childless women at age 20 and 25 which disappears at higher ages. These long-run effects on childlessness are robust to the exclusion of African-American women (Table 10) and they are observed when including more recent cohorts (Table 11).

The coefficient of 0.51 (p=0.015) in column (1) implies that a 1 percentage point increase in the average unemployment rate at age 20 to 24 is associated with about 5 additional childless women per 1,000 at age 40. Under the assumption that absent high unemployment these women would have had the average number of conceptions, this estimate of 0.51 implies a strong and accumulating effect on completed fertility. In our data there are on average 2.35 conceptions among women who reach age 40 with at least one child. Thus, 5.1 fewer women with children per 1,000 yields about 12 fewer conceptions per 1,000 prior to age 40. This accumulating effect explains almost the entire estimated effect on completed fertility (of -14.21) shown in column (1) of Table 4.[3]

4. Discussion and Conclusion

Whether temporary fertility reductions reflect mere postponement or lead to permanent reductions in completed fertility has been a central question in demographic research (16, 17). In a seminal contribution Bongaart and Feeney (17) develop a tempo-adjusted total fertility rate that accounts for reductions in observed fertility caused by shifts in maternal age. If, for example, women began to delay first births but went on to have the same

[3] There is a stronger tendency to catch up in terms of childlessness than in completed fertility. This is because a woman who is childless at say age 30 may go on to have one child before age 40, but is less likely to have two or more children than a woman who started childbearing earlier.

number of children, there would be a temporary decline in fertility which would not affect completed fertility. However, in order to analyze the actual long-term effects of observed short-run fertility reductions on completed fertility it is necessary to follow affected cohorts over their fertile lifecycle (18, 19).[4] Our cohort-based approach achieves this goal, following women at the state-of-birth level over time so that we can relate their completed fertility to the unemployment rates they faced at different points in their fertile lifecycle.

The completed fertility measures we construct using the Vital Statistics Natality data are very similar to the standard estimates which the U.S. Census Bureau publishes biannually based on surveys of nationally representative samples (Fig. 8).[5] However, unlike the estimates from survey data, the Vital Statistics data provides us with mothers' state of birth which allows us to follow cohorts over time. At the same time, the statistical power derived from including the universe of U.S. births allows for a precise analysis at the level of these individual birth cohorts. Further, in the data we see the states in which women in each cohort give birth at different ages, information that is used to infer the actual unemployment rates that each cohort experienced.

A possible issue is that since not every woman in a cohort gives birth in every year, using women who give birth to track the cohort could impart some bias. In Census years it is possible to obtain the location of each cohort, and to compare the distribution of locations for all women in the cohort, to the distribution of locations of women from the cohort who give birth. This comparison suggests that the spatial distribution of women who give birth is a good proxy for a cohort's overall migration behavior (Fig. 9). Hence, we can relate completed fertility to the unemployment rates that a cohort actually faced at different ages.

[4] As Bongaart and Feeney (18) explain: "Neither the [total fertility rate] nor the [adjusted total fertility rate] attempts to estimate the completed fertility of any actual birth cohort, nor do they attempt any prediction of future fertility."

[5] Until 1990 the Census included a question about the total number of children ever born. Unfortunately, since state-level unemployment rates are available only after 1976 the cohorts of women that could be included in analyses using this measure are all below age 30 in 1990 (see Fig. 5), so that these measures of completed fertility are not useful for our purposes.

A second issue is that we observe only conceptions that result in live births. It is possible that the number of live births falls with unemployment because more women seek abortions or suffer pregnancy losses rather than solely because fewer women conceive. Thus, our results pertain to the cyclicality of conceptions resulting in live births rather than to the universe of all conceptions.

Our analysis shows a robust negative short-term response of fertility to changes in the unemployment rate. This pro-cyclical effect on fertility is visible in the national U.S. time series data. The short-term estimates are very similar whether they are estimated at the state-level or the national level and are strongest for women aged 20 to 24. Cohorts of women who face high unemployment rates during their early 20s do not just postpone fertility but have fewer children in both the short and long term, suggesting that the negative effect accumulates over time.

The observed short- and long-term impacts of unemployment on fertility might also have compositional effects on maternal characteristics such as maternal age or race. Postponing births would imply an increase in average maternal age at conception in affected cohorts. However, when we examine average maternal age over all conceptions up to age 40, we do not find any significant effect of the unemployment rate at 20 to 24 (Table 12, column 1), though we do find a significant positive effect (0.05, $p<0.01$) of the unemployment rate experienced at age 15 to 19. We also find a significant negative effect of the unemployment rate at age 15 to 19 on the percent of African-American mothers (-0.84, $p=0.01$; Table 12, column 2), perhaps because the fertility response at that age range is more persistent for this racial subgroup.

These long-run effects on the composition of mothers could impact health at birth. The offspring of mothers who faced high unemployment between ages 15 and 29 are significantly less likely to be low birth weight (Table 12, col. 3). But this effect on health at birth disappears when we control for the fraction of African-American mothers (col. 5), indicating that the health effect is in fact driven by the change in the composition of mothers.

What economic mechanisms drive the short- and long-term fertility responses to recessions? The standard economic theory of fertility (20) assumes that children are 'normal goods,' that is, that fertility increases with income. However, higher female wages also makes children more expensive, since child bearing and rearing has costs in terms of foregone income. Recent empirical studies (21-24) support these opposing mechanisms.

Recessions are known to affect male employment more than female employment (25), suggesting that they may have effects on household income that are greater than the effects on female earnings opportunities. The reduction in income in turn, could explain lower fertility during recessions. The short-term fertility response to the recent Great Recession (Fig. 10) was unusually large, which is in keeping with the fact that it initially had a very large effect on male employment (26). Young adults, and especially young men, entering the labor market during recessions suffer strong and persistent reductions in their lifetime income (27, 28). These long-term income losses among men entering the labor market during recessions may make them less attractive matches for women in the same cohorts. [6]

Using data from the American Community Survey we find that a one percentage point increase in the average unemployment rate at ages 20 to 24 raises the fraction of women never married at age 40 by about half a percentage point (p=0.01; Table 13). This estimate is similar to the estimated long-run effect on the fraction of childless women and it is in line with a literature that finds persistent negative effect of unemployment on marriage rates (30). We do not find significant effects on women's educational attainment; if young women

[6] On the other hand, Kondo (29) uses longitudinal data from the Survey of Income and Program Participation (SIPP) to examine the effect of contemporaneous differences in male and female unemployment rates on fertility. She does not find a significant effect, but the cohorts available in SIPP are very small. .

facing a recession obtained more education than otherwise, then this could have been an independent factor decreasing fertility (Table 13, col. 2).

A useful benchmark to assess the magnitude of the estimated long-term effects on completed fertility is provided by Black et al. (21) who study the coal boom in the 1970s as a 'natural experiment' that increased male workers' incomes in coal regions. They find that the coal boom increased the completed fertility of affected cohorts by 3% while incomes were permanently increased by 6%. Our estimates suggest that a 1 p.p. increase in the average unemployment rate decreases completed fertility by 0.7%, while the long-run income effect of a 1 p.p. unemployment rate increase for young male workers has been estimated to be around 1.5% (27). Hence, our estimates are close to the elasticity of 0.5 reported in Black et al. (21).

