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THE PUZZLE OF FALLING US BIRTH RATES SINCE THE GREAT RECESSION

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ABSTRACT

This paper documents a set of facts about the dramatic decline in birth rates in the United States between 2007 and 2020 and explores possible explanations. The overall reduction in the birth rate reflects declines across many groups of women, including women who differ by race and ethnicity, age, and level of education. The Great Recession contributed to the decline in the early part of this period, but we are unable to identify any other economic, policy, or social factor that has changed since 2007 that is responsible for much of the decline beyond that. Mechanically, the falling birth rate can be attributed to changes in birth patterns across recent cohorts of women moving through childbearing age. We conjecture that the "shifting priorities" of more recent cohorts, reflecting changes in preferences for having children, aspirations for life, and parenting norms, may be responsible. We conclude with a brief discussion about the societal consequences for a declining birth rate and what the United States might do about it.

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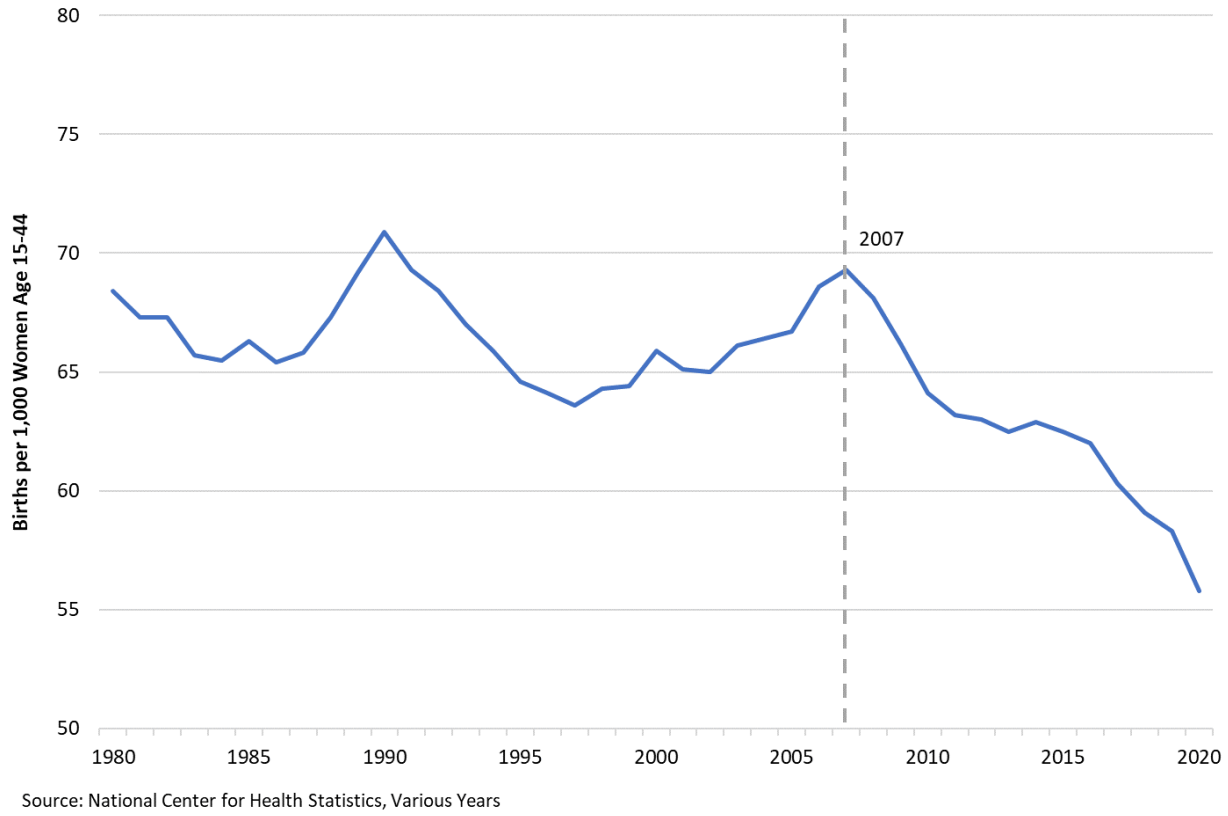
Between 1980 and 2007, US birth rates generally fluctuated within a narrow range of roughly 65 to 70 births per 1,000 women between ages 15 and 44. Since then, they have plummeted, reaching 55.8 in 2020, about a 20 percent decline over 13 years. Figure 1 plots the trend in the US birth rates. The decline began at the onset of the Great Recession and continued during the ensuing recovery, with no signs of reversing.

Figure 1: Trend in US Birth Rates



Source: National Center for Health Statistics, Various Years

This paper considers possible suspects behind the falling birth rates. We begin with a detailed look at birth rates by demographic groups defined by age, education, race and ethnicity, marital status, and birth parity. A detailed examination by group might offer some preliminary

clues as to what types of factors might be responsible for the aggregate trend. While the decline is concentrated among women in the under-30 age group, the decline is generally widespread across demographic subgroups, which gives reason to suspect that the dominant explanation for the aggregate decline is likely to be multi-faceted or society-wide. We see no indication in the data that there is likely to be a reversal of these trends in the near future.

We next turn to an exploration of potential economic, social, and policy factors that might be responsible for the post-2007 decline in US birth rates. We begin with a brief overview of the economics of fertility and the framework that economists typically use to model and to study the "demand for children," which is the individual decision underlying aggregate birth rates. We then describe the empirical relationship between annual state level birth rates and economic and policy factors that vary at the state and year level, including labor market conditions, social policy indicators, and reproductive health policy measures. After that, we consider the impact of a set of slower-moving factors, like women's economic status, changing take-up of contraceptive technology, and the cost of raising children. Aside from the impact of the Great Recession, which contributed to the decline for the first few years of this period, we are unable to identify a strong link between any specific policies or economic factors and the declining birth rates.

We also compare birth trends in the United States to other highly developed countries to examine whether international differences in social, economic, and policy environments hint at a likely cause. The fact that birth rates are also relatively low in other high-income countries supports the notion that localized factors may not explain a significant portion of the decline.

If period- and location-specific factors generally cannot explain declining birth rates, perhaps the cause has to do with changes in the cohorts of women moving through their

childbearing years. *Shifting priorities* among more recent birth cohorts – potentially driven by changes in preferences for having children, aspirations for life, and parenting norms – would represent a more universal, harder to quantify factor that may be the key driver of the decline in US birth rates (and elsewhere). This line of explanation is potentially related to a concept referred to by demographers as the "second demographic transition." Our conclusion briefly considers the societal consequences for the United States of a declining birth rate—such as reduced productivity growth and instability in the finances of programs to support the elderly like Social Security and Medicare –and what might be done about it.

RECENT TRENDS IN US BIRTH RATES

We begin by providing a detailed, descriptive examination of birth rate trends in the United States, using data on the universe of US births from the Vital Statistics system from 1980 through 2020.[1] Our examination focuses on the steady, dramatic decline in birth rates since 2007, but showing data from this longer period helps put the recent decline in context. We describe trends in birth rates for different demographic groups and then evaluate how much of the decline in the total birth rate since 2007 reflects changing population demographics versus changes in birth rates within certain demographic groups.

[1] At the time of writing, aggregate statistics on births are available from the National Center for Health Statistics through 2020; individual level microdata is available through 2019. For demographic groups that are not included in the aggregate reports, we tabulate data through 2019 using the microdata.

