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CHAPTER

The Causes and Consequences of Declining US Fertility

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The Causes and Consequences of Declining US Fertility

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ABSTRACT

US births have fallen steadily since 2007 and the total fertility rate is now well below replacement level fertility—the rate at which the population replaces itself from one generation to the next. Our analysis suggests that this trend is unlikely to reverse in the coming years. The decline in births is widespread across demographic groups and it does not merely reflect a delay to older ages. Rather, more recent cohorts of women are having fewer children over the entirety of their childbearing years. We are unable to identify any period-specific social, economic, or policy changes that can statistically explain much of the decline. We conjecture instead that the sustained decline in the US fertility rate more likely reflects shifted priorities across recent cohorts of young adults. A prolonged US total fertility rate this low—specifically, a rate substantially below 2—would lead to slower population growth, which could in turn cause slower economic growth and present fiscal challenges. While the decline presents a fairly new challenge to the United States, other high-income countries have sustained below replacement level fertility for some years now and have attempted policies to mitigate that trend. But the evidence on these pro-natalist policies leads us to conclude that incremental policy responses are unlikely to reverse trends in the US fertility rate. The slowdown in native population growth could be addressed with increased immigration and advances in productivity.

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1. Introduction

Population growth has been slowing in the United States for several years, driven by a decrease in births, an increase in deaths due to an aging population, and lower net immigration. The US population grew by only 0.1 percent in 2021, the slowest rate in the nation's history (Rogers, 2021). While this historically low rate was in part reflective of the unusual conditions brought about by the COVID-19 pandemic, it also continued a sharp downward trend. From the 1970s through the Great Recession, the population grew at roughly a 1 percent annual rate. But the growth rate has been steadily slowing since. Population growth has now reached considerably lower levels than during either World War (the earlier of which coincided with the Spanish Flu's peak spread) or the Great Depression. The Census Bureau reported that in the year 2019, the natural increase in population (births minus deaths) fell below one million for the first time in decades (US Census Bureau, 2022).

In this paper, we focus on the causes and consequences of declining US fertility, a key contributor to declining US population growth. Between 1980 and 2007, the *general fertility rate* (defined as the number of annual live births per 1,000 women of childbearing age, which is usually defined as age 15 to 44 years) fluctuated within a narrow range of roughly 65 to 70.¹ Since then, it has plummeted, falling to 56.6 in 2021.

The decline in the general fertility rate implies a decline in the current period *total fertility rate* (TFR), a simulated measure that calculates expected lifetime births by assuming that women will follow current age-specific birth rates over their childbearing years. This measure is key to population growth. The US TFR declined from 2.12 in 2007 to around 1.65 in 2020 and 2021, the lowest levels ever recorded (Hamilton et al., 2022). Since 2007 it has been consistently below the replacement level of 2.1 (Hamilton et al., 2021).

For reasons we describe below, we conjecture that the US fertility rate is unlikely to substantially rebound in the foreseeable future, and that the country is likely to experience below replacement level fertility in the coming years. We note that forecasting birth rates is notoriously difficult and we put forward our estimates with the requisite humility; the factors that influence birth rates are not entirely well understood and have moreover been observed to swing unpredictably. But attempting an estimate is important for national policy: lower fertility implies lower population growth and eventually a smaller working-age population, which will have consequences for social,

1 The measures we use to statistically describe birth patterns include: (a) the general fertility rate—births per year per 1,000 women between the ages of 15 and 44; (b) the current period total fertility rate—the total number of births an average woman would have over her childbearing years if her age-specific birth rates matched observed year-specific values; and (3) the cohort total fertility rate—the number of births a woman from a specific birth cohort will have over her childbearing years.

fiscal, and economic conditions. We review some of the current economic thought and evidence about the likely impacts of lower population growth and a smaller working-age population on the US economy and society more broadly.

We also discuss possible policy responses to these demographic challenges, emphasizing the potential reliance on immigration to compensate for a smaller native population, along with investments in human capital and technology that would increase worker productivity. Based on our read of the evidence, we conclude that incremental pro-natalist policies, such as expanded child tax credits or more generous childcare subsidies, might at best have a modest effect on the aggregate US fertility rate, and that they are unlikely to improve it to replacement level. Broader structural changes in US society, including a system of government programs that support residents “cradle-to-grave” along with considerably greater equality in the division of family and home responsibilities between men and women, are more likely to lead to a sizable rebound in the US fertility rate. International evidence, though, suggests there is reason to be skeptical about even those interventions.

2. Recent Trends in US Fertility Rates

In this section we highlight three key facts about declining fertility in the United States, using data on the universe of US births from the Vital Statistics system from 1980 through 2021:

- The US general fertility rate has fallen since 2007, not only for the country as a whole but also among many demographic subgroups of women.
- The decline cannot be explained by women delaying pregnancy until older ages; women are having fewer children over their entire childbearing years.
- The US total fertility rate is converging to that of other high-income countries, after decades as an outlier.