The estimated long-term response of -14.21 conceptions per 1,000 women aged 20 to 24 facing a 1 percentage point increase in the unemployment rate is sizeable. Given that there are about 9.2 million U.S. born women aged 20 to 24 currently living in the U.S., our estimates suggest that the increase of 3.22 percentage points in the 5-year unemployment rate experienced during the Great Recession will result in a long-term loss of 420,957 conceptions (and 426,850 live births) among affected cohorts, a 2.4 % decrease in completed fertility. This long term effect on fertility is largely driven by women who remain childless. The estimates imply that of the women aged 20-24 at the start of the Great Recession, an additional 151,082 will remain childless at age 40 (an 8.9% increase in the rate of childlessness).[7] We find it remarkable that changes in macroeconomic conditions have such a profound effect on individual women's lives.

[7] 5-year unemployment rate 2004-2008: 5.12; 2008-2012: 8.34; difference: 3.22. Long-term effect on conceptions: 3.22*(-14.21) /1,000*9.2m; 1 conception=1.014 births. Long-term effect on childless women: 3.22*(-0.51) /100*9.2m.

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6. Tables and Figures

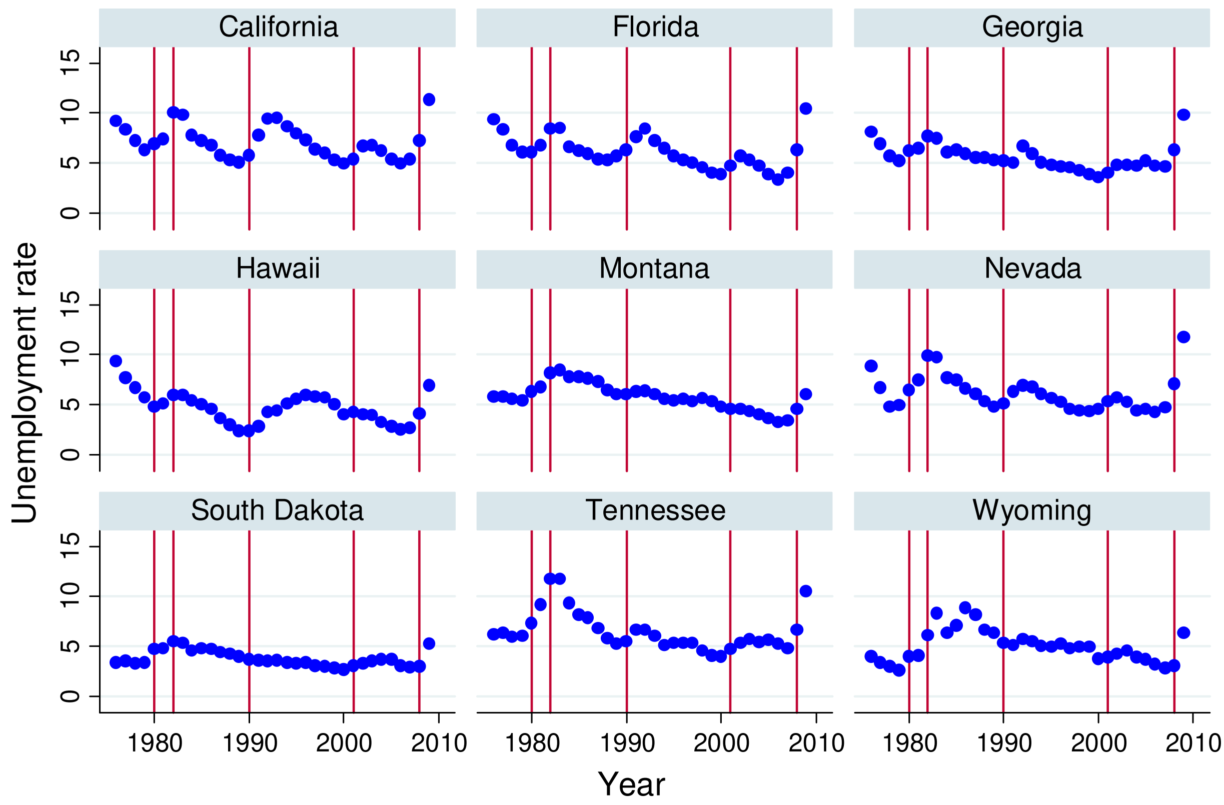


Fig. 1: Variation in unemployment rates over time in nine example states. Monthly unemployment rates are plotted for nine states. Red vertical lines indicate the starts of recessions in 1980, 1981, 1990, 2001, and 2008.