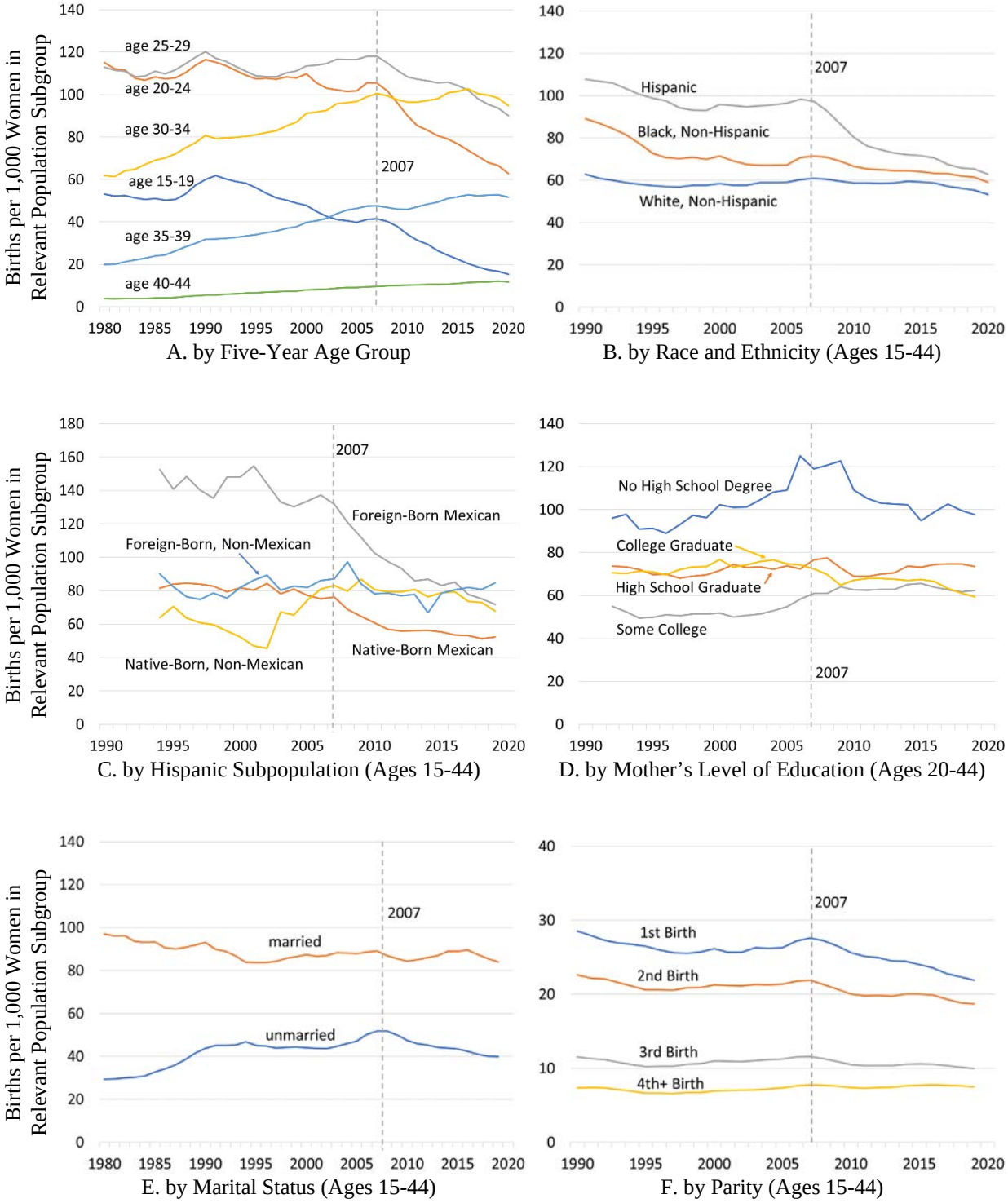
Birth Rates by Demographic Group

We take advantage of the demographic data included in the publicly available Vital Statistics natality data to document birth rates by maternal age, race and ethnicity, nativity, and marital status.[2] In Figure 2, Panel A plots birth rates for six different age groups. Birth rates have declined most dramatically among teenagers, but the downward trend in births among teens began well before the broader decline in births to non-teens. The teen birth rate peaked in 1991 at a level of 61.8 births per 1,000 women aged 15 to 19. The pace of that decline slowed approaching 2007 and then accelerated in the following years. Overall, teen births fell to 41.5 by 2007 and then to 15.3 births per 1,000 teen women in that year.[3] The overall decline was 75 percent, representing a massive change in a frequently tracked social outcome (as discussed in this journal by Kearney and Levine 2012).

[2] We combine Vital Statistics birth data with population data from the Surveillance, Epidemiology, and End Results (SEER) program at the National Cancer Institute to generate rates of birth per 1,000 women between the ages of 15 and 44 by race and ethnicity. Since SEER data does not report population by educational attainment, marital status, and nativity, we use data from the American Community Survey to estimate the number of women in each relevant group in order to construct those birth rates.

[3] Kearney and Levine (2016) provide evidence that the introduction of the MTV show *16 and Pregnant* contributed to the more recent decline after it was introduced in 2009.

Figure 2: Trend in Birth Rates by Population Subgroup



Notes: Birth rates are calculated by the authors using NCHS Vital Statistics Natality Data, SEER population data, and the American Community Survey. The data appendix provides detailed information on the specific data sources.

Other than teens, the main decline in birth rates was women in their 20s. Birth rates among women 20 to 24 fell from 105.4 to 62.8 through 2020 and birth rates among women 25 to 29 fell from 118.1 to 90.0. Births to women at older ages remained constant or rose, but not nearly enough to make up for these large declines at younger ages. These trends are consistent with women having fewer children over their childbearing years, not merely delaying childbearing to older ages (Kearney and Levine 2021).

We next examine birth rates by race and ethnicity, as shown in Panel B of Figure 2. Hispanics have experienced the most dramatic recent declines in birth rates. In 2007, the birth rate among Hispanic women was 97.4; it fell to 62.8 by 2020. Birth rates for Black and white non-Hispanic women also fell, but by much smaller amounts. When the Great Recession hit, birth rates differed dramatically by race and ethnicity. By 2020, racial and ethnic differences in birth rate levels remain, but they have become much smaller.

Assimilation offers one possible explanation for the falling birth rate among Hispanic women (Tavernise 2019) if birth rates among Hispanic women converge to those of native non-Hispanic US women over time and generations. The share of Hispanic women of childbearing age who are native-born as opposed to foreign born has increased from 49.3 percent in 2007 to 61.7 percent in 2018, according to our calculations from the American Community Survey. Parrado and Morgan (2008) consider birth cohorts from 1835-1839 through the 1960-1964, and show that successive generations of Hispanic women, in general, and particularly Mexican women, have birth rates that converge to those of non-Hispanic white women.

In Panel C of Figure 4, we look separately at birth rates among native- and foreign-born Hispanics, and further segment Hispanics into country of origin. Among those with Mexican heritage, birth rates are considerably higher among foreign-born women than among native-born

women, which is descriptively consistent with assimilation along this dimension. But birth rates among both groups have fallen rapidly suggesting that something more than just assimilation and an increase in the native-born share of Hispanics is behind the fall in Hispanic birth rates. It is relevant to note that the birth rate in Mexico has fallen dramatically over the past 50 years; it is now only slightly higher than in the United States (World Bank 2021). Birth rates have not changed much over time for Hispanic women not of Mexican origin in the United States, regardless of their nativity.

We next examine birth rates by four different maternal education groups: less than high school degree, high school degree, some college, a four-year college degree or more. We drop teens from this analysis since many will not have completed their education. Panel D of Figure 2 shows that recent declines in birth rates are largest for the most and the least educated women, those with a four-year college degree (36.3 percent of women aged 20 to 44 in 2018) and those without a high school degree (8.1 percent of those women). Birth rates fell from 72.5 to 59.4 between 2007 and 2019 for college-educated women and from 119 to 97.5 for women without a high school degree. Births to this latter group rose by about the same level in the decade before that, bringing recent levels of births back in line with that 25 years ago. Both women with a high school degree and those who attended some college have had fairly stable birth rates since 2007.

Figure 2 Panel E separately plots births by maternal marital status. Between 1980 and the early 1990s, birth rates for married women were falling and birth rates for unmarried women were rising. What is relevant for our purposes is that since 2007, birth rates have not trended very differently for married and unmarried women. Births to unmarried women fell somewhat more (perhaps attributable to the large decline in teen births, which are almost exclusively to unmarried women), but births to married women fell as well, albeit not continuously.

Although birth rates in each marital status category have fallen by only a small amount, the percentage of women of childbearing age who are unmarried is growing (58.2 percent in 2007 to 63 percent in 2018). Since unmarried women have lower birth rates, the rise in the share of women unmarried would reduce the overall birth rate purely based on this compositional change. The fact that women now marry at older ages contributes to greater numbers of unmarried women among those of childbearing age. The median age at first marriage has risen continuously over the past 50 years, although perhaps at a faster rate more recently, rising from 22.0 in 1980 to 25.6 in 2007 to 28.1 in 2020 (US Census Bureau 2021).

Finally, we tabulate trends in births by parity. These data reveal that the post-2007 decline in births is driven more by a decline in initial childbearing (first births) than by women not having larger families (third and higher order births). First births declined the most, from a rate of 27.6 per 1,000 women of childbearing age to 21.9 per 1,000 women, a drop of 5.7 births. Second births declined from 21.9 to 18.7, a drop of 3.2 births. The trend lines for third and higher order births are much flatter over this period. These data are consistent with a trend towards childlessness (Stone 2020b).

Decomposing the Decline in Birth Rates into Between- and Within-Demographic Groups

The contribution of any particular demographic group to the overall decline depends on both changes in birth rates for that group and that group's share of the female population of childbearing age. For instance, birth rates fell dramatically among Hispanic women, but they only represent 16.7 percent of the overall population of women of childbearing age. In a mechanical sense, the massive decline in their birth rates is diminished somewhat in explaining the overall decline because they are not a large population subgroup. Larger groups with a more

modest decline may have contributed to the aggregate decline just as much or more. Furthermore, even if birth rates did not change for any of the demographic groups, if the population shifted toward groups that traditionally have lower birth rates, aggregate birth rates would decline.