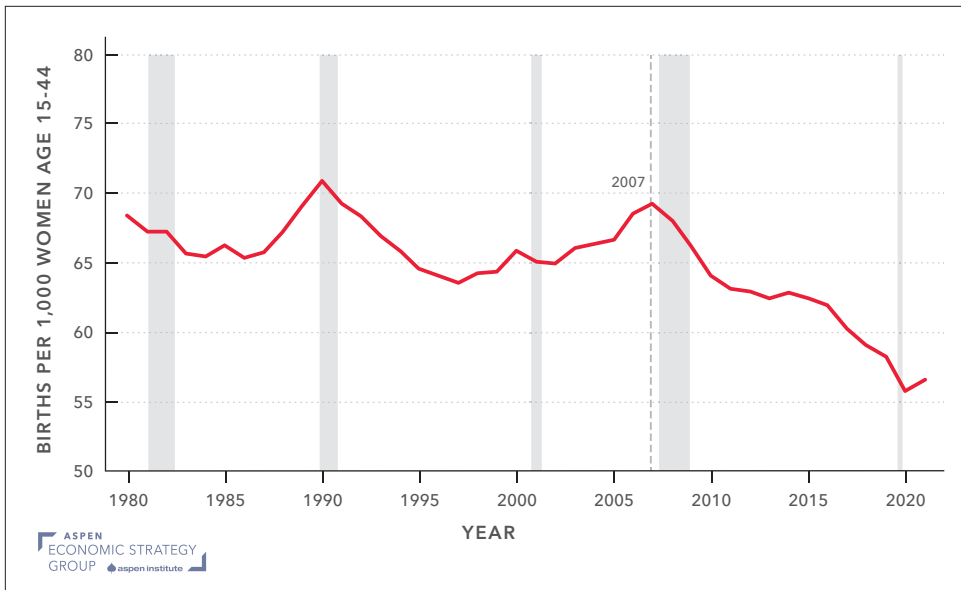
These patterns suggest that the drop in the annual fertility rate will persist. We expand on these observations below.

2.a. *The US fertility rate has been falling since 2007.*

Figure 1 plots the trend in the US general fertility rate, defined as births per 1,000 women of childbearing age (15-44). The decline began at the onset of the Great Recession and continued during the ensuing recovery, with no signs of reversing. Birth rates fell beyond what one would have expected in 2020 as the result of COVID, but rebounded somewhat in 2021, placing the trend in birth rates back onto its previous downward path (Kearney and Levine, 2022).

Births have fallen for women under the age of 30. They have declined most dramatically over the past four decades among teenagers.² The fertility rate for those aged 15 to 19 peaked in 1991 at 61.8 births per 1,000 women. That rate declined slowly through 2007, and then quickly in the following years. Overall, teen fertility rates fell to 41.5 by 2007 and then to 15.3 births per 1,000 teen women in 2020—a 75 percent decline. Births have meanwhile fallen steeply for women in their 20s as well since around 2007. Births by women in their 30s or older remained constant or rose slightly, but not by 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.

Figure 1. Trend in US General Fertility Rate



Source: Martin et al. (2012); Osterman et al. (2022); and Hamilton et al. (2021, 2022).

Among racial and ethnic groups, Hispanic women have experienced the most dramatic recent declines in births. In 2007, the fertility rate among Hispanic women was 97.4; it fell to 62.8 by 2020. Birth rates for Black women and for white non-Hispanic women also fell, but by much smaller amounts. The decline in fertility among Hispanic women is driven by Mexican-American women, both foreign- and

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 fertility rates.

native-born, 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. Of note is that the birth rate in Mexico has itself fallen dramatically over the past 50 years; it is now only slightly higher than in the United States (World Bank, 2021).

“We find that if birth rates had remained constant and only population shares shifted between 2007 and 2019, the birth rate would in fact have risen by 2.6 births per thousand. Fertility declines within groups account for the entire overall decline.”

When we separate women by education level, we see that those with a four-year college degree (36.3 percent of those aged 20 to 44 in 2018) and those without a high school degree (8.1 percent) have experienced the largest declines in fertility rates.³ The fertility rate among women with a high school degree but not a four-year college degree has been fairly stable since 2007.

During the 1980s and the early 1990s, birth rates for married women were falling and birth rates for unmarried women were

rising. That pattern has not held more recently: birth rates have declined in parallel for married and unmarried women since 2007. However, a rising share of women of childbearing age are unmarried—from 58 percent in 2008 to 63 percent in 2018. Because unmarried women have lower fertility, the decline in marriage rates leads to a lower fertility rate overall. The median age at first marriage has meanwhile risen continuously over the past 50 years, from 22.0 in 1980 to 25.6 in 2007 to 28.1 in 2020 (US Census Bureau, 2021). This rise contributes to greater numbers of unmarried women among those of childbearing age, and consequently lower birth rates.

Finally, the country has experienced an increase in childlessness. The decline in births since 2007 is driven more by a decline in initial childbearing (first births) than by a decline in larger families (third and higher order births).

The decline in the US general fertility rate is driven by a decline in births within age, race/ethnicity, and education groups, as opposed to changes in the population composition. As described in detail in Kearney, Levine, and Pardue (2022), we perform a statistical decomposition of the overall decline in the fertility rate into changes within-group, the contribution of changes in group population shares, and the interaction of a group's changing rates and changing population shares. We find that if birth rates had remained constant and only population shares shifted between 2007 and 2019, the birth rate would in fact have risen by 2.6 births per thousand. Fertility declines within groups account for the entire overall decline.

³ For these calculations, we restrict the sample to women age 20 and over, since women at younger ages are less likely to have completed their education.

The decomposition analysis also reveals which groups of women account for most of the overall decline. Each demographic group's contribution to the overall decline depends on two factors: the fertility rate decline within that group and that group's share of the overall population of women of childbearing age. Hispanic teens contributed the largest share, explaining 14 percent of the overall decline; though this group represents only 3.1 percent of the female population of childbearing age, its fertility rate fell dramatically, from 82.2 to 24.7 over the period. White women between the ages of 25 and 29 with college degrees account for 12 percent of the overall decline. Their fertility rate fell from 101.1 to 65.1, and they comprise 4.2 percent the female population of childbearing age.