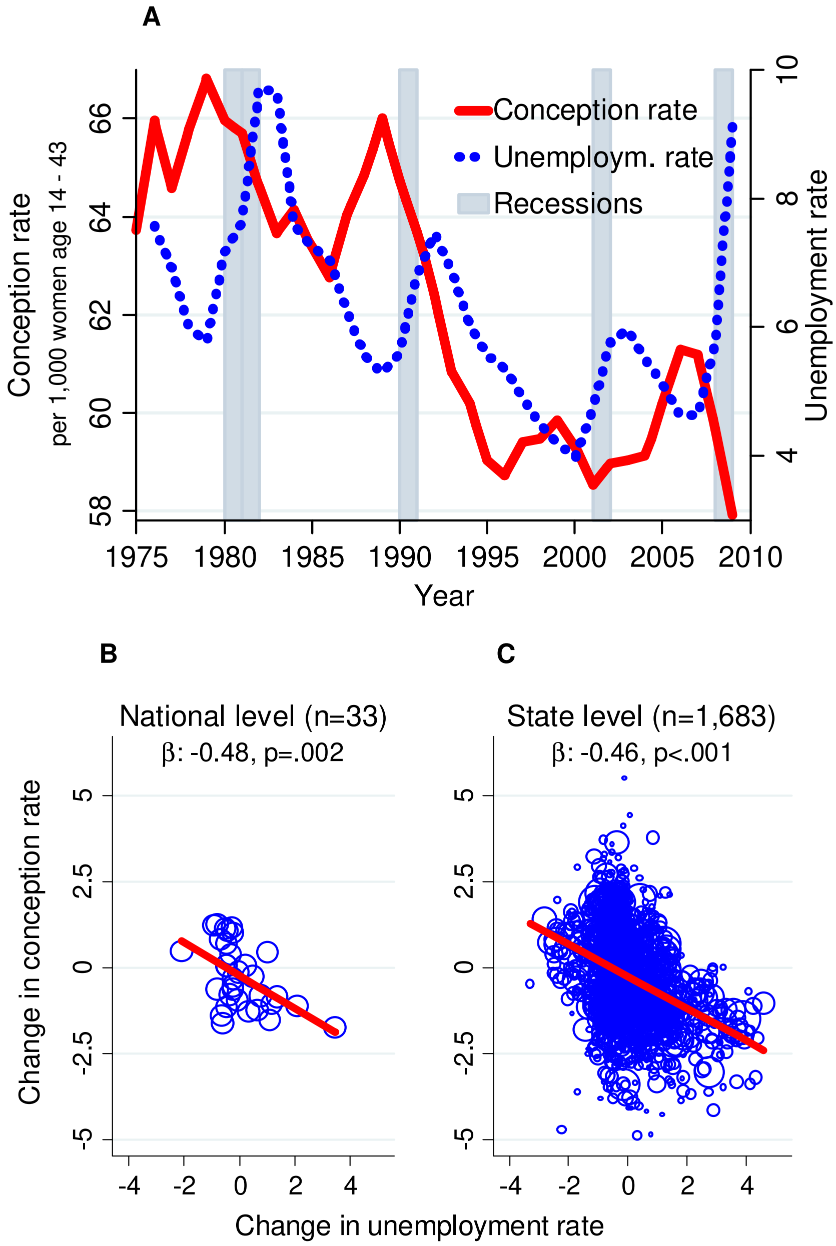


Fig. 2: Conception rates and unemployment rates at the national and state level. Conception rates for U.S. born women only. Straight lines in panels B and C are fitted using OLS. Observations are weighted by cohort size in C. Corresponding regression results presented in Table 2A. See Materials and Methods for the definition of conception and unemployment rates.

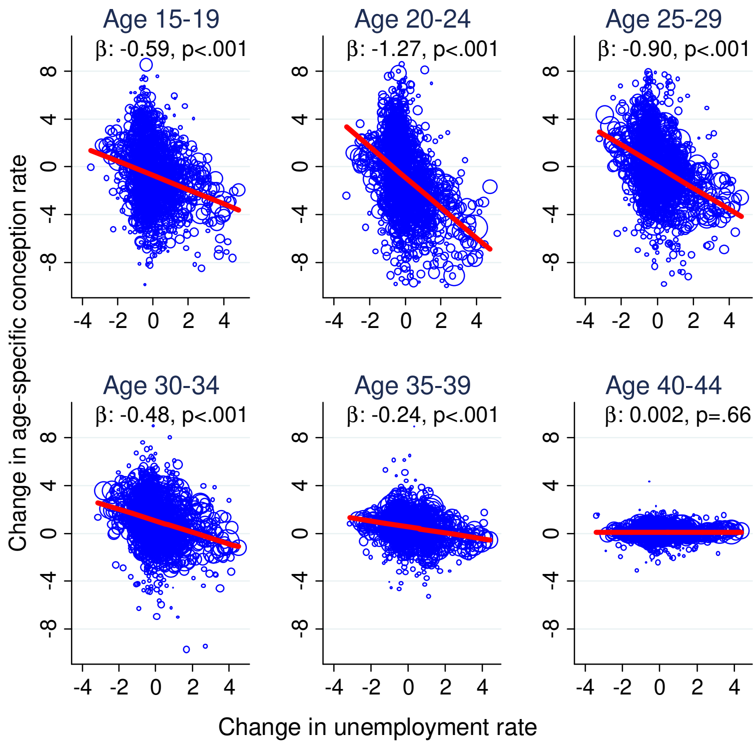


Fig. 3: Short-term relationship of unemployment and conception rates at different ages. Straight lines are fitted using OLS. Observations are weighted by cohort size. Corresponding regression results and average fertility rates per age group in Table 2B. Further comments as in Fig. 2.

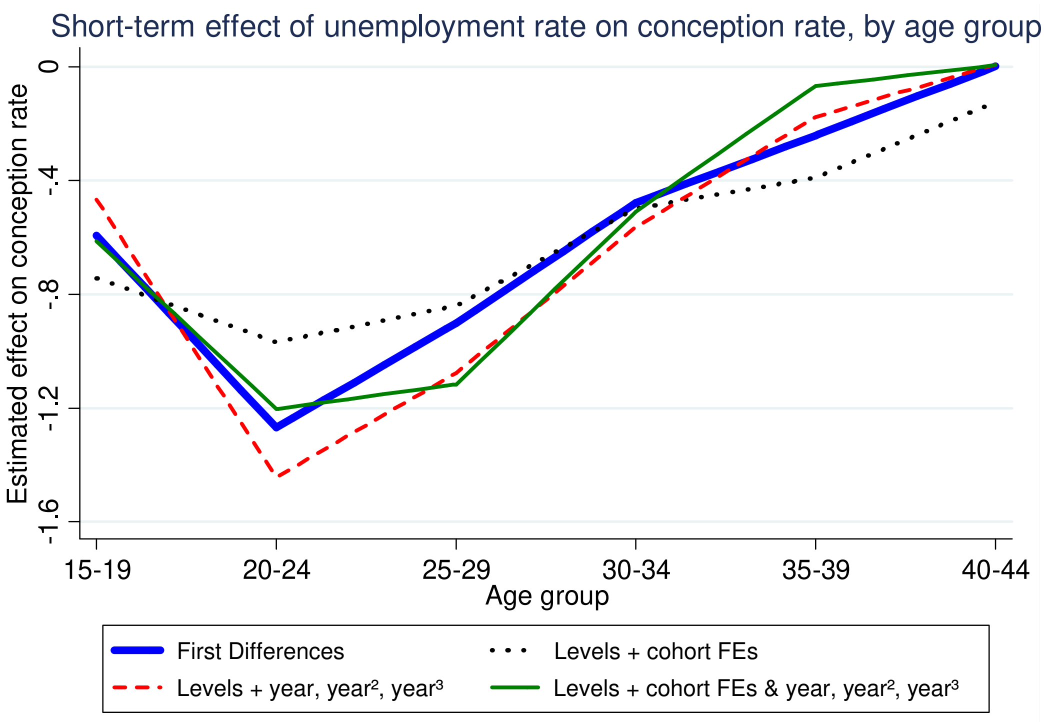


Fig. 4: Short-term effect of the unemployment rate on the conception rates by age group, estimated with different econometric specifications. Coefficients are estimated in separate regressions for each age group. These estimates are connected across age groups for a given econometric specification. Regression results are shown in Table 2 (B) for the first difference specification and in Table 3 for the levels specifications.

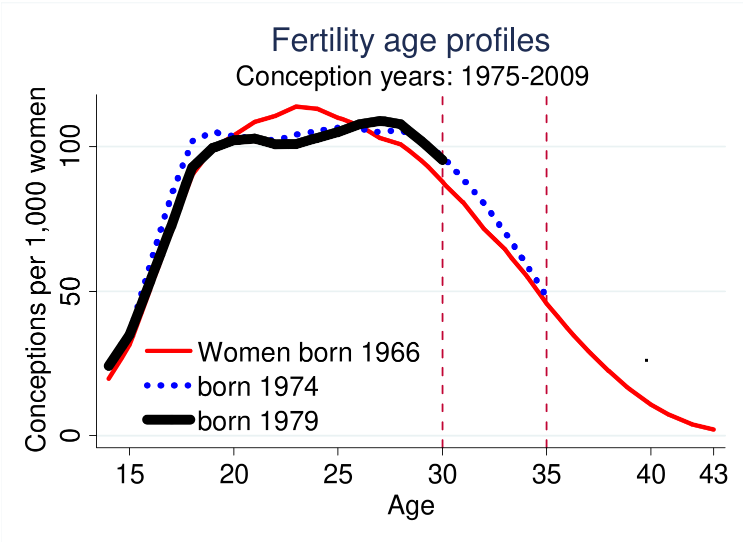


Fig. 5: Fertility age profiles for different birth cohorts of women. Annual conception rates are plotted by age for three example birth cohorts. The available calendar years for which we observe conceptions limit the age up to which different cohorts can be followed.