In this section, we decompose the post-2007 decline in the aggregate birth rate to declines within demographic groups and changes in demographic group's population shares. We also identify which demographic groups have contributed the most to the overall decline, either because they experienced a very large decline in their birth rate or because they are a particular large share of the population. Specifically, we decompose the overall change into the contribution of changing within-group birth rates, the contribution of changes in group population shares, and the interaction of a group's changing rates and changing population shares.[4]

Our decomposition is based on categorizing the population of women of childbearing age into demographic groups defined by the interaction of three race/ethnic groups (white non-Hispanic, Black non-Hispanic, and Hispanic), six five-year age groups (15 to 19 through 40 to 44), and for women over 20, four education levels (no high school degree, high school degree, some college, and college graduate). This breakdown results in 63 subgroups (three race/ethnicity groups, six five-year age groups, and four education levels would total 72, but we

[4] The overall change in the birth rate can be written as:

$$\Delta\left(\frac{B}{P}\right)_{t_o,t_1} = \sum_i s_{i,t_o}\Delta\left(\frac{B}{P}\right)_{i,t_o,t_1} + \sum_i \left(\frac{B}{P}\right)_{i,t_o}\Delta s_{i,t_o,t_1} + \sum_i \Delta s_{i,t_o,t_1}\Delta\left(\frac{B}{P}\right)_{i,t_o,t_1}$$

where B is the number of births, P is population, s is the share of overall population, *i* indexes the 63 groups, and t_0 and t_1 are the beginning and ending years.

omit education levels for teens). We focus on explaining changes in birth rates between 2007 and 2019, the period of rapidly declining fertility.

This exercise makes two points clear. First, changing birth rates within demographic groups is responsible for the declining birth rate since 2007, not changing population shares. From 2007 to 2019, the birth rate declined by 10.8 births per thousand women 15 to 44 (from 69.1 to 58.3).[5] Across all groups, had birth rates been constant and only population shares shifted between 2007 and 2019, the birth rate would in fact have *risen* by 2.6 births per thousand. On the other hand, if population shares were held constant and only within-group birth rates moved over that period (the change captured by the first term), the overall birth rate would have fallen by 12.8 births per thousand.

Second, this decomposition highlights the importance of the relative size of a demographic group when accounting for the overall decline in the birth rates. Table 1 reports the 8 out of 63 demographic groups that contribute the most to the declining birth rate. These groups account for 34 percent of the population, but changes in their birth rates explain 75 percent of the overall decline. The three teen categories by race/ethnicity explain 37 percent of the overall decline. Hispanic teens contributed the largest share, explaining 14 percent of the overall decline; their birth rate fell dramatically, from 82.2 to 24.7 over the period.

Other demographic groups with smaller declines in their birth rate also contributed extensively to the overall decline, because of their relatively large population shares. For instance, the third largest contributing group is white women between the ages of 25 and 29 with

[5] Note that these values are slightly different than those reported in Figure 1 because the data used for the decomposition include women whose race is white or Black and omits the small number of births to women categorized in the vital statistics as having a race of "other"; the birth numbers used in Figure 1 include births to women of "other" race," generating a slight discrepancy in birth rates.

college degrees; their birth rate fell from 101.1 to 65.1, accounting for 11.9 percent of the overall decline. This group represents 4.2 percent of women; with 63 separate categories, the average group comprises 1.6 percent of the female population of childbearing age.

Table 1: The Eight Demographic Groups that Contributed the Most to the 2007-2019 Decline in the US Birth Rate

Group	Relative Contribution to Declining Birth Rates	2007 Share of Population	2007 Birth Rate	2019 Birth Rate	2007-19 Change in Birth Rate
Age 15-19, Hispanic	14.0%	3.1%	82.2	24.7	-57.5
Age 15-19, White NH	13.9%	11.0%	27.1	11.0	-16.1
Age 25-29, White NH, College Grad	11.9%	4.2%	101.1	65.1	-36.0
Age 15-19, Black NH	8.8%	2.8%	65.1	25.3	-39.8
Age 20-24, White NH, HS Grad	7.6%	2.8%	139.9	105.3	-34.6
Age 20-24, White NH, Some College	7.1%	5.5%	54.2	37.7	-16.5
Age 30-34, White NH, College Grad	6.4%	4.2%	131.7	112.0	-19.7
Age 20-24, Hispanic, Less than HS	5.3%	0.8%	295.1	206.8	-88.3
Total	75.1%	34.%	76.5	50.5	-25.9

Source: Author's calculations based on Vital Statistics Natality data.
Note: Birth rates are measured as the number of births per 1,000 women in each population subgroup.

Note that five of the leading groups contributing the most to declining birth rates are subsets of white, non-Hispanic women. Figure 2, though, shows no dramatic decline in births among that broader group. In this decomposition analysis white, non-Hispanic women are broken down into 21 subgroups. The apparent discrepancy in results is attributable to the fact that births were relatively constant or slightly increasing (mostly for older white women) in the other 16 subgroups. This is confirmed by an examination of trends in birth rates for each specific subgroup (not shown).

HOW ECONOMISTS MODEL FERTILITY

Before evaluating some evidence concerning the drivers of recent changes in birth rates, we discuss the general economic framework for thinking about fertility. Starting with the seminal work of Gary Becker (1960), economists have viewed the decision to have a baby (sometimes referred to as the "demand for children") using the framework of constrained utility maximization. This approach recognizes that children bring people utility – perhaps in the form of life satisfaction, general happiness, or pleasurable experiences – but that children also come with associated costs, broadly defined, including both time and money. Becker (1960) also introduced the concept of child "quality," a term he uses to refer to expenditures per child, but which he carefully specifies does not mean "morally better." He explains "a family must determine not only how many children it has but also the amount spent on them—whether they should provide separate bedrooms, send them to nursery school and private colleges, give them dance or music lessons, and so forth" (p. 211).

This approach to modeling the decision to have a child leads to standard predictions of price and income effects. Sometimes the price effect of children is direct, like the costs of housing and childcare. Dettling and Kearney (2014), for example, show that birth rates decrease for renters when housing prices increase, which is consistent with a negative price effect because housing is a large cost associated with having children. Other times the price effect is indirect, like the opportunity cost of a woman's time, which would increase along with women's wages or a greater likelihood of finding employment during an economic expansion.

Holding prices and quality constant, an increase in income will lead people to choose to have more children. In the vernacular of consumer demand, children are "normal" goods (jargon

that is also unfortunate in this context). This positive relationship between income and births may come as a surprise to some readers, given the negative relationship between birth rates and income or per capita GDP observed over time and place.

There are a few potential explanations for this apparent contradiction within standard economic models of fertility. First, correlational observations are often plagued by a potential conflating of income and price effects. As economic development increases income, it also tends to increase the price of children, in terms of the price of housing, childcare, and the opportunity cost of women's time. Such correlations could also reflect the effect of confounding selection effects. Perhaps birth rates are lower in high-income cities because the cost of living is higher and/or because people who choose to live their desire more adult-centric amenities like restaurants and bars.

Second, smaller families among higher income people – either over time or across place – could reflect a "quantity-quality" trade-off (another unfortunate label that is common in economics jargon). The idea is that as societies become richer, parents may opt to have fewer children and spend more per child, investing in greater "quality," say, through expenditures on education and enrichment (Becker and Lewis 1973).

Economic models also lead to opposite-signed predictions about the effects of male and female wages on birth rates. The seminal work of Butz and Ward (1979) predicted that an increase in male earnings will lead to increase in the total demand for children, but an increase in female wages will have both positive income effects and negative price effects on fertility. The "baby boom" of the 1950s is broadly consistent with their predictions of increasing births in response to rising male earnings. The "baby bust" of the 1960s is broadly consistent with their prediction of increases in female earnings leading to fewer births. More recent work by Schaller

(2016) considers the period 1980 to 2009 and documents that exogenously determined improvements in men's labor market conditions lead to increases in birth rates, while exogenously determined improvements in women's labor market conditions lead to small decreases in birth rates.

Apart from the question of how many children to have, parents also face the decision of *when* to have them. There is robust empirical evidence showing that aggregate birth rates tend to be pro-cyclical (Schaller 2016; Dettling and Kearney 2014; and Kearney and Levine 2020). This is consistent with the notion that people are more likely to become parents when they have income available to pay for the associated costs of childbearing. If credit markets were perfect, parents could borrow and save to finance the cost of children and optimally choose when to have them. But credit markets are imperfect, and many people are liquidity constrained; couples might thus refrain from having a child at times when their income is low—that is, when the economy is weak.

In the uncertain context of pregnancy and childbearing, economic models also can incorporate the fact that optimized "choices" are not always realized. The availability, price, and efficacy of contraception, as well as the degree of access to abortion providers, will all affect the degree to which women are able to achieve their desired level of pregnancy and birth avoidance.[6] There is ample evidence from recent US contexts that expanded access to affordable and efficacious contraception has led to a reduction in births among affected populations (for example, Kearney and Levine 2009; Bailey 2010; Lindo and Packham 2017; Kelly, Lindo, and Packham 2020).

[6] See Levine (2004) for a detailed presentation of this form of decision-making in the context of changes in abortion policy.

Finally, economic models tend to take preferences as given. However, people's preferences for having children or spending their resources investing in children might change over time. Secular changes in attitudes and aspirations, religiosity and family attachment, and other societal changes could all lead to changes in preferences and the demand for children (Adserà 2013). This is a point to which we will return later.