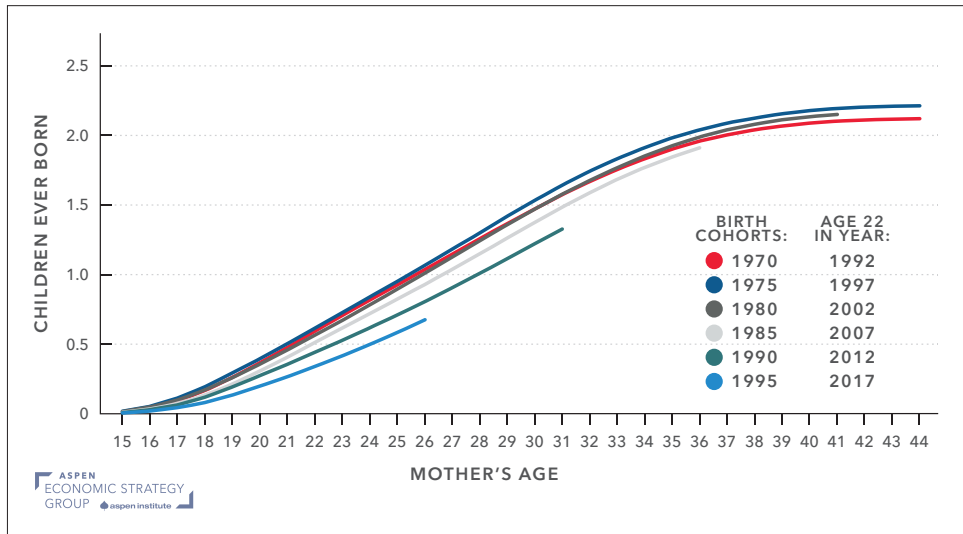
2.b. Women are having fewer births at all ages than did women in previous recent cohorts.

The decline in the US fertility rate could simply reflect a delay in childbearing to older ages. Were that the case, we would expect the recent drop in births to be a temporary trend; more births would occur in the coming years as women eventually “catch up.” More formally, the current period general fertility rate may understate the current cohort's likely completed fertility rate.

Childbearing age profiles across successive cohorts of women can help us to gauge the extent to which this delaying explains the observed drop in fertility. We aggregate women into five-year birth cohorts, starting with the 1968-1972 birth cohort and continuing through those women born between 1993 and 1997. For simplicity of exposition, in Figure 2 and below we label these cohorts by the midpoint year in the range. These are the birth cohorts who are in their early 20s in 1992, 1997, 2002, 2007, 2012, and 2017, respectively. We then plot the average number of children ever born by specific ages to the women in these cohorts.

Figure 2 demonstrates 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. The cohort of women who entered young adulthood in 2007 (the 1985 birth cohort), had fewer children throughout their 20s and early 30s. The 1990 and 1995 cohorts, who entered their prime childbearing years around 2012 and 2017 respectively, are pulling even further away from earlier cohorts, having fewer children so far.

A comparison of the childbearing age profiles across cohorts suggests that more recent cohorts of women are not simply delaying childbearing. They are having fewer children at all ages. Decreased total completed fertility follows.

Figure 2. Children Ever Born by Mother's Age, by Mother's Birth Cohort

Source: Kearney and Levine (2021).

Based on these data, we project that the total number of children ever born to more recent cohorts of women is likely to fall well below that of previous cohorts, and below the replacement level of 2.1 births per woman (Kearney and Levine, 2021). We extrapolate total completed fertility rates for the younger cohorts of women under three different scenarios. The “conservative” scenario applies the childbearing age profile observed for the 1975 and 1980 birth cohorts to the remaining childbearing years for the 1995 birth cohort. The “moderate” scenario assumes that births for this more recent cohort converge toward the levels observed for the 1975 and 1980 cohorts by age 30 and then follow their age profile in the ensuing years. The “aggressive” scenario assumes that births for this more recent cohort converge by age 30 to a level that is 10 percent higher than that observed for the 1975 and 1980 cohorts and stays similarly elevated after that. The conservative approach yields an estimated total completed fertility of 1.44 births per woman, the moderate approach yields an estimate of 1.77, and the most aggressive approach yields an estimate of 1.92. Even under the most aggressive assumptions—which we consider highly unlikely—fertility in the United States will remain below replacement level.

This analysis implies that US fertility rates are likely to be considerably below replacement level for the foreseeable future. More than a decade of falling birth

rates and declining births at all ages for multiple cohorts of women drive this result. The pandemic-induced reduction in births, described by Kearney and Levine (2022), is an insignificant factor in this longer-term trend. Furthermore, the simulated fertility rates we report in this paper are similar to those observed in virtually all other high-income countries, as we discuss below (Institut National D'études Démographiques, 2021). This evidence leads us to expect that US birth rates and total completed fertility rates are not likely to rebound soon.

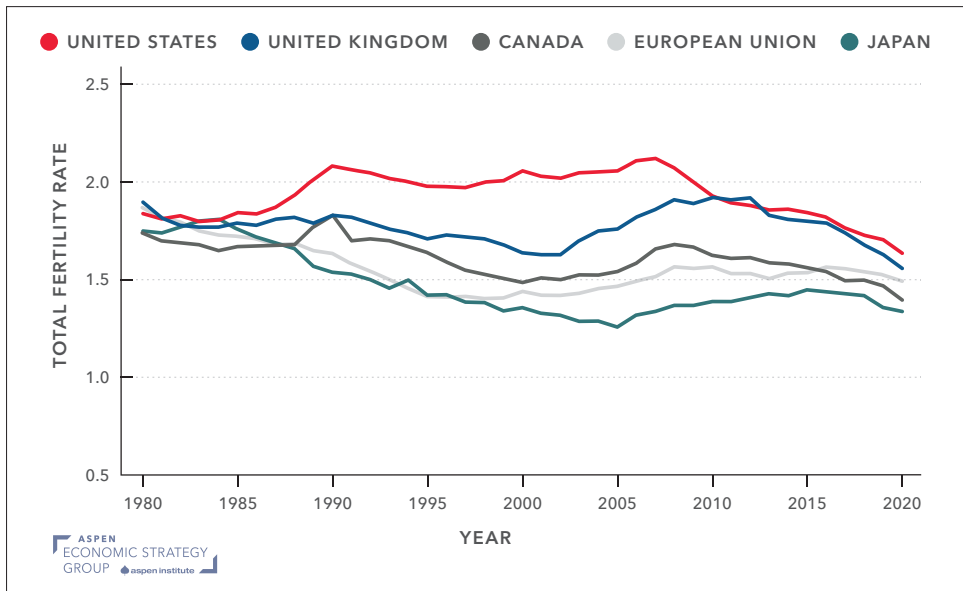
2.c. The US total fertility rate is converging toward that of other high-income countries.