CALENDAR YEAR (YEAR OF CONCEPTION)

WOMEN'S YEAR OF BIRTH	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	0	1	2	3	4	5	6	7	8	9
60	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
61	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
62	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
63	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
64	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
65	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
66	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
67	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
68	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
69	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
70	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
71	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
72	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
73	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
74	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
75	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
76		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
77			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
78				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
79					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
80						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

Fig. 6: Birth cohorts included in the analysis of completed fertility. Cells indicate the age of cohorts born 1961 to 1980 in calendar years 1976 to 2009. State-level unemployment rates are available starting in 1976, while conceptions are observed until 2009. Green cohorts ('61-'70) are included in Table 4. Blue cohorts ('71-'75) are added in columns (3) and (4) of Table 8. Purple cohorts ('76-'80) are added in column (5) of Table 8.

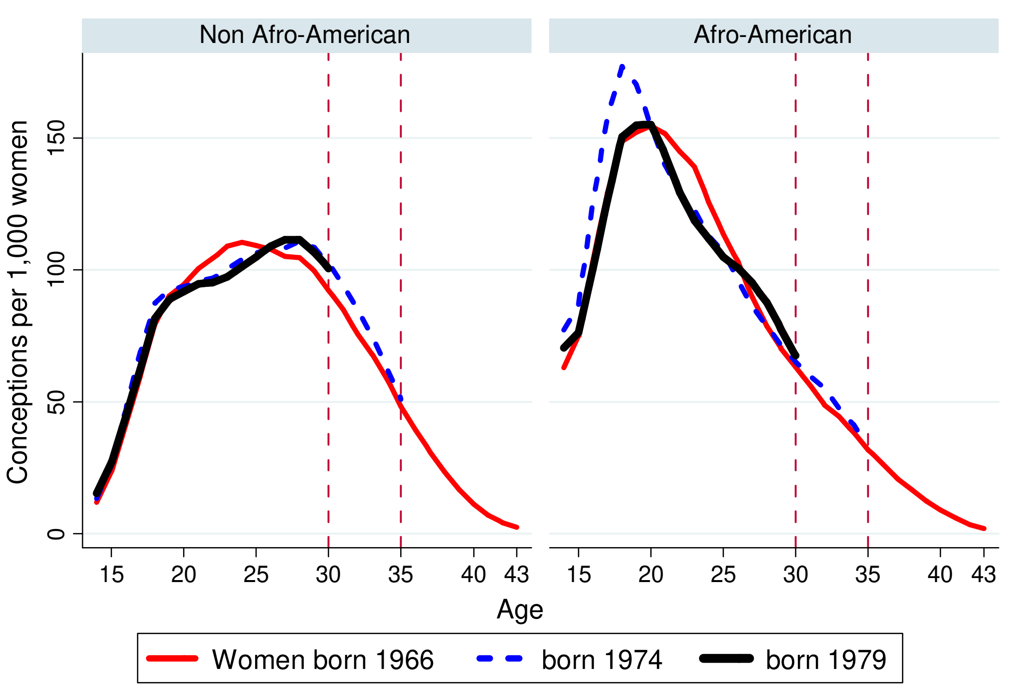
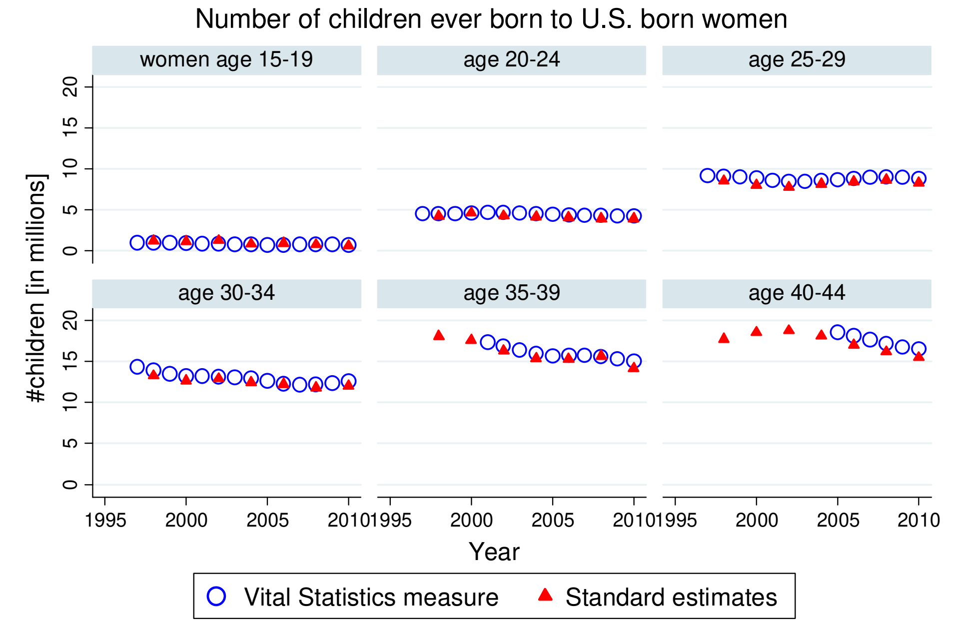


Fig. 7: Fertility age profiles, by women's race and cohort. Annual conception rates are plotted by age for three example birth cohorts, separated by race. Further comments as in Fig. 4.

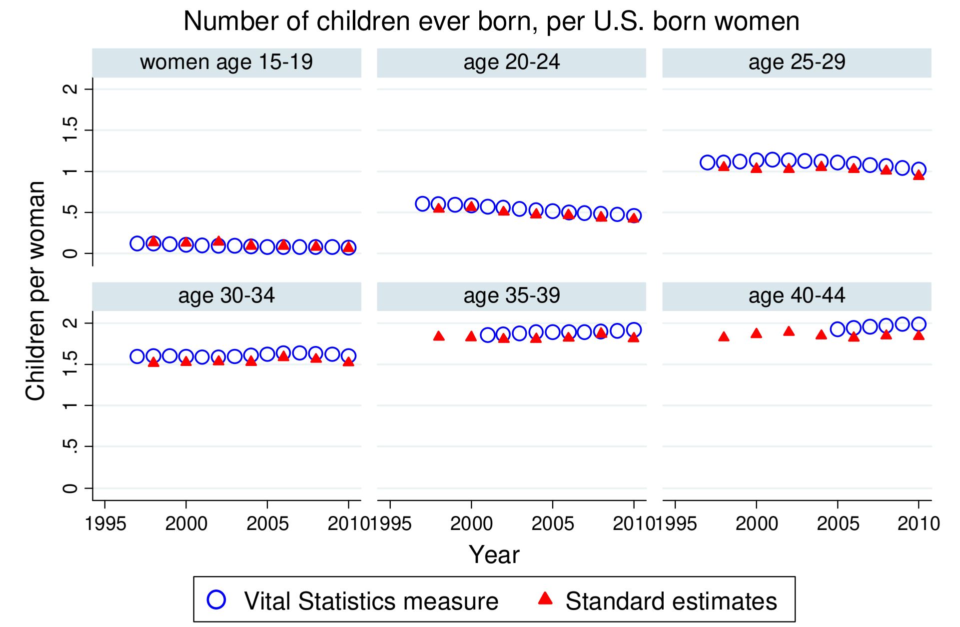
Fig. 8: Comparison of our completed fertility measures (based on Vital Statistics birth records) with standard estimates published biannually by the Census bureau.