POTENTIAL EXPLANATIONS FOR DECLINING US BIRTH RATES

Next, we turn to potential empirical explanations for the decline in US birth rates, focusing on economic, policy, and social factors, and distinguishing them by the time horizon over which changing factors occur and how long it would take for behavioral change to be observed. We also compare trends in birth rates in the US to those in other high-income countries to see how international differences in economic and policy environments may contribute to differences in birth patterns over time.

The Great Recession and Birthrates

An array of empirical evidence from a variety of sources suggests that a recession will cause birth rates to fall for a time. Some of this evidence comes from studies of how changes in income affect the number of children with evidence from a variety of contexts, including the case of individual job loss (Lindo 2010), shocks to area-level earnings and income (Kearney and Wilson 2018; and Black, Kolesnikova, Sanders, and Taylor 2013), and shocks to the housing market that increase owners' housing wealth and equity (Dettling and Kearney 2014; Lovenheim and Mumford 2013).

Figure 1 reveals a noticeable drop in birth rates after the recessions of the early 1980s and the 1990-91 recession, as well as after the 2007 recession (although there is not much change in birthrates after the mild recession of 2001). The economic stress of the Great Recession surely contributed to the abrupt downturn in birth rates after 2007. Based on the 5-percentage point increase in the unemployment rate from 2007 to 2010 (from 4.6 percent to 9.6 percent), our analysis described below indicates that one could have expected births to fall by 3.5 percent between 2008 and 2011 (approximating a nine-month gestational lag). Over that period, the birth rate fell 7.2 percent, from 68.1 to 63.2. Although the recession clearly contributed to that decline, it is also the case that other factors must have also been at play. The lack of any rebound in births and, in fact, their continued decline following the end of the recession further suggests a role for factors beyond the Great Recession.

Beyond the Great Recession

There are a substantial number of economic and factors that plausibly may affect birth rates in one way or another. We begin our investigation with a state-level approach to look at possible economic and policy determinants of overall birth rates from 2001 to 2019. This empirical approach relies on the presumed exogeneity of state-level policy changes to interpret the reported relationships as causal. The regression model controls for year fixed effects (to account for changes in birth rates over time that are not state specific), as well as state fixed effects (to account for persistent differences across states in average birth rates).

We focus on sets of operational factors that fit with the economic approach to modeling fertility described above. One key factor is the unemployment rate; we described those results above. We also consider an extensive set of relevant social policies, many of which have been

separately examined in previous studies of birth rates. These include the generosity of welfare benefits (Moffitt 1998; Grogger and Karoly 2002; Lopoo and Raissan 2012; and Ziliak 2016), the state minimum wage (Bullinger 2017), and child support enforcement (which affects the opportunity cost of fathering a child, see Aizer and McLanahan 2005). We also include a number of reproductive health policies that potentially affect a woman's ability to achieve her desired fertility, including abortion restrictions in the form of parental notification laws and waiting periods (Levine, 2004), health insurance coverage through Medicaid (DeLeire, Lopoo, Simon 2011), mandatory coverage of contraception in private insurance plans, and state mandatory sex education and mandatory contraception instruction laws (Paton, Bullivant, and Soto 2020). We hold constant the demographic composition of female adults in each state and year (specifically, the share white, Black, Hispanic, married, and in four different education groups).

Details regarding the exact policies, source data, variable construction, and results are available in the data appendix. The key result is that when we sum the estimated coefficients on our ten economic/policy variables with their average change between 2007-2018, their combined effect is a 6.2 percent of the total decline in the birth rate from 69.1 to 58.3 births per 1,000 women age 15 to 34 between 2007 and 2018. Of course, it is quite possible that some of these factors affect the birth rates of targeted groups of women in some contexts (i.e. births among lower-income and teen women might fall when subsidized contraception becomes more readily available, as past research has shown); the point here is simply that any effect they might have is too small – or on too small a group of women – to explain a sizable share of the total change in births.

This analysis – and the finding that specific policy and economic factors have limited explanatory power – is similar in approach to a previous study two of us published on trends in

teen births between 1981 and 2010 (Kearney and Levine 2015). The birth rate for teens began falling in 1991, much sooner than the overall decline in birth rates beginning in 2007. Our earlier analysis found that the only three factors that had a statistically significant relationship with state/year teen birth rates were the unemployment rate, the maximum welfare benefit amount, and the implementation of a Medicaid family planning expansion waiver. However, none of these factors could explain a large share of the overall decline in teen births, either individually or collectively. The weak results of both analyses make it difficult to determine whether the decline for teens since 2007 was due to continuing factors unique to them or factors common to older women of childbearing age.

Returning to the decline in overall births post-2007, we augment the preceding state-year analysis by examining the potential impact of slower-moving forces that might not change birth rates year-to-year but might have a meaningful effect over a longer period of time. The factors we consider have been suggested by observers as possibly important contributors to the recent decline in US birth rates. Some examples include more widespread usage of long-acting reversible contraception, costs associated with raising children (like housing and child care costs), improvements in women's economic position (which would increase the opportunity cost of women's time), and rising student debt burdens (which would reduce adults' level of disposable income). Popular press articles in outlets including the *Washington Post*, *Wall Street Journal*, *New York Times*, *Vox*, *Business Insider*, and *CNBC*, among others, have suggested that these factors played an important role in the decline.[7] Others have advanced the notion that

[7] Examples of press reports that mention these factors include the following: contraception (Iati, 2019 and DeBarros and Adamy, 2019); the cost of raising children (Miller, 2018; Belluz, 2020); women's economic advancement (Hoffower, 2021; Tavernese, 2021), and student debt (Dickler, 2018; Snodgrass, 2021).

declining religious observance might affect preferences toward and attitudes about having children (Adserà 2013; Stone 2018; and Douthat 2020).[8]

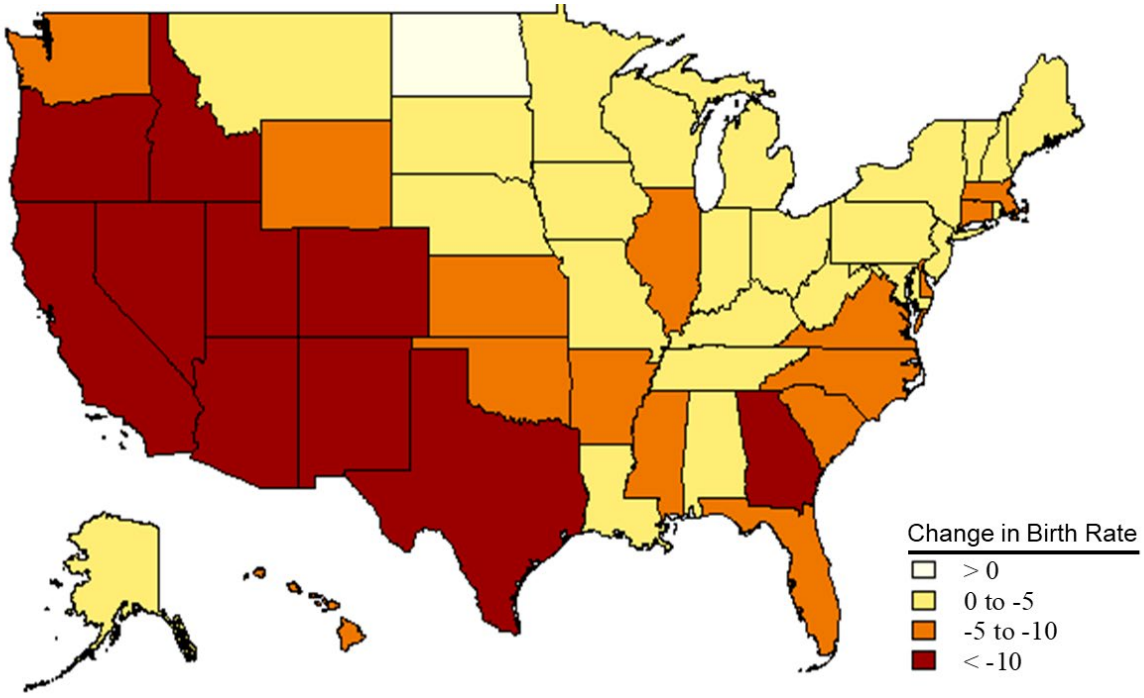
Establishing a causal link between these factors and changes in birth rates would require identifying exogenous variation in factors such as contraceptive take-up and childcare prices, which is beyond the scope of this paper. But basic descriptive evidence suggests that such effects are not likely to explain the large and extended fall in birth rates.

The map in Figure 3 displays changes in state-level birth rates between two five-year periods, 2004-2008 to 2015-2019 (before and after the Great Recession), which we subsequently relate to state-level changes in relevant economic, policy, and social factors. This grouping of years avoids the confounding influence of state-level variation in the severity of the great recession. Averaging the birth rates over these periods reduces the random, year-to-year variation in these data that is present, particularly in smaller states.