While the decline in the US birth rate is a relatively new phenomenon, birth rates fell substantially in earlier decades in other high-income countries. As shown in Figure 3, total fertility rates in other industrialized nations started falling in the 1980s through around 2000. In that year, TFR was 1.64 in the United Kingdom, 1.49 in Canada, 1.44 in the European Union, and 1.36 in Japan. Although there has been a little variability since then, TFRs today are similar to those in 2000: 1.56 in the United Kingdom, 1.40 in Canada, 1.50 in the European Union, and 1.34 in Japan in 2020.

Even after the US period TFR fell from 2.12 in 2007 to 1.64 in 2020 (the most recent year for which comparable World Bank statistics are currently available), it remained higher than the TFR in each of the United Kingdom, Canada, the European Union, and Japan. Even in Scandinavian countries specifically, with their especially generous system of public support, the total fertility rate is comparable to or below that of the United States. In 2020, these rates were 1.37 in Finland, 1.48 in Norway, and 1.66 in Sweden.

We interpret these trends as evidence that the US fertility rate is belatedly converging toward other high-income countries', including those with greater support systems for families and workers. US exceptionalism in this regard is likely nearing an end.

“A comparison of the childbearing age profiles across cohorts suggests that more recent cohorts of women are not simply delaying childbearing. They are having fewer children at all ages.”

Figure 3. Total Fertility Rate in the United States and Other High-Income Countries

Source: World Bank (2021).

3. Potential Factors Behind the Recent Decline in US Fertility

In this section we describe potential explanations for the recent decline in the US fertility rate. Our read of the evidence is that beyond the temporary effects of the Great Recession, no recent economic or policy change is responsible for a meaningful share of the decline in the US fertility rate since 2007.

3.a. The Great Recession initially contributed to the drop in births.

The pro-cyclical nature of birth rates is a well-established empirical fact in economics and demography.⁴ The economic approach to modeling the decision to have a child has its foundation in the seminal work of Becker (1960). In short, people are more likely to choose to become parents when they have more disposable income available to pay for the associated costs of childbearing. Increases in income lead to higher demand for children, holding other factors constant, and increases to the costs of raising children reduce demand for more children.

⁴ For instance, see Galbraith and Thomas (1941); Silver (1965); Butz and Ward (1979); Ermisch (1988); Adsera (2005); Currie and Schwandt (2014); Dettling and Kearney (2014); Schaller (2016); and Schaller, Fishback, and Marquardt (2020).

In a more dynamic setting, people decide not only on the number of children to have, but also when over the lifecycle to have children. In a standard economic model with no credit constraints, job loss and transitory changes in income would not be expected to affect when people have children. However, that is not the world we live in. Many people are credit-constrained, and empirical evidence shows that births (more accurately, conceptions leading to live births) increase when the economy is strong and decrease when it is weak.

Figure 1 reveals a noticeable drop in birth rates after the recessions of the early 1980s and the 1990-1991 recession, as well as after the 2007 recession (although it does not show much change in birth rates 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, other factors must also have 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.

3.b. *There is little evidence that current social, economic, and policy factors are important drivers of the recent decline in births.*

A substantial number of social, economic, and policy factors, beyond the unemployment rate, plausibly may affect birth rates. We conducted an econometric investigation on the roles that a large set of state-level economic and policy factors might play in explaining changes in birth rates from 2001 to 2019 (Kearney, Levine, and Pardue 2022). Our methods accounted for changes to the birth rate that were not state-specific (year-fixed effects) and for persistent differences across states in average birth rates (state-fixed effects). To draw causal conclusions, this empirical approach requires that changes in the factors we consider are unrelated to other determinants of fertility beyond those for which we control.

Factors that relieve budget constraints—most notably increases in available income—are expected to lead to higher birth rates, while factors that raise the cost of having a child—either in terms of direct expenditures or the cost of parental time—are expected to decrease birth rates. The four economic and policy factors we consider include the aggregate unemployment rate, generosity of welfare benefits, the state minimum wage, and expenditures on child support enforcement. We also consider six reproductive health policies with the potential to affect a woman’s ability to

achieve her desired fertility: abortion restrictions in the form of parental notification laws, abortion restrictions in the form of waiting periods, health insurance coverage through Medicaid, mandatory coverage of contraception in private insurance plans, mandatory sex education, and mandatory contraception instruction laws.

Our analysis implies that the combined effect of these 10 factors is around 6 percent of the total decline in the birth rate between 2007 and 2018. That suggests that any effect these policies had on birth rates was too small, or affected too small a set of women, to explain a sizable share of the total change in US births over the past decade and a half.

Casual observers have suggested several other societal pressures that might have exerted a meaningful downward force on birth rates over the past decades. In Kearney, Levine, and Pardue (2022), we considered six such factors:⁵

- *Greater adoption of long-acting reversible contraception.* The percentage of sexually active women who report using long-acting reversible contraception (LARC) increased from 5.5 percent in 2004 to 10.7 percent in 2017.
- *Increasing housing rental costs.* Average monthly rents for a two- to three-bedroom apartment rose 14 percent nationwide from 2004 to 2018. The increase was much larger in states including Colorado and Washington, and the District of Columbia.
- *Increasing childcare costs.* Among families with children under 12 who reported positive childcare spending, annual expenditures on childcare rose nationwide from \$5,020 in 2009 to \$7,190 for the average of 2015-2019 (all dollar values throughout are measured in constant 2019 dollars).
- *Improving female wages, employment, and occupational prestige.* Although women's economic standing in the labor market is not improving rapidly, gains are slowly being made. For instance, the female-male wage ratio increased from 0.80 to 0.84 between the 2004-2008 and 2015-2019 periods. This increases women's opportunity cost of having children.
- *Rising student debt burdens.* Student debt per capita has increased from \$2,500 to \$5,400 between the 2004-2008 and 2015-2019 periods. Young adults saddled with debt may feel as if they lack sufficient disposable income to have children.