A



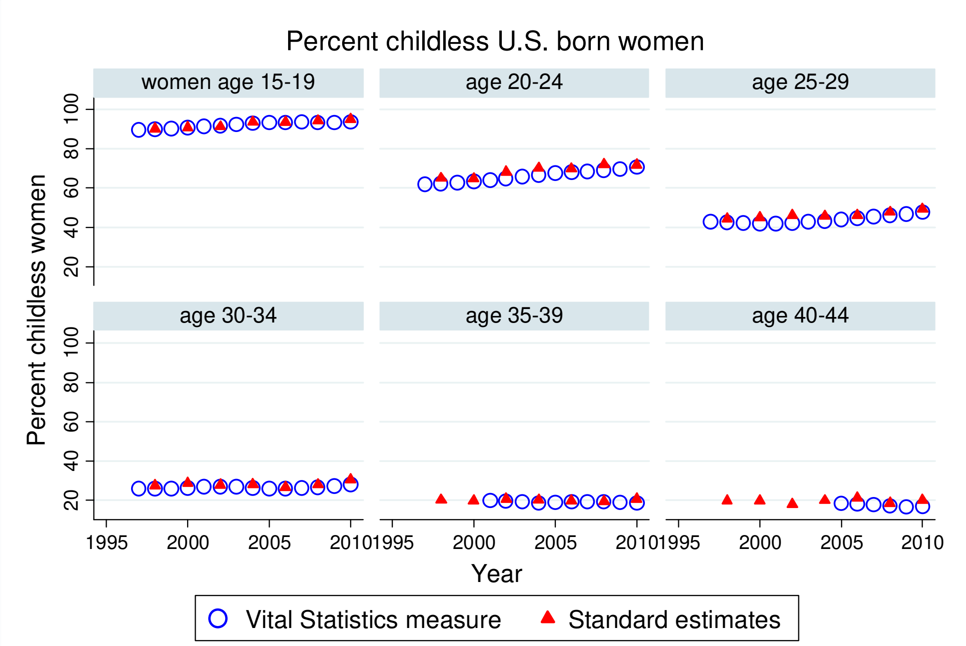
Notes: Standard estimates of completed fertility are published biannually by the U.S. Census Bureau (http://www.census.gov/hhes/fertility/), based on survey data collected by the American Community Survey, the Current Population Survey and the Survey of Income and Program Participation. Our Vital Statistics measure is based on the universe of births occurring after 1975. Cohorts of women who enter the fertile age range before 1975 are excluded (i.e. those aged 35-39 before year 2000, or aged 40-44 before year 2005). Here we focus on births rather than conceptions resulting in live births (as in the remainder of the paper) for better comparability with the Census estimates.

B



Notes: We construct the number of children ever born per woman the same way as the completed conception rate (see Materials and Methods), but with birth instead of conception counts. Further comments as in panel A.

Fig. 8 cont., Panel C



Notes: For the construction of the percent childless women using the Vital Statistics data see the Materials and Methods section. Further comments as in panel A.

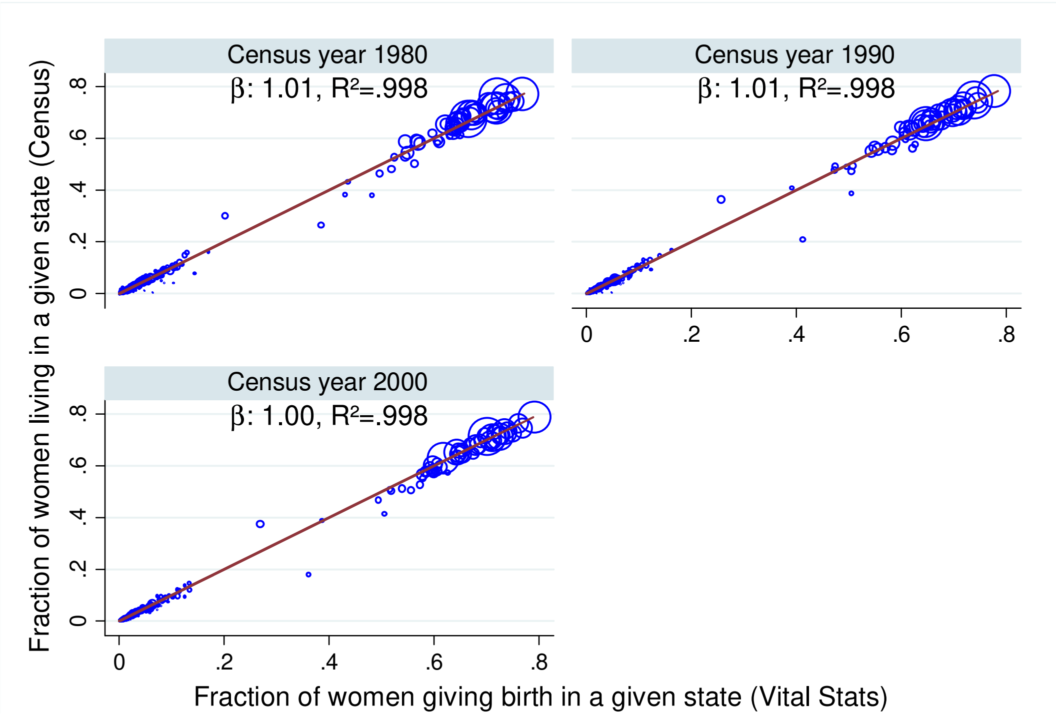


Fig. 9: The fraction of women residing in a state from the Census vs. from Vital Statistics data. Every circle represents the fraction of women born in one state X and giving birth / living in state Y (which might equal X). There are 51*51=2,601 X-Y combinations. Circles are scaled by the number of women in each combination according to the Census estimate. Large circles at the top right of each figure represent X=Y combinations, i.e. the fractions of women who reside in their own birth state according to the Census and who give birth in their own birth state according to the Vital Statistics. Straight lines are fitted using OLS**.** The slope and the R^2 are close to unity, which indicates that the state of residence pattern observed among women giving birth in the Vital Statistics is a good predictor of the overall state of residence pattern among women in the fertile age range that is observed in the Census. The two outliers in the .2-.4 range are women born in DC who live/give birth in DC and in Maryland, respectively. Our results do not change when we exclude DC born women from the analysis.