The decline in birth rates has been widespread across the country. Birth rates fell in every state over this period, except for North Dakota. One possible explanation for the increase in North Dakota birth rates is the fracking boom that occurred in this state over those years, which has been shown in other research to increase the birth rate (Kearney and Wilson 2018). But as can be readily seen in the map, there is substantial variation in the extent of the decline across places.

[8] Stone (2018) examines a number of the hypotheses we address here as well. We extend and update that analysis incorporating their ability to explain state-level variation in birth rates over time.

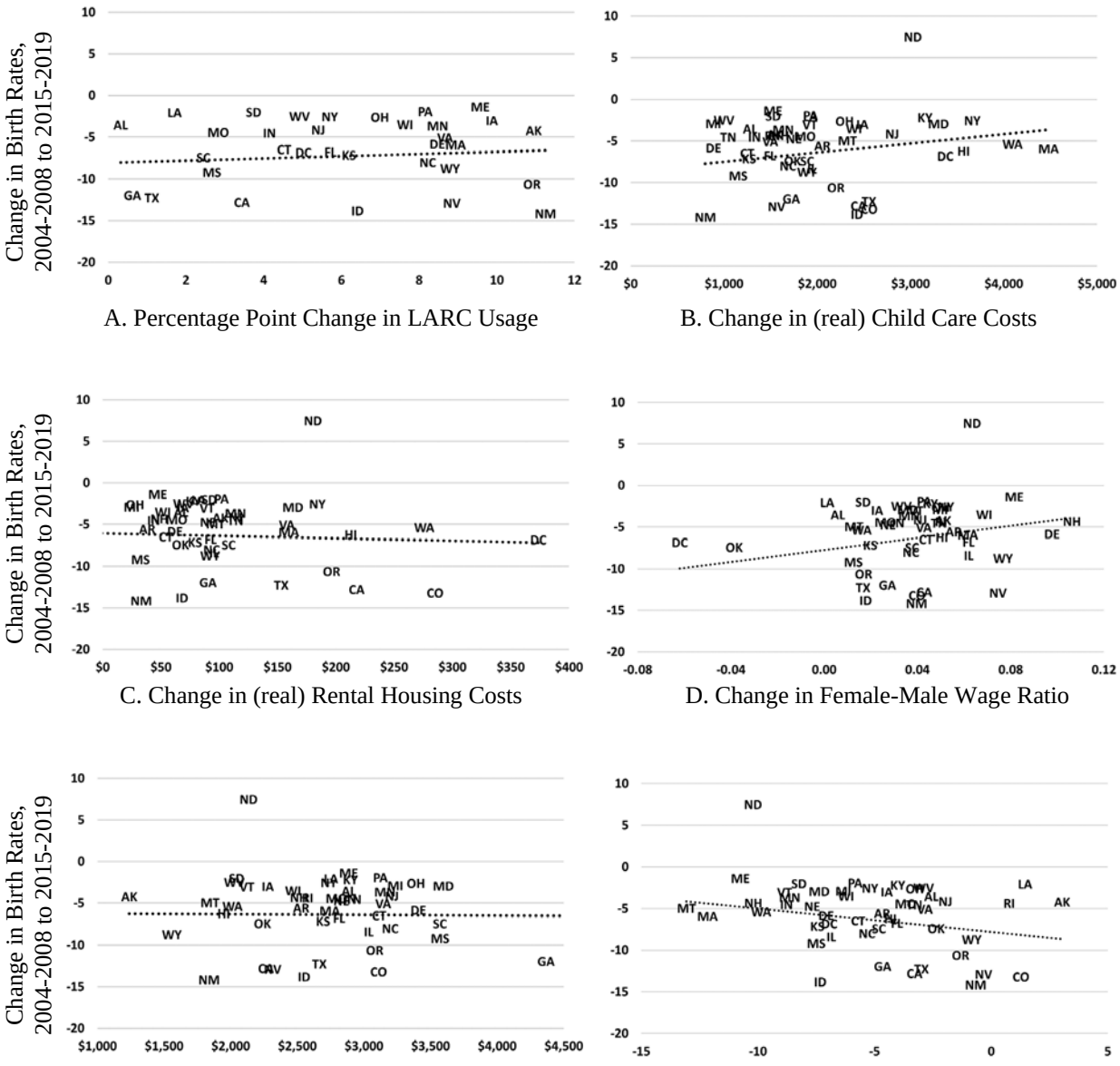
Figure 3: Change in Birth Rates by State, 2004-2008 to 2015-2019



Notes: Birth rates are calculated among women aged 15 to 44.
Source: Birth data are from NCHS Vital Statistics. Population data are from CDC SEER.

Births fell the most in the Southwestern and Western states. The sizable Hispanic population in much of this region is consistent with the particularly large decline in births among Hispanic women, driven by a decline in births among both native and foreign-born Mexicans. The fact that other states with smaller shares of Hispanic residents (like Georgia and Oregon) also experienced large declines, though, further clarifies the broad-based nature of the decline.

Figure 4: Relationship between Changes in Birth Rates and Potential Explanatory Factors, 2004-2008 to 2014-2019



Notes: Birth rates are calculated by the authors using NCHS Vital Statistics Natality Data and SEER population data. The data appendix provides detailed information on the data sources and variable construction for the six explanatory factors considered in Panels A through F.

Figure 4 presents six scatter plots showing the two-way relationship between the change in each considered factor (on the X-axis) and the change in birth rates (on the Y-axis) over these two five-year periods. Each marker represents a state, labeled with its two-letter abbreviation. The data appendix provides details regarding the sources of these data.[9]

The percentage of sexually active women who report using long-acting reversible contraception (LARC) increased from 5.5 percent in 2004 to 10.7 in 20017 and could have contributed to declining birth rates. The simple correlation, though, between the percentage point change in LARC usage in a state and the change in birth rates is wrong-signed (that is, positive), albeit close to zero. This suggests that take-up of LARCs has likely not played an important role in explaining the decline in the aggregate birth rate over this period.[10]

Annual expenditures on childcare for families with children under 12 who report positive child care spending rose nationwide from $5,020 in 2009 to $7,190 for the average of 2015-2019, based on data from the Current Population Survey (all dollar values throughout are measured in constant 2019 dollars). But in the cross-state correlations, places where childcare expenditures increased more did not experience a noticeable drop in birth rates.

Average monthly rents for a two- to three- bedroom apartment rose $124 per month (from $930 to $1,060 in 2018 dollars, a 14 percent increase) nationwide over this period. The increase was much larger in some states, like Colorado, Washington, and the District of

[9] Not all explanatory variables are available for all years. The data appendix includes details about these explanatory variables, including the years for which they are available.

[10] This comment does not imply that expanding access to LARCs among low-income teens or young women would not lead to a reduction in births for them. Research by Lindo and Packham (2017) and Kelly, Lindo, and Packham (2020) provide evidence that expanded access to LARCs in Colorado through the Family Planning Initiative led to a reduction in birth rates among teens and low-income women in that state.

Columbia. The data, though, do not indicate a negative association between state-level changes in rents and state-level changes in birth rates.[11]

As one way to measure changes in women's economic opportunities over time, we used the female-to-male median earnings ratio among full-time, year-round workers; our estimates indicate that this rose from 0.80 in the earlier period to 0.84 percent in the later period.[12] States in which the wage ratio rose the most over this sample period did not exhibit a greater decline in the birth rate.

If young adults are saddled with debt, they might not feel like they have sufficient disposable income to have a child or more children. The total level of student debt per capita in a state, which has increased from $2,500 to $5,400 (in 2018 dollars), on average, between the earlier and later periods we consider. The relationship between state-level student debt and the birthrate is generally flat, giving no indication that increases in student debt are related to the aggregate reductions in birth rates.

Finally, we looked at survey data that tracks the percentage of a state's population who report that religion is at least somewhat important to them. This statistic fell from 83 percent to 78 percent between 2007 and 2014. Again, despite the national trend, we see no evidence that states where religiosity declined the most experienced a greater relative decline in birth rates. If anything, the relationship goes the other way.

In short, other than the Great Recession itself as a triggering event for the deeper and more lasting persistent changes in birth rates, it is difficult to find prima facie evidence for other

[11] When we weight these state-level observations by state population, the specific slopes may change, but none provide statistically significant estimated relationships consistent with falling birth rates.

[12] We calculate this statistic among workers between the ages of 25 and 54. We obtained similar results using the female employment-to-population ratio and a measure of occupational prestige.

economic or policy factors that offer a plausible explanation. One should probably not be surprised that none of these factors explain much of the decline in the aggregate birth rate based on the timing of the decline. Births clearly dropped beginning in 2007, as shown in Figure 1. For any factor to have explained much of that decline, it would have had to change dramatically around the same time. Aside from the Great Recession, none of these factors exhibit that property.

A Comparison of US Birth Rates to Birth Rates in Other High-Income Countries

The total fertility rate is an estimate of the total number of children the average woman will have over her lifetime, based on age-specific birth rates at a given point in time. A total fertility rate of 2.0 means that a woman is expected to have two children on average; 2.1 is generally regarded as the rate required for population replacement (incorporating small amounts of mortality between birth and reproductive age). Comparable country level statistics on the total fertility rate are available from the World Bank Database.