⁵ Popular press articles in outlets including *The Washington Post*, *The Wall Street Journal*, *The New York Times*, *Vox*, *Business Insider*, and *CNBC*, among others, have suggested that these factors played an important role in the decline. Examples of press reports that mention these factors include the following: contraception (Iati, 2019; DeBarros and Adamy, 2019); the cost of raising children (Miller, 2018; Belluz, 2018); women's economic advancement (Hoffower, 2021; Tavernise et al., 2021); student debt (Dickler, 2018; Snodgrass, 2021); declining religious observance (Douthat, 2020).

- *Declining religious observance.* Greater religiosity is linked to higher fertility, and religiosity is declining in the United States. The percentage of the population who report that religion is at least somewhat important to them fell from 83 percent in 2007 to 78 percent in 2014.

While these trends all could plausibly drive birth rates down, our analysis finds no empirical indication that any of these trends are responsible for the recent decline in US births. Specifically, we find no correlation between state-level changes in birth rates and state-level changes in these factors.

In subsequent, unpublished work, we have also explored the role that concerns about climate change have played in driving down births. We similarly find, though, that this factor does not seem to be linked to the decline in births. Survey evidence in the United States does not suggest that those concerns are growing. Furthermore, states in which Google searches for climate change have increased more are not the states in which births have fallen the most.

“In summary, we have had no success finding evidence in favor of any social, economic, or policy factors being important drivers of the recent decline in the US birth rate, other than the appearance of the Great Recession.”

In summary, we have had no success finding evidence in favor of any social, economic, or policy factors being important drivers of the recent decline in the US birth rate, other than the appearance of the Great Recession. Perhaps observers should not be surprised; for any factor to explain much of the birth rate's decline since 2007 (see Figure 1), we would expect that factor to have changed meaningfully around that time. None of these factors exhibit that property.

3.c. A more likely explanation for the decline in US births is “shifting priorities” across cohorts.

We showed above that lifecycle childbearing patterns have shifted across cohorts of women. That finding suggests the possibility that factors behind falling annual birth rates are more about the circumstances related to cohorts, as opposed to the specific years with low birth rates.

We speculate that the key explanation for the post-2007 sustained decline in US birth rates is not about some changing policy or cost factor in recent years, but rather shifting priorities across cohorts of young adults (Kearney, Levine, and Pardue, 2022). These shifted priorities likely reflect differences in the ways more recent generations of young adults were raised, experienced childhood, and had their aspirations and preferences shaped.

One aspect of modern life that may contribute to young adults' views on 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 Furstenberg, 2013; Doepke and Zilibotti, 2019). Changing norms regarding the intensity of parenting might change prospective parents' decisions on how many children to have or whether to have children 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 may incorporate choice in the context of trading off how many children parents want to have with how much they want to "invest" in those children (labeled a "quality/quantity tradeoff"). It also may highlight external determinants of what is generally expected or required of parents.

While it's unlikely that career aspirations or parenting norms changed abruptly in 2007, note that women who grew up in the 1990s were the daughters of the 1970s generation, and that women who grew up in the 1970s and 1980s were daughters of the 1950s and 1960s generation. It seems plausible that recent cohorts of women were raised to more strongly expect having life pursuits outside their roles as wives and mothers. Some survey data suggests just that—in the World Values Survey, the percentage of women who report that work is very important to them rose from 32 percent to 47 percent between 2005-2009 and 2017-2020 (Inglehart et al., 2014; Haerpfer et al., 2020).

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 or soon after 2007—experienced more intensive parenting from their own parents than did those who grew up primarily in the 1970s and 1980s. This generation may have developed 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 adults are having fewer children than previous cohorts.⁶

3.d. The decline in US fertility is unlikely to reverse course in the near future.

Our interpretation of the evidence is that the decline in fertility over the past 15 years is not temporary, and that the United States can expect births below replacement level for the foreseeable future. That conclusion is based on several factors: (a) the

6 In a 2018 survey conducted for The New York Times, the leading self-reported reasons for why American adults had fewer children than they planned included concerns about the costs of childcare, the overall expenses of raising a child, and worries about the economy or their own financial instability (Miller, 2018). Other frequently noted reasons included wanting to spend more time with children that 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 examine whether stated priorities have shifted, but the responses are potentially illuminating even without that comparison.

broad-based nature of the falling fertility rate across demographic groups; (b) the lack of evidence that women are merely delaying pregnancy to older ages, and strong evidence among recent cohorts of women of a longer-term reduction in the number of children ever born; (c) the converging total fertility rates between the United States and other high-income countries; and (d) a plausible hypothesis regarding shifting priorities that is consistent with this empirical evidence. If we are correct, this longer-term reduction in fertility has broader implications for American society, which we address below.