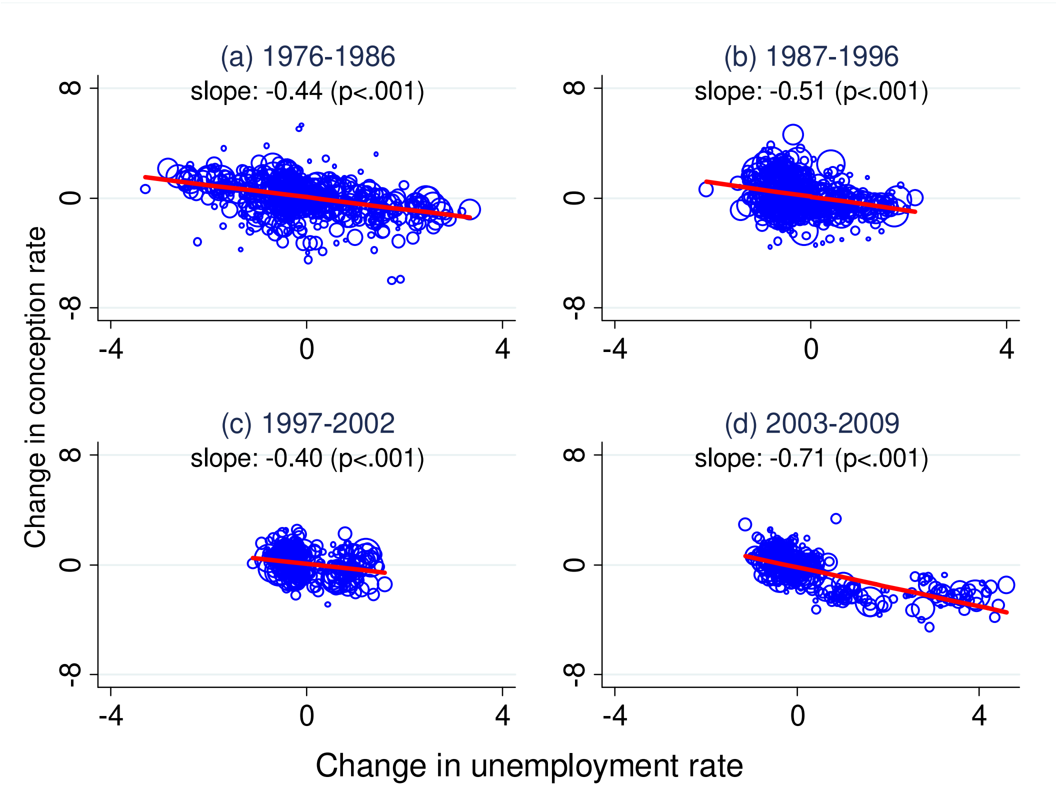


Fig. 10: Short-term fertility responses across four recession periods (US born women). Plotted are changes in the conception rate against changes in the unemployment rate at the state-year level. Four time periods are chosen to include distinct recession periods. See Fig. 1 for the timing of each recession. Straight lines are fitted using OLS. Observations are weighted by state size.

Table 1: Descriptive statistics

Conception years: '75-'09	U.S. born women	All women
Number of births	111,880,471	135,995,642
Number of conceptions	110,339,005	134,172,249
Annual conception rate, per 1,000 women age 14-43	62.16	66.16
Age at conception	25.17	25.45
% African-American	17.06	15.88
% giving birth in own birth state	67.08	-
Conceptions prior to age 40, per 1,000 women	1,916	-
% childless at age 40	18.44	-

Notes: Conceptions refer to conceptions resulting in live births. Births > conceptions due to births of multiples. Number of conceptions prior to age 40 and percent childless are calculated for cohorts 1961-1970. See the Methods section for definitions of fertility rates.

Table 2: Short-run effect of the unemployment rate on the conception rate

A: All ages

Dep. var.: Conception rate	Dep. var. in first differences: National level (1)	Dep. var. in first differences: State level (2)	Dep. var. in levels: State level (3)
Change in unemployment rate	-0.480 ***	-0.465 ***	
	(0.144)	(0.029)	
Unemployment rate			-0.668 ***
			(0.082)
Controls: State FEs, time, time², time³			Yes
N	33	1,683	1,734

B: Age group-specific regressions (state level)

Dep. var.: Change in conception rate	Age: 15-19 (1)	20-24 (2)	25-29 (3)	30-34 (4)	35-39 (5)	40-44 (6)
Change in unemployment rate	-0.594 ***	-1.270 ***	-0.901 ***	-0.479 ***	-0.242 ***	0.002
	(0.047)	(0.083)	(0.044)	(0.025)	(0.011)	(0.004)
Average conception rate	64.94	105.16	101.95	63.85	22.83	4.10
Semi-elasticity	-0.92%	-1.21%	-0.88%	-0.75%	-1.06%	0.04%
N	1,683	1,683	1,683	1,683	1,683	1,683

Notes: Coefficients from OLS regressions of changes in the conception rate on changes in the overall unemployment rate are displayed. The data is aggregated by calendar year in (A) column 1, by calendar year and women's state of birth in (A) column 2, and by calendar year, women's state of birth and women's age group in (B). Hence state level regressions in (A) 2 and (B) refer to women's own state of birth. Changes refer to annual changes. The assigned unemployment rate is the weighted average unemployment rate across states where women give birth, with the number of births as weights. Standard errors in parenthesis are clustered by state of birth. Observations are weighted by cohort size. Significance levels: *:p<0.1, ** p<0.5; *** p<0.01.

Table 3: Short-run effects over age groups, across different specifications

	Age											
Dependent variable:	15-19		20-24		25-29		30-34		35-39		40-44	
Conception rate	(1)		(2)		(3)		(4)		(5)		(6)	
(1) Levels specification with age, state, and cohort FEs												
Unemployent rate	-0.743	***	-0.969	***	-0.840	***	-0.498	***	-0.391	***	-0.125	***
	(0.077)		(0.117)		(0.116)		(0.115)		(0.069)		(0.021)	
(2) Levels specification with age and state FEs, and 3rd order time polynomial												
Unemployent rate	-0.468	***	-1.443	***	-1.077	***	-0.565	***	-0.177	***	0.008	
	(0.163)		(0.133		(0.096)		(0.120)		(0.056)		(0.015)	
(3) Levels specification with age, state and cohort FEs, and 3rd order time polynomial												
Unemployent rate	-0.615	***	-1.203	***	-1.117	***	-0.510	***	-0.067		0.006	
	(0.099)		(0.141)		(0.095)		(0.128)		(0.073)		(0.020)	

Notes: The coefficients from regressions of the conception rate on the unemployment rate are displayed. Each coefficient is derived from a separate regression. For a graphical representation of these results see Fig. 4. Equation (IV) in the Methods section shows the regression model for specification (3).

Table 4: Long-run effect of the unemployment rate at different ages on completed fertility.