Through the 1990s and early 2000s, US births were at roughly replacement level throughout this period, but the total fertility rate was typically lower in other high-income countries. For instance, in the year 2000, the total fertility rate was 1.89 in the United Kingdom, 1.67 in Canada, 1.52 in the European Union, and 1.37 in Japan. Even after the US birth rate in fell from 2.12 in 2007 to 1.73 in 2018 (the most recent year for which the World Bank statistics are currently available), the US total fertility rate is higher than that in the United Kingdom, 1.68; Canada, 1.50; European Union, 1.54; and Japan, 1.42. Even in Scandinavian countries specifically, with their especially generous system of public support, the total fertility rate is

lower than in the United States; in 2018 it was 1.56 in Norway, 1.76 in Sweden, and 1.41 in Finland.

The fact that the US total fertility rate is now closer to other high-income countries, though generally still slightly higher, does not fit with the narrative that if the United States had more supportive government programs – such as subsidized childcare and generous paid work leave – birth rates would be higher. One cannot prove this counterfactual, of course: perhaps if the United States had a more robust system of child and work supports, like in Scandinavian countries, than perhaps our birth rate would have stayed elevated. It is always difficult to make comparisons across countries because policy context is not all that differs; societal norms and cultural preferences also tend to differ. Still, the international comparisons combined with the difficulty of finding policy and economic factors to explain the sustained decline in US birthrates suggest that these factors are not driving the changes in US birth rates.

THE ROLE OF COHORT EFFECTS IN EXPLAINING THE DECLINE IN ANNUAL BIRTH RATES

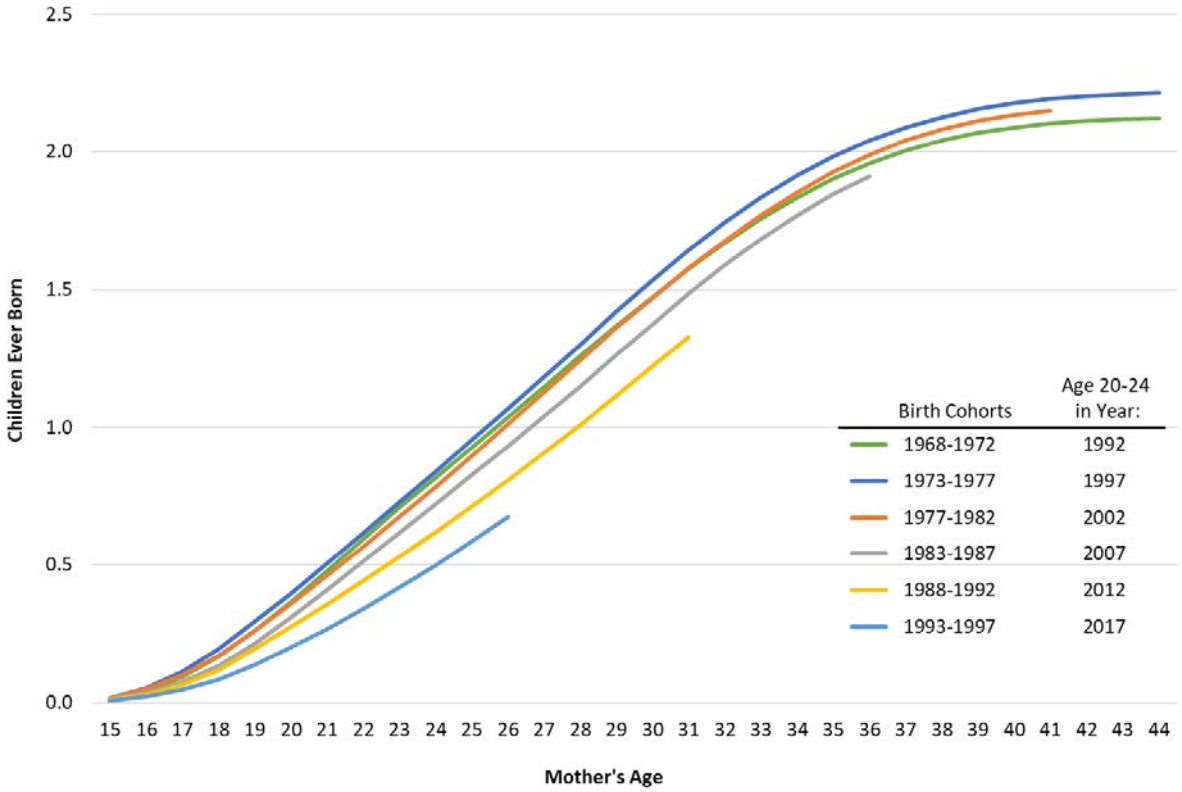
Falling Birth Rates across Recent Cohorts of Young Adults

Our empirical analyses described above do not uncover a readily identifiable, contemporaneous cause of declining births. That leads us to speculate that perhaps the key explanation for the post-2007 sustained decline in US birth rates is not about some changing policy or cost factor, but rather shifting priorities across cohorts of young adults. In other words, perhaps what we are seeing are cohort effects, rather than period effects. Period effects reflect

changes that impact everyone at a point in time, whereas cohort effects reflect changes across people born or raised in different years.

To assess the contribution of cohort effects to the observed declines in birth rates, we examine birth data organized by mother's birth year. The impact of mothers' birth cohort on annual birth rates begins in earnest when those women hit their prime childbearing years, say between the ages of 20 and 24. Women between these ages in 2007 were born between 1983 and 1987. In Figure 5, we track the average number of children ever born by specific ages to women in five-year birth intervals from 1968-1972 to 1993-1997 birth cohorts. These are the birth cohorts comprising women entering their prime childbearing years (ages 20 to 24) in 1992, 1997, 2002, 2007, 2012, and 2017, respectively.

Figure 5: Children Ever Born by Mother's Age, by Mother's Birth Cohort



This figure shows that the three cohorts of women who entered their young adult years in 1992, 1997, and 2002 (born between 1968 and 1982), all had similar childbearing age profiles. Then, the cohort of women who entered young adulthood in 2007 (the 1983-87 birth cohort), had fewer children throughout their 20s and their 30s. The next two cohorts of young adults, the birth cohorts who entered their prime childbearing years in 2012 and 2017 (born between 1988 and 1997), are pulling even further away from earlier cohorts, having fewer children so far. Recall from Figure 2 that the decline in births since 2007 is driven by declines in births to women in their 20s and declines in first and second births. This is consistent with a decline in births mostly to more recent cohorts of women. In a mechanical sense, this divergence across cohorts can explain the sizable decrease in annual birth rates that began in 2007.

This analysis suggests that to really understand the factors behind falling annual birth rates, we should be looking for circumstances related to cohorts, as opposed to contemporaneous years. Perhaps the explanation lies more in the way these cohorts were raised or experienced their childhoods, than about a particular policy or cost factor post-2007. This type of investigation is much harder to undertake with standard data and econometric techniques. The role of factors that affect the decisions of an entire cohort are harder to pin down econometrically than are the role of policy factors that vary across states and years. The remainder of this section is thus speculative.

A Potential Explanation: Shifting Priorities

We propose a general explanation for the decline in births across recent cohorts of US women that focuses on the shifting priorities of cohorts. We introduce this term as a catch-all

phrase that encompasses preferences for having children, life aspirations, and the nature of parenting, among other things.

This speculative hypothesis is related to the concept of a "second demographic transition" (SDT), as proposed in Lesthaeghe and van de Kaa (1986) and Lesthaeghe (2014). Note that the "first" demographic transition refers to the movement from high to low levels of fertility and death rates historically associated with the industrial revolution. The SDT theory emphasizes an overall shift to a greater emphasis on individual autonomy, with a corresponding de-emphasis on marriage and parenthood. The specific manifestations of this shift are taken to include a decoupling of marriage and childbearing, a change in the relationship between education and childbearing, a rise in childlessness, and the establishment of a two-child norm for those having children. Zaidi and Morgan (2017) put this observation into the framework of Becker, indicating that "tastes and preferences have irreversibly changed" (p. 478). These authors point out in their literature review that this explanation has been widely applied to the European context.[13]

Beyond these attitudinal changes, one specific aspect of modern life that may contribute to young adults' views about having children is how the act of "parenting" has evolved over recent decades. Parenting has become more resource- and time-intensive, both in the United States, as well as in many other high-income countries (Bianchi 2011; Kornrich and Frank Furstenberg 2013; Doepke and Zilibotti 2019). Changing norms regarding the intensity of parenting might change people's views toward how many children to have or whether to have

[13] With regard to the US context, Bailey, Guldi, and Hershbein (2014) examine demographic changes during the 1960s and 1970s, concluding that it is not clear whether the changes in marriage, family, and childbearing observed during those decades are sufficiently large to constitute a second demographic transition at that time. Lesthaeghe and Neidert (2006) asked whether perhaps the United States was a counterexample of this phenomenon. However, perhaps these dynamics were slower to arrive in the United States. We leave this open question to future research and examination.

them at all. Such changes are particularly relevant in an era where parents, including mothers, work longer hours outside the home, clashing with career aspirations or a desire for more leisure time. This idea incorporates choice in the context of a quality/quantity trade-off, but it also emphasizes external determinants or expectations of what is generally expected or required of parents.