4. Implications for Economic Growth and Fiscal Sustainability

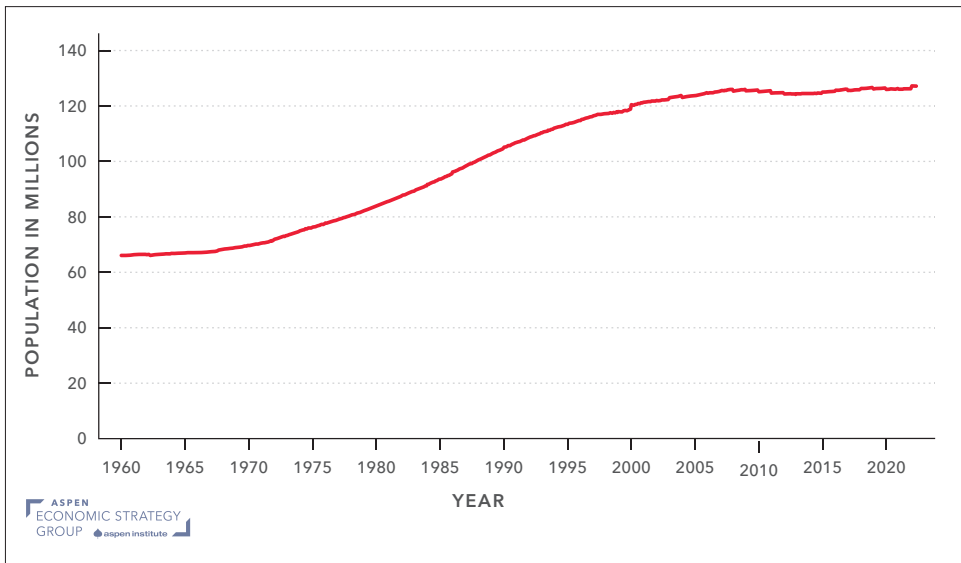
The size of the working-age population has already been stagnant for the past 15 years, as shown in Figure 4. If fertility continues to decline or stabilizes at a low level without a substantial increase in immigration, we can expect the size of the US working-age population to begin declining in the next decade. Absent other adjustments, this decline potentially implies lower economic growth and decreased income per capita. It also has direct implications for the solvency of our Social Security system. We address these issues in this section.

4.a. Lower fertility could negatively impact economic growth.

It is common for discussions regarding economic growth to begin with lessons from the Solow Growth Model (Solow, 1956). That model identifies growth as a movement to a steady-state level of capital determined by equal levels of investment in new capital and depreciation of existing capital. Combining that steady-state level of capital with a predetermined size of the workforce determines the size of the economy. In the model, economic growth occurs during transition periods when the economy is not in equilibrium.

In the Solow model, changing the size of the workforce leads to proportional shifts in the size of the economy. That is, increasing the number of workers leads to greater output, and decreasing the number of workers reduces output. The size of the workforce does not, however, impact output per worker, which remains constant in the steady state. In that sense, a falling birth rate that will eventually reduce the size of the workforce (if not compensated with greater immigration) will reduce GDP, but not GDP per worker, according to the Solow model.

A higher level of GDP may be desirable even if GDP per worker is constant, which is achieved through growth in the working-age population. It is beneficial, for instance, in terms of the provision of public goods. A nation can spend more on national defense if its GDP is larger and that provides benefits to all of its citizens. It is not

Figure 4. Size of the US Working-Age (25-54) Population

Source: OECD (2022b).

a coincidence that America was a leader in space exploration, not Sweden. Beyond those examples, increasing GDP per person is what improves living standards.

There are also reasons to believe that fertility rates and GDP per capita may be linked. First among those reasons are mechanical explanations related to the population's age distribution. Simple growth models including the Solow model address the relationship between the size of the economy and the size of the workforce, not the overall population. If fewer workers enter the labor force in the wake of falling fertility rates, while more older workers leave the labor force via retirement, the workforce will shrink and GDP per capita will be reduced (Maestas, Mullen, and Powell, forthcoming).

Second, economists have long considered models in which the lack of population growth may slow economic growth on a per capita basis. In fact, some of these ideas predate the Solow model. Hansen (1939) argued that the rock-bottom birth rates of the Great Depression contributed to decreasing incentives for investment at the time, leading to a "secular stagnation." This outcome was not realized going forward, though, as the economy prospered following World War II. In this framework, the baby boom that occurred then may have contributed to that prosperity.⁷ Hansen

⁷ Summers (2020) also raised this hypothesis in a contemporary context.

also cited Adam Smith's hypothesis that population growth causes productivity growth: a larger population has more opportunities to efficiently divide labor.

More recently, macroeconomists have focused more intensively on the role that innovation and technological change play in determining economic growth. In the Solow model, technological progress can occur that would increase the steady-state level of GDP, but those developments would be "exogenous" to the model, occurring almost by chance. In newer models of "endogenous growth," innovations occur as the result of economic factors, not by chance.

Romer's seminal work in this area develops these ideas (e.g., Romer, 1990). His model distinguishes objects (like capital and labor) from ideas (like innovation). Societies' resources are directed towards both types of inputs. When those resources are devoted to capital and labor, output increases proportionally as in the Solow growth model. When resources are instead directed toward ideas, however, they can generate even greater increases in output. Unlike capital, innovations are nonrival and can be shared by everyone. An innovation is nonrival if one worker's use of a new technology to become more productive does not inhibit another worker's ability to do the same.

In this framework, growth in the size of the workforce has the potential to produce longer-term economic growth. Consider a society with a constant share of the workforce dedicated to research and development. With a larger workforce, the absolute level of resources devoted to innovation increases. More new ideas arise that can increase all workers' productivity, increasing output per capita. Low or falling fertility will eventually reduce the size of the US workforce and its overall population, reducing innovation and productivity. Jones (2020) expresses this position eloquently, stating:

"From a family's standpoint, there is nothing special about "above two" versus "below two" and the demographic transition may lead families to settle on fewer than two children. The macroeconomics of the problem, however, make this distinction one of critical importance: it is the difference between an Expanding Cosmos of exponential growth in both population and living standards and an Empty Planet, in which incomes stagnate and the population vanishes."

Indeed, some recent research supports the relationship between population growth and economic growth. Karahan, Pugsley, and Sahin (2019) and Hopenhayn, Neira, and Singhanian (2018), for instance, suggest that falling labor force growth may explain a substantial part of the decline in firm entry and dynamism in the US economy.

"Low or falling fertility will eventually reduce the size of the US workforce and its overall population, reducing innovation and productivity."

4.b. Lower fertility could also pose fiscal challenges.

Beyond its potential impacts on economic growth, a lower fertility rate also has potential fiscal implications. Of primary concern is the funding of public assistance programs such as Social Security and Medicare (technically, the Old Age, Survivors, Disability and Health Insurance program). Funded by taxes on workers, these programs provide benefits to non-working individuals funded through taxes on workers.