	Dep. var.: Conceptions per 1000 women, prior to				
	age 40	age 35	age 30	age 25	age 20
	(1)	(2)	(3)	(4)	(5)
Effect of average unemployment rate at					
Age 15-19	-5.07	-4.83	-3.89	-9.65**	-7.37***
	(7.60)	(6.94)	(5.95)	(3.80)	(2.10)
Age 20-24	-14.21**	-15.35**	-14.56***	-7.85*	0.65
	(6.02)	(5.84)	(5.56)	(4.16)	(2.30)
Age 25-29	5.41	1.27	1.66		
	(9.68)	(6.97)	(5.09)		
Age 30-34	-5.23	-4.44			
	(16.30)	(16.03)			
Age 35-39	0.40				
	(12.83)				
N	510	510	510	510	510
Mean	1,916	1,770	1,416	900	362

Notes: Coefficients from OLS regressions of completed fertility on the average unemployment rate at different periods of women's fertile lifecycles are displayed. The data is aggregated by women's state and year of birth. U.S. born women of cohorts born 1961-1970 are included. All regressions include indicator variables for women's state and year of birth. The unemployment rate refers to the weighted average unemployment rate across states where women from the relevant cohort gave birth, with the number of births as weights. Standard errors are shown in parenthesis and are clustered by state of birth. Observations are weighted by cohort size. Significance levels: *:p<0.1, ** p<0.5; *** p<0.01.

Table 5: Long-run effect of the unemployment rate at different ages on completed fertility, using the unemployment rate in women's own state of birth as an instrumental variable (2SLS regressions).

Dependent variable	Conceptions per 1000 women, prior to				
Incl. cohorts '61-'70	age 40	age 35	age 30	age 25	age 20
2SLS	(1)	(2)	(3)	(4)	(5)
Effect of average unemployment rate (instrumented) at					
Age 15-19	-5.29	-4.88	-4.18	-9.67***	-7.63***
	(6.91)	(6.29)	(5.39)	(3.48)	(1.97)
Age 20-24	-13.81**	-14.82***	-14.45***	-7.86**	0.53
	(5.48)	(5.30)	(5.02)	(3.80)	(2.18)
Age 25-29	5.02	1.24	0.94		
	(8.74)	(6.42)	(4.56)		
Age 30-34	-2.47	-1.86			
	(14.59)	(14.27)			
Age 35-39	-0.63				
	(11.57)				
N	510	510	510	510	510
Mean dep. var.	1,916	1,784	1,418	902	372

Notes: Coefficients from two-stage least squares (2SLS) regressions are displayed. The average unemployment rates in women's own state of birth at age 15-19, 20-24, ..., 35-39 are used as instruments for the average unemployment rate in the states where women give birth at age15-19, 20-24, ..., 35-39. The Kleibergen-Paap F-statistic is always in excess of 10. All regressions include indicator variables for women's state and year of birth. Standard errors are shown in parenthesis and are clustered by state of birth. Observations are weighted by cohort size. See Materials and Methods for definitions of completed fertility rates. Significance levels: *:p<0.1, ** p<0.5; *** p<0.01.

Table 6: Long-run effect of the unemployment rate *in women's own state of birth* at different ages on completed fertility .

Dependent variable	Conceptions per 1000 women, prior to				
Incl. cohorts '61-'70	age 40	age 35	age 30	age 25	age 20
	(1)	(2)	(3)	(4)	(5)
Effect of average unemployment rate in women's **own state of birth** at					
Age 15-19	-4.22	-3.80	-3.23	-7.71**	-6.09***
	(5.73)	(5.28)	(4.51)	(2.93)	(1.65)
Age 20-24	-10.18**	-10.88***	-10.63***	-5.74**	0.45
	(4.03)	(4.00)	(3.87)	(2.96)	(1.70)
Age 25-29	3.73	1.16	0.91		
	(5.81)	(4.49)	(3.31)		
Age 30-34	-1.59	-1.11			
	(9.24)	(9.13)			
Age 35-39	-0.34				
	(6.82)				
N	510	510	510	510	510
Mean dep. var.	1,916	1,784	1,418	902	372

Notes: Coefficients from OLS regressions of completed fertility on the average unemployment rate at different periods of women's fertile lifecycle are displayed. The data is aggregated by women's state and year of birth. All regressions include indicator variables for women's state and year of birth. The unemployment rate refers to the unemployment rate in women's own state of birth. Standard errors in are shown in parenthesis and are clustered by state of birth. Observations are weighted by cohort size. See Fig. 5 for an illustration of the included birth cohorts and Materials and Methods for definitions of completed fertility rates. Significance levels: *:p<0.1, ** p<0.5; *** p<0.01.

Table 7: Long-run effect of the unemployment rate at different ages on completed fertility for *non African-American* women.

Dependent variable	Conceptions per 1000 non African-American women, prior to				
Incl. cohorts '61-'70	age 40	age 35	age 30	age 25	age 20
	(1)	(2)	(3)	(4)	(5)
Effect of average unemployment rate at					
Age 15-19	-1.88	-0.84	1.43	-6.11	-4.61**
	(8.59)	(7.74)	(6.67)	(4.18)	(2.11)
Age 20-24	-12.91*	-13.50**	-11.69*	-4.23	2.58
	(7.01)	(6.65)	(6.37)	(4.34)	(2.10)
Age 25-29	6.29	3.11	5.39		
	(11.16)	(7.47)	(6.10)		
Age 30-34	-8.61	-7.06			
	(17.66)	(16.45)			
Age 35-39	-1.23				
	(15.90)				
N	510	510	510	510	510
Mean dep. var.	1,869	1,716	1,345	818	306

Notes: Coefficients from regressions using completed fertility for non African-American women (i..e children ever born to non A-A women, per 1,000 A-A women) are displayed. Significance levels: *:p<0.1, ** p<0.5; *** p<0.01. Further comments as in Table 4.

Table 8: Long-run effect of the unemployment rate at different ages on completed fertility *across different cohorts*.

Dependent variable	Number of conceptions per 1000 women prior to				
	age 40	age 35		age 30	
Incl. cohorts	'61-'70	'61-'70	'61-'75	'61-'75	'61-'80
	(1)	(2)	(3)	(4)	(5)
Effect of average unemployment rate at					
Age 15-19	-5.07	-4.83	-2.29	-4.43	-2.28
	(7.60)	(6.94)	(5.67)	(5.28)	(3.79)
Age 20-24	-14.21**	-15.35**	-12.52***	-15.89***	-15.21***
	(6.02)	(5.84)	(4.21)	(4.06)	(3.63)
Age 25-29	5.41	1.27	7.43	2.18	5.16
	(9.68)	(6.97)	(6.58)	(4.99)	(6.09)
Age 30-34	-5.23	-4.44	7.95		
	(16.30)	(16.03)	(11.37)		
Age 35-39	0.40				
	(12.83)				
N	510	510	765	765	1,020
Mean dep. var.	1,916	1,775	1,784	1,419	1,417

Notes: Coefficients from OLS regressions of completed fertility on the average unemployment rate at different periods of women's fertile lifecycles are displayed. The data is aggregated by women's state and year of birth, hence only U.S. born women are included. All regressions include indicator variables for women's state and year of birth. The unemployment rate refers to the weighted average unemployment rate across states where women from the relevant cohort gave birth, with the number of births as weights. Standard errors are shown in parenthesis and are clustered by state of birth. Observations are weighted by cohort size. See Fig. 5 for an illustration of the included birth cohorts and Materials and Methods for definitions of completed fertility rates. Significance levels: *:p<0.1, ** p<0.5; *** p<0.01.