It is unlikely that career aspirations or parenting norms changed exactly in or around 2007. Note, though, that women who grew up in the 1990s were the daughters of the 1970s generation and women who grew up in the 1970s and 1980s were daughters of the 1950s and 1960s generation. It seems plausible that these more recent cohorts of women were likely to be raised with stronger expectations of having life pursuits outside their roles as wives and mothers. It also seems likely that the cohorts of young adults who grew up primarily in the 1990s or later – and reached prime childbearing years around and post 2007 – experienced more intensive parenting from their own parents than those who grew up primarily in the 1970s and 1980s. They would have a different idea about what parenting involves. We speculate that these differences in formed aspirations and childhood experiences could potentially explain why more recent cohorts of young women are having fewer children than previous cohorts.

Related (Limited) Survey Evidence

In this section we describe some survey evidence that is related to our proposed hypothesis that shifting priorities across cohorts may be a key explanation for declining US birth rates. We caveat this discussion with an acknowledgement of the limitations of such self-reported survey responses. Self-reports about priorities, attitudes, reasons, etc., are often subject to interpretation, sensitive to survey wording or current context, plagued by issues of recall, and

other limitations. We also acknowledge the limited amount of survey evidence available, particularly surveys that have been asked repeatedly over time to track trends. Still, they offer some insights, and we describe some of this evidence here.

Some nationally representative surveys ask women about their expectations or desires for childbearing. On this point, the number of children women report wanting to have has been dropping slightly. Hartnett and Gemmill (2020) report that data from the 2006-2017 National Survey of Family Growth shows that the total number of children women intend to have declined (from 2.26 in 2006-2010 to 2.16 children in 2013-2017) and that the proportion intending to remain childless increased slightly. Women also tend to have fewer children than they end up having and that gap has been growing (Stone, 2021). One interpretation of this discrepancy as prima facie evidence that constraints or costs are playing a role in depressing birth rates. An alternative interpretation is that women report they want, say, two or three children, but when faced with actual trade-offs associated with having more children, they choose differently.

In a 2018 survey conducted for the *New York Times*, the leading self-reported reasons for why US adults had fewer children than they planned included concerns about the expense of childcare costs, the costs of raising a child, and worries about the economy or their own financial instability (Miller 2018). Other frequently noted reasons include wanting to spend more time with children they already had or wanting more leisure time. The desire to have more leisure time is also reported as the leading reason among adults who said they did not want to have children or were not sure whether they did. We have been unable to find comparable data from an earlier period to see if stated priorities have shifted, but even without that comparison, these responses are potentially illuminating.

We also look to survey data on young adults' stated attitudes about having children and the importance of various goals and achievements in life. Data from the World Values Survey gives some insight into the expressed priorities of women between the ages of 20 and 44 in the United States in 2005-2009 (Inglehart et al. 2014) and in 2017-2020 (Haerpfer et al. 2020). Between those two survey years, the percentage of women who report that work is very important to them rose from 31.9 percent to 47.4 percent.

CONCLUSION: SOME THOUGHTS ON A DECLINING US BIRTH RATE

Why Does a Declining Birth Rate Matter?

A decline in annual birth rates does not necessarily imply a long-term reduction in childbearing. If the recent decline in annual birth rates simply reflects women pushing off having children from their 20s to their 30s, then annual birth rates will eventually rebound and the total number of children the average US woman has over her lifetime will not change. Any long-run implications of the current decline in births would then be modest.

But this pattern of offsetting changes seems unlikely. As we showed in the previous section, the decline in annual birth rates since 2007 is consistent with more recent cohorts of women having fewer births. Those cohorts have not completed their childbearing years yet, but the number of births they would have to have at older ages to catch up to the lifetime childbearing rates of earlier cohorts so large that it seems unlikely they will do so. Levine and Kearney (2021) project that the total number of children ever born of more recent cohorts of women is likely to fall well below that of previous cohorts, and specifically, below the replacement level of 2.1 births per woman.

A persistent decline in births across age groups will eventually affect population composition and size. If birth rates remain persistently low, and net immigration is not increased to make up for smaller cohorts at younger ages (which seems politically unlikely), then the US population will age and potentially shrink. Some of the consequences that have been discussed include a decline in productivity, instability in financing of old-age programs, and potential for environmental gains.

The potential for interaction between population growth and economic growth has been on the agenda of economists for some time. For example, in the American Economic Association Presidential Address delivered by Alvin Hansen (1939), "Economic Progress and Declining Population Growth," he argues that the rock-bottom birthrates of the Great Depression were one of the reasons leading to less incentive for investment, thus leading to a future of "secular stagnation." Hansen also pointed out that Adam Smith had hypothesized about how population growth expands productivity growth because a larger population has more opportunities for the division of labor.

More recently, there have been an array of arguments about the "demographic dividend," the idea that when a larger share of the workforce is in its early or prime working years, it will tend to stimulate economic growth. Conversely, an aging population could mean lower per capita GDP if older workers are less likely to work and, conditional on working, be less productive (Maestas, Mullen, and Powell 2016). Growth theorists like Jones (2020) have presented models where lower population growth leads to lower economic growth via a reduced number of new ideas that can become the source for technological progress. These theories all differ in various ways. Our goal here is not to sort them out, but only to suggest that a link from slower

population growth to slower economic growth has some plausibility and a pedigree in the research literature.

An aging population also puts pressure on social insurance programs, like Social Security and Medicare (technically, the Old Age, Survivors, Disability and Health Insurance program), since these programs provide benefits to non-working individuals funded through taxes on workers. The striking decline in birth rates since 2007 means that predictions made at that time about the long-run fiscal sustainability of those programs were overoptimistic (Office of the Chief Actuary, Social Security Administration 2007).

Some contend that a shrinking population would be beneficial for the environment. Ecologists use the "IPAT" equation to describe the impact of human activity on the environment: Impact = Population x Affluence x Technology. Affluence is defined to be consumption per person (which is linked to GDP per capita), while technology represents the amount of resources required to produce a unit of GDP (Chertow 2000).We claim no expertise in this domain, but our review of the relevant evidence suggests that the amount of population decline that would be necessary to meaningfully reduce the impact of human activity on the environment is far greater than what will be achieved by the realized reduction in US birth rates. Reducing human impact on the environment through reduced consumption of energy and materials per person, along with more sustainable production processes are much more likely to have meaningful impacts.

Is There a Role for Pro-Natalist Policies?

"Pronatalist" policies generally make it easier or more affordable for families to have children. These include steps like subsidized childcare, parental leave policies, and child allowances or tax credits. Many countries are contemplating or implementing pronatalist

policies: the United Nations reports that the number of countries with a policy goal of increasing fertility has risen from 19 to 55 between 1986 and 2015 (Sobotka et al. 2019).

The evidence about pronatalist policies that have been implemented and evaluated in the United States and in other high-income countries suggests that these types of policies lead to modest increases in birth rates in the short-term, but are unlikely to lead to sustained higher birth rates (Brainerd 2014; Lopoo et al. 2018; Sobotka, et al. 2019). Stone (2020a) concluded that a pro-natalist policy would cost $200,000 or more per additional baby born; using such policies to close the gap between current fertility in the United States and the replacement level of fertility would cost somewhere between $250 billion and $1 trillion in new spending per year—a daunting sum.

Final Thoughts

The arrival of the Great Recession offers an immediate and obvious reason why a decline in birth rates started in 2007. However, we do not have solid evidence of US-specific policies or economic factors that can explain the depth of that decline and the way it extended through the entire business cycle up through the arrival of the pandemic recession in 2020. We do know that the trend toward lower US birth rates has brought US fertility rates closer to that of other high-income countries. We suspect that this shift reflects broad societal changes that are hard to measure or quantify: possibilities include changing preferences for children, broader career options (and other aspirations) for women, and shifts in the nature of parenting.

In this essay, we have sidestepped any attempt to make an overall judgement on whether the decline in the US birth rate should be viewed as an overall positive or negative development. On one side, if decreasing births are attributable to greater economic opportunities for women,

they may be viewed as a positive development. On the other side, if some women would prefer to have children but do not feel they have the resources to do so then this suggests viewing the fall in birth rates as a negative development. Because the evidence does not pinpoint strong contributing factors to the decline in US birthrates, it is difficult to reconcile these normative distinctions.

Whatever normative view one takes about declining fertility rates, it is important from an economic policy standpoint to acknowledge that an aging population and shrinking workforce pose challenges for economic growth and the sustainability of social insurance systems. We see no particular reason to believe that a pro-natality public agenda will have much effect on birth rates (although of course some parts of that agenda may be desirable for other reasons). Thus, the most appropriate way to address declining US birthrates may be to address its two main symptoms directly: that is, a greater emphasis on technological improvements, along with investments in human capital and productivity-enhancing infrastructure, and a greater emphasis on putting the finances of Social Security and Medicare on a secure basis for the long-term. The US economy and political system will need to contend with these issues if the recent, sustained decline in birth rates is not reversed.