The problems expected to be caused by the aging of the Baby Boom generation have been well-known for quite some time. Figure 4, which demonstrates the size of the US workforce over time, at least partially captures that demographic trend. Baby Boomers, who were born between 1946 and 1964, entered the labor force roughly in the period between 1970 and 1990. They began to retire in meaningful numbers approximately a decade ago, placing downward pressure on the size of the workforce. Based on standard longevity patterns, we can expect the United States to be supporting a large population of retirees in the coming decades.

Forecasting the size of the labor force based on the size of cohorts that have already been born is considerably easier than incorporating cohorts of the yet unborn. But these future cohorts are just as important toward calculating the coming size of

the workforce and the country's ability to fund social insurance programs. Projections of the unborn population are necessary to make accurate assessments of these programs' funding needs in the decades ahead.

It is not surprising that past fertility forecasts failed to predict the striking decline in birth rates the country has witnessed since 2007. Even in retrospect, we are unable to find data that would have suggested such a sustained

“Existing evidence about likely causes of the US birth rate’s sustained decline provide no reason to expect the US total fertility rate to return to near replacement level soon.”

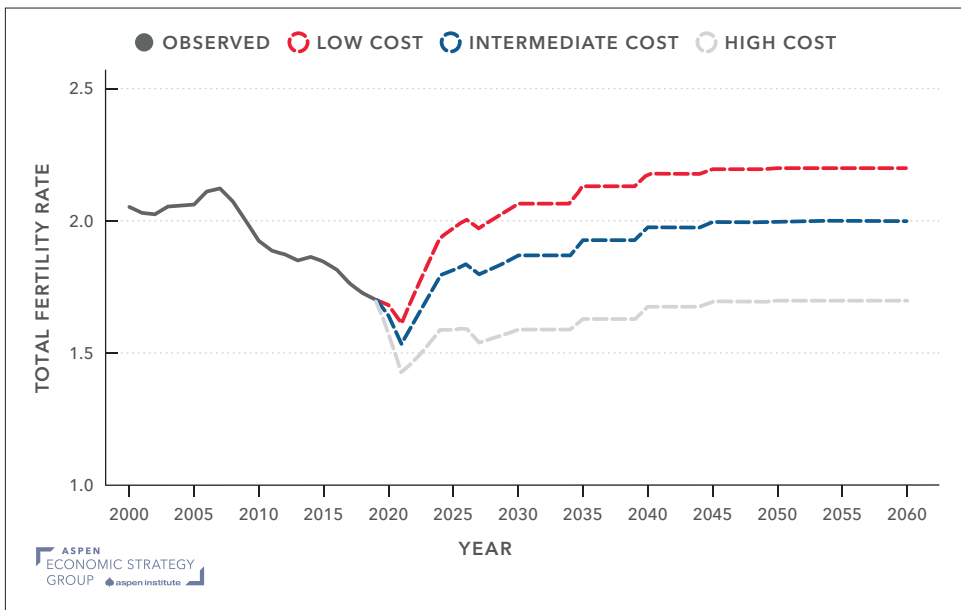
drop was imminent. As a result, contemporaneous predictions of public assistance programs' long-run fiscal sustainability were overly optimistic (Office of the Chief Actuary, Social Security Administration, 2007).

We are concerned that current forecasts of future fertility patterns remain overly optimistic. Figure 5 characterizes current long-term demographic projections from the United States Social Security Administration (2022). The report provides alternative forecast values depending on potential costs to the system resulting from varying fertility rates. A low fertility rate, for instance, would require greater additional revenue to fund the Social Security system. It is therefore labeled the “high cost” assumption. The “low cost” assumption stipulates a higher fertility rate, and the “intermediate cost” assumption represents the Administration's best estimate of the future fertility rate.

Each of the Administration's three estimates forecasts a rising fertility rate beginning in 2022. In each of the three estimates, projected fertility rates rise continuously before reaching a steady-state value within approximately a decade. The Administration's best estimate assumes that the country will return to a total fertility rate of 2.0 by 2040. To justify this projection, the report offers the following explanation, with no further elaboration: "a sustained TFR at the low levels experienced by certain other industrialized countries is unlikely due to economic, demographic, and cultural differences between the U.S. and those countries."

Based on our analyses, we view these assumptions as overly optimistic. Existing evidence about likely causes of the US birth rate's sustained decline provide no reason to expect the US total fertility rate to return to near replacement level soon. Indeed, other high-income countries' TFRs fell below that threshold decades ago and have not reapproached it since. Our projections, based on the birth patterns of recent cohorts of US women, imply a TFR that will remain well below 2.0. These more recent cohorts of women are providing no indication that they are merely delaying pregnancy; we project that their lower birth rates at younger ages are likely to translate into lower lifetime completed fertility.

Figure 5. Social Security Administration Fertility Assumptions, 2021



Source: Office of the Chief Actuary, Social Security Administration (2022).

While we cannot assert definitively that younger women today will not substantially increase their rates of childbearing at older ages, nothing exists in the data to suggest this outcome is likely to occur. We therefore suggest that the SSA's high-cost fertility projections are significantly more likely to prove correct than the Administration's "intermediate cost" (best estimate) projections, or especially its "low cost" projections. To better understand the revenue gaps that are likely to make Social Security benefits more difficult to fund, we advise focusing instead on the Administration's more conservative fertility projections.

The 2022 Social Security Trustee Report provides estimates of the "actuarial deficit," which is based on the difference between the present value of the expected outflow of funds (expected benefits and administrative costs) and the expected inflow of funds (expected tax revenue) as a percentage of taxable payroll.⁸ The deficit reflects the tax increase that would be necessary to fully fund the system over the next 75 years. The actuarial deficit is 3.42 percent if the TFR is assumed to be 1.99, and 4.13 percent if the TFR is assumed to be 1.69. While the report treats 1.99 as the TFR midpoint estimate, we view a TFR of 1.69 as the more likely outcome. If that prediction proves true, overall taxes would have to be raised another 0.71 percentage points (21 percent) higher than the Social Security Trustees' best estimate in order for the system's finances to be in balance. A TFR below 1.69, which we view as not unlikely, would create an even greater imbalance in the system.