Table 9: Long-run effect of the unemployment rate at different ages on the percent of childless women.

Dep. var.	Percent childless women at				
	age 40	age 35	age 30	age 25	age 20
	(1)	(2)	(3)	(4)	(5)
Effect of average unemployment rate at					
Age 15-19	0.34	0.33	0.21	0.50***	0.62***
	(0.25)	(0.24)	(0.23)	(0.17)	(0.11)
Age 20-24	0.51**	0.55***	0.68***	0.48***	0.00
	(0.20)	(0.18)	(0.20)	(0.17)	(0.12)
Age 25-29	-0.06	0.09	0.15		
	(0.33)	(0.28)	(0.22)		
Age 30-34	0.27	0.20			
	(0.54)	(0.53)			
Age 35-39	-0.01				
	(0.46)				
N	510	510	510	510	510
Mean dep. var.	18.44	21.79	31.24	49.76	73.59

Notes: Coefficients from OLS regressions of the percent of childless women on the average unemployment rate at different periods of women's fertile lifecycles are displayed. See notes under Table 4 for further comments. Significance levels: *:p<0.1, ** p<0.5; *** p<0.01.

Table 10: Long-run effect of the unemployment rate at different ages on the percent of childless *non African-American* women.

Dependent variable	Percent childless non African-American women at				
Incl. cohorts '61-'70	age 40	age 35	age 30	age 25	age 20
	(1)	(2)	(3)	(4)	(5)
Effect of average unemployment rate at					
Age 15-19	0.34	0.29	0.08	0.35*	0.44***
	(0.30)	(0.28)	(0.25)	(0.18)	(0.12)
Age 20-24	0.57**	0.59***	0.69***	0.43**	-0.07
	(0.23)	(0.21)	(0.23)	(0.19)	(0.12)
Age 25-29	-0.06	0.05	0.05		
	(0.40)	(0.31)	(0.23)		
Age 30-34	0.49	0.37			
	(0.57)	(0.52)			
Age 35-39	0.09				
	(0.58)				
N	510	510	510	510	510
Mean dep. var.	19.22	22.81	33.03	52.89	76.95

Table 11: Long-run effect of the unemployment rate at different ages on the percent of childless women *across different cohorts*.

Dependent variable	Percent of childless women at				
	age 40	age 35		age 30	
Incl. cohorts	'61-'70	'61-'70	'61-'75	'61-'75	'61-'80
	(1)	(2)	(3)	(4)	(5)
Effect of average unemployment rate at					
Age 15-19	0.34	0.33	0.13	0.14	0.06
	(0.25)	(0.24)	(0.18)	(0.19)	(0.12)
Age 20-24	0.51**	0.55***	0.37**	0.72***	0.66***
	(0.20)	(0.18)	(0.14)	(0.14)	(0.14)
Age 25-29	-0.06	0.09	-0.23	-0.03	-0.17
	(0.33)	(0.28)	(0.23)	(0.19)	(0.20)
Age 30-34	0.27	0.20	-0.33		
	(0.54)	(0.53)	(0.32)		
Age 35-39	-0.01				
	(0.46)				
N	510	510	765	765	1,020
Mean dep. var.	18.44	21.55	21.53	31.28	31.82

Notes: Coefficients from OLS regressions of the percent of childless women on the average unemployment rate at different periods of women's fertile lifecycles are displayed. See notes under Table 4 for further explanations. Significance levels: *:p<0.1, ** p<0.5; *** p<0.01.

Table 12: Long-term effect on maternal composition and health at birth

Dependent variable (prior to age 40)	Average age at conception	Percent African-American mothers	Percent low birth weight babies		
	(1)	(2)	(3)	(4)	(5)
Effect of average unemployment rate at					
Age 15-19	0.05***	-0.84**	-0.08***	-0.06***	-0.01
	(0.02)	(0.32)	(0.02)	(0.02)	(0.02)
Age 20-24	0.03	-0.33	-0.04*	-0.02	-0.01
	(0.02)	(0.33)	(0.02)	(0.02)	(0.02)
Age 25-29	0.06*	-0.55	-0.10**	-0.08**	-0.05
	(0.03)	(0.65)	(0.05)	(0.04)	(0.04)
Age 30-34	0.10*	-0.95	-0.06	-0.02	0.02
	(0.05)	(0.66)	(0.06)	(0.05)	(0.04)
Age 35-39	0.06	-0.15	-0.07	-0.04	-0.06
	(0.04)	(0.82)	(0.06)	(0.05)	(0.05)
Controls:					
Maternal age, gender, parity				Yes	
Fraction African-American mothers					Yes
N	510	510	510	510	510
Mean dep. var.	25.36	16.80		6.11	

Notes: As in previous regressions the data is aggregated by women's own state of birth and year of birth. All birth cohorts from 1961-1970 are included. The dependent variable in column (1) is women's age at conception averaged across all conceptions in a cohort prior to age 40; in column (2) the percent of all mothers in a cohort that are African-American; in column (3) to (5) the percent of all babies conceived in a cohort prior to age 40 that are low birth weight (<2500g). The unemployment rate refers to the weighted average unemployment rate across states where women in a particular year of birth and state of birth cohorts subsequently gave birth, with the number of births as weights. All regressions include indicator variables for women's state and year of birth. Standard errors are shown in parenthesis and are clustered by state of birth. Significance levels: *:p<0.1, ** p<0.5; *** p<0.01.

Table 13: Long-term effect on socio-economic outcomes

Dependent variable (at age 39)	Percent women never married (1)	Years of education (2)	Log family income (5)
Effect of average unemployment rate at			
Age 15-19	-0.04	-0.022	0.017
	(0.28)	(0.017)	(0.011)
Age 20-24	0.64**	-0.004	0.006
	(0.24)	(0.017)	(0.013)
Age 25-29	-0.17	-0.012	0.034
	(0.50)	(0.035)	(0.024)
Age 30-34	-0.49	0.050	0.002
	(0.50)	(0.045)	(0.022)
Age 35-39	0.12	-0.043	-0.035
	(0.66)	(0.050)	(0.024)
N	510	510	510
Mean dep. var.	15.84	13.47	10.73

Notes: As in previous regressions the data is aggregated by women's own state of birth and year of birth. All birth cohorts from 1961-1970 are included. The data is obtained from the 2000 Census and the 2001-2009 American Community Survey (ACS). Women's state of birth is reported in the ACS which allows us to replicate the specification used for the analysis of completed fertility. The unemployment rate refers to the weighted average unemployment rate across states where women in a particular year of birth and state of birth cohorts subsequently gave birth, with the number of births as weights. All regressions include indicator variables for women's state and year of birth. Standard errors are shown in parenthesis and are clustered by state of birth. Observations are weighted by cohort size as reported in the Census/ACS. Significance levels: *:p<0.1, ** p<0.5; *** p<0.01.