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DATA APPENDIX

I. Birth Rates

Birth rates are collected directly from CDC Vital Statistics Births Reports or calculated using birth numbers from the CDC WONDER database and population estimates from public sources. Birth rates for all women 15-44 years old, and for women 15-44 disaggregated by age, Hispanic origin, and marital status (presented in Figures 1 and 2) are gathered from Vital Statistics Final Births reports for 2015, 2019, and the 2020 Provisional Birth Report (Martin et al 2017, Martin et al. 2021, Hamilton et al 2021).

Birth rates disaggregated by mother's education level, nativity, birth order (Figure 2), and by cohort (Figure 5) are calculated using birth numbers aggregated from NCHS microdata and using annual population estimates from the Current Population Survey Annual Social and Economic Supplement (CPS ASEC) (CDC NCHS 2020, Flood et al 2020). Beginning in 2003, jurisdictions began to transition from the 1989 U.S. Standard Certificate of Live Birth which collected mother's years of education, to the 2003 revised version, which collects highest level of schooling achieved.[14] Due to this change, from 2003-2015, education is missing across a maximum of 30 states in any given year (2007 births), leading to 10% of all births having missing maternal education over these years (see "Maternal Education" note in CDC 2020). To obtain a national estimate of births by education across all years in the sample, we allocate births with missing maternal education according to the observed distribution of mother's education levels in each year. We restrict population estimates by education to 1992 forward because the educational attainment question in the CPS was revised in that year. Population estimates by nativity among Hispanic women are restricted to 1994 forward because Hispanic origin was not recorded in the CPS prior to 1994.

Annual state-level birth rates for 2001-2019 and average state-level birth rates for 2004-2008 and 2015-2019 among women 15-44 are calculated using annual state-level birth numbers from NCHS microdata and annual state-level population estimates of women 15-44 from CDC SEER Single-Year of Age U.S. Population Estimates, 1990-2019. (CDC NCI 2021).

II. State level economic and policy factors used in annual regressions, 2000-2019

a) Unemployment rates: obtained from University of Kentucky's Center for Poverty Research National Welfare Database (UKCPR 2021).

[14] When using maternal education data from the 1989 birth certificate, we assign mother's education using the following method: fewer than 11 years of education is assigned "Less than High School Diploma;" 12 years of education is assigned "High School Diploma;" 13-15 years of education is assigned "Some College, No Degree;" 16 or greater years of education is assigned as "College Degree or Greater."

b) State minimum wage: obtained from University of Kentucky's Center for Poverty Research National Welfare Database (UKCPR 2021). We update minimum wages to 2019 dollars using CPI-U (BLS 2021b).

c) Maximum TANF benefit for a family of three: obtained from University of Kentucky's Center for Poverty Research National Welfare Database (UKCPR 2021). We update TANF benefits to 2019 dollars using CPI-U (BLS 2021b).

d) Abortion parental notification laws: Obtained from Guttmacher Institute's "Parental Involvement in Minors' Abortions" database (Guttmacher 2021). Dates of enactment of notification laws are gathered from the National Association for the Repeal of Abortion Laws state governments page (NARAL 2021).

e) State abortion delay or mandatory waiting period: Indicator variables for laws through 2010 is obtained from Kearney and Levine (2010), and updated using the Guttmacher Institute's "Counseling and Waiting Periods for Abortion" database. Dates of enactment of new laws is gathered from NARAL (2021).

f) State mandatory sex education laws and mandatory contraception instruction laws: indicators on these laws through year 2010 are obtained from Kearney and Levine (2015); updated information was obtained from and the Guttmacher Institute's "Sex and HIV Education" report (Guttmacher 2021d). The enactment dates of new laws is gathered from the Sexuality Information and Education Council of the United States' State Profiles (SEICUS 2021).

g) Child support enforcement expenditures: data from 2001-2010 are taken from Kearney and Levine (2015), data on expenditures from 2010-2015 are collected from the Department of Health and Human Services, Administration for Children and Families (HHS 2014) and data for 2015 through 2019 are collected from HHS Preliminary FY 2019 Program Report (HHH 2019). California's 2016 enactment of required sexual education and contraception instruction is noted in the California Department of Education's Health Initiatives FAQ (CDE 2020).

h) Medicaid expansions: Information about the implementation of state Medicaid expansions after the Affordable Care Act was gathered from the Kaiser Family Foundation's "Status of State Medicaid Expansion Decisions: Interactive Map" (KFF 2021). We use the year of implementation (rather than adoption) as our indicator of Medicaid expansion in this analysis.

i) State mandates for private health insurance contraception coverage: The classification of state mandates for contraception coverage in private health insurance plans are gathered from the Guttmacher Institute's "Insurance Coverage of Contraceptives"; information about the dates of implementation are collected from the

National Conference of State Legislature's "Insurance Coverage for Contraception Laws" (Guttmacher 2021; NCSL 2021).

j) Demographic variables included as control variables, including the percent of each state married, percent White, non-Hispanic and percent Hispanic; percent who have less than a high school diploma, percent high school diploma, and percent with some college education come from the 2001-2019 CPS Merged Outgoing Rotation Group Sample (NBER 2021).

III. Potential explanatory factors used in the long-difference scatter plots, 2004-2008 – 2015-2019 (Figure 4)

a) **Female-Male Median Wage Ratio:** State-level female-male median wage ratios are calculated from the 2004-2008 and 2015-2019 American Community Survey (Ruggles et al, 2021). We calculate state-level median wage and salary income for all full-time, full-year (FTFY) women and men and take the ratio of those figures. We define FTFY workers as those who reported usually working at least 35 hours per week for 40 weeks in the past year. All wages are in 2019 dollars using the CPI-U.

b) **LARC usage:** We measure the change in women's access and usage of long-acting, reversible contraceptives (LARCs) across states using the 2004 and 2017 CDC Behavioral Risk Factor Surveillance System (BRFSS) (CDC 2004; CDC 2017).

There is a slight difference in the wording of questions between these years. In 2004, respondents were asked "Are you or your [if female, insert husband/partner, if male, insert wife/partner] doing anything now to keep [if female, insert husband/partner, if male, insert wife/partner] from getting pregnant?" If yes, they were asked "What are you or your [if female, insert husband/partner, if male, insert wife/partner] doing now to keep [if female, insert husband/partner, if male, insert wife/partner] from getting pregnant?" with a list of options. Included in LARC users were those who responded "Contraceptive implants (Jadelle or Implants)," "Shots (Depo-Provera)," "Shots (Lunelle)," or "IUD (including Mirena).

In 2017, The BRFSS asked respondents "Did you or your partner do anything the last time you had sex to keep you from getting pregnant?" And, if yes, "What did you or your partner do the last time you had sex to keep you from getting pregnant?" with a list of birth control options. We included in LARC users, those who responded with "Contraceptive implant (ex. Implanon)," "Levonorgestrel (LNG) or hormonal IUD (ex. Mirena)," "Copper-bearing IUD (ex. ParaGard)," "IUD, type unknown," or "Shots."

In each year, we calculated the share of all women 18-44 who report using LARCs by state (unconditional on reported sexual activity). The survey module including these questions birth control usage was not included in every state, so between both years we are able to compute changes for 35 states.

c) **Student Loan Debt Per Capita:** We calculate the change in student debt using the Federal Reserve Bank of New York's Student Loan Borrowing by State dataset (Federal Reserve Bank of New York 2021). We take average debt per capita by state as of Q4 2004-Q4-2008 and the averages across Q4 2015-Q4 2019 (averages across year are weighted by the state's estimated population, included in the dataset).

d) **Average Gross Rent:** State-level average gross rent figures are calculated as the average monthly cost of renting a 2- or 3-bedroom apartment among all renters in each state, following Moretti (2013). Rental costs are gathered from monthly gross rent data in the 2004-2008 and 2015-2019 American Community Survey (Ruggles et al, 2021). All figures are updated to real 2019 dollars using the CPI-U.

e) **Child Care Expenses:** We estimate the change in childcare expenses across states using self-reported childcare expenditures from the Current Population Survey, Annual Social and Economic Supplement (CPS ASEC) (Flood 2020Child care expenses were collected as a part of the Supplemental Poverty Measure Module, which began in 2010 (for reference year 2009). We calculate state-level average reported child care expenses using the 2010 CPS ASEC (2009 reference year) in the earlier periods and the 2016-2020 CPS ASEC (2015-2019 reference years) measuring expenses in the later period. We update expenditures to 2019 real dollars using the CPI-U. We restrict estimates to include families with children under 12 and positive childcare expenses (due to a large share or households reporting no child care expenses).

f) **Religious Importance:** We estimate changes in the importance of religion using the 2007 and 2014 US Religious Landscape Survey produced by the Pew Research Center (Pew 2008; Pew 2015). In both surveys, respondents were asked about the importance of religion in their life ("Very important," "somewhat important," "not too important," "don't know"). In each state-year we calculate the percent of respondents who reported that religion is either somewhat or very important in their lives.

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