4.c. The decline in US fertility may not have a meaningful effect on climate change.

While lower fertility may reduce economic growth and destabilize elements of our social safety net, it provides potential benefits as well, for instance through its impact on the environment. While we claim no particular expertise in this domain, our review of the relevant evidence suggests that the 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 per capita consumption of energy and materials, in tandem with developing more sustainable production processes, is significantly more likely to produce meaningful impacts.

⁸ This calculation also includes the value of the trust fund at the start of the period and a requirement to have one year of benefits on hand at the end of the 75 years.

5. Is There a Role for Pro-Natalist Policies?

A policy is “pro-natalist” if it provides incentives to women or couples to have more children. Broadly, such policies can either raise income for families with children or reduce the costs of having and raising children. For instance, many high-income countries have implemented pro-natalist policies that provide child allowances or subsidies to women who give birth or to families with children. Many countries also provide implicit subsidies in the form of free or subsidized childcare or paid family leave. Such policies reduce the personal cost to parents of having or raising children.

Over the past 30 years, an increasing number of countries have implemented pro-natalist policies. A recent United Nations report (Sobotka et al., 2020) states that the number of national governments reporting that they aim to increase fertility jumped from 19 in 1986 to 52 in 2011. In 2015, the governments of 55 countries and territories surveyed by the World Population Policies Database—including 27 countries in Europe and 18 in Asia—reported that increasing fertility was a national goal.

Sobotka et al. (2020) also reports that pro-natalist policies are often characterized by parity-specific rules that provide benefits based on how many children a family has, even if it is uncommon for governments to set targets for families to bear a specific number of children (China being a notable exception). Since 1993, for instance, Hungarian mothers with three or more children have been eligible to receive a fixed monthly sum to offset the costs of raising a child until the youngest child is eight years old. In the 1990s, the province of Quebec likewise paid families a newborn allowance that ranged from C\$3,000 for a first child to C\$8,000 for a third child (nominal Canadian dollars).

Many countries provide families with children some type of child allowance or child tax credit or deduction. Even if the explicit goal of such policies is something other than a pro-natalist aim—say, alleviating child poverty or providing income assistance to middle-income families raising children—a cash benefit or tax credit that is conditional on the presence of a child in the family or household can be understood as a financial incentive to have a child. The question is then an empirical one: do child-related cash benefits or tax credits lead to an increase in births?

The empirical evidence on the relationship between cash benefits or child tax credits and fertility is mixed, but in general, it suggests that policies that directly subsidize the birth of a child might lead to a modest increase in fertility. For instance, there is a large literature studying the fertility effects of the former Aid to Families with Dependent Children (AFDC) welfare program in the United States. That literature has consistently produced results showing, at best, small effects of welfare benefits on birth rates (see,

for instance, the review by Moffitt, 1998). More recent evidence comes from studies of the fertility response to child allowances or tax credits in specific locations. For example, Gonzalez (2021) studies the introduction of a new, universal child benefit in Spain in 2007 that awarded parents a one-time payment of about US\$3,900. She finds that the policy led to a 6 percent increase in the number of annual births.

Policies that help parents to balance work and family, such as subsidized childcare or paid parental leave, can also be considered pro-natalist and could plausibly lead to an increase in birth rates even if the policies are not implemented with expressly pro-natalist aims. A recent paper by Doepke, Hannusch, Kindermann, and Tertilt (2022) proposes that in modern high-income countries, the ability to combine career and family is a key determinant of fertility rates. The authors also emphasize the practical importance of bargaining between men and women and the role of social norms around shared household and childcare responsibilities in affecting fertility choices. For instance, in couples in which the woman wants fewer children than does the man, fewer children are born.

These authors draw on OECD country-specific data from 1980 and 2000 to relate the percentage of women between ages 25 and 54 who are in the labor force to the total fertility rate.⁹ They show that in 1980 there was a negative relationship between a country's rate of female labor force participation and the total fertility rate, but that by 2000, the relationship reversed—in countries where more women work, the birth rate was higher. They argue that as social norms around female work have changed, countries that make it easier for parents to combine work and family have both higher female labor force participation rates and higher fertility rates.

We replicate and extend this analysis in Figure 6. Importantly, we find that data from 2010 and 2019 tell a different story about the relationship between a country's level of female labor force participation and fertility rates. In these more recent years, women in all countries participate in the labor force at about the same rate: approximately 80 to 85 percent. There are, however, sizable differences in total fertility rates across countries, ranging from 1.2 to 1.8. This indicates that differences in policy environments are not highly predictive of female labor force participation rates, but they might have an effect on how many children they have. We note, though, that in no OECD country is the total fertility rate near the replacement level of 2.1, including in those with strong family support programs and more equal gender norms.

Past research focused on estimating the causal effects of various pro-natalist policies designed to facilitate work and childbearing is mixed, but generally does not find evidence of sizable fertility effects. As one example, Dahl et al. (2016) find

9 The OECD countries used in this analysis represent those with data available throughout the period considered.

that policy reforms in Norway in the late 1980s and early 1990s that substantially expanded paid maternity leave had no discernible effect on fertility rates. In another example, the lengthening of paid parental leave in Sweden led many women to have their subsequent child before the end of the parental leave, fueling a temporary baby boom, that was subsequently offset by a baby bust (Andersson, Hoem, and Duvander, 2006). In other words, that policy led to a transitory timing effect, but not to a sustained increase in the fertility rate. This extensive line of research on the causal effects of pro-natalist policies is reviewed by Brainerd (2014), Lopoo et al. (2018), Sobotka et al. (2019), and Stone (2020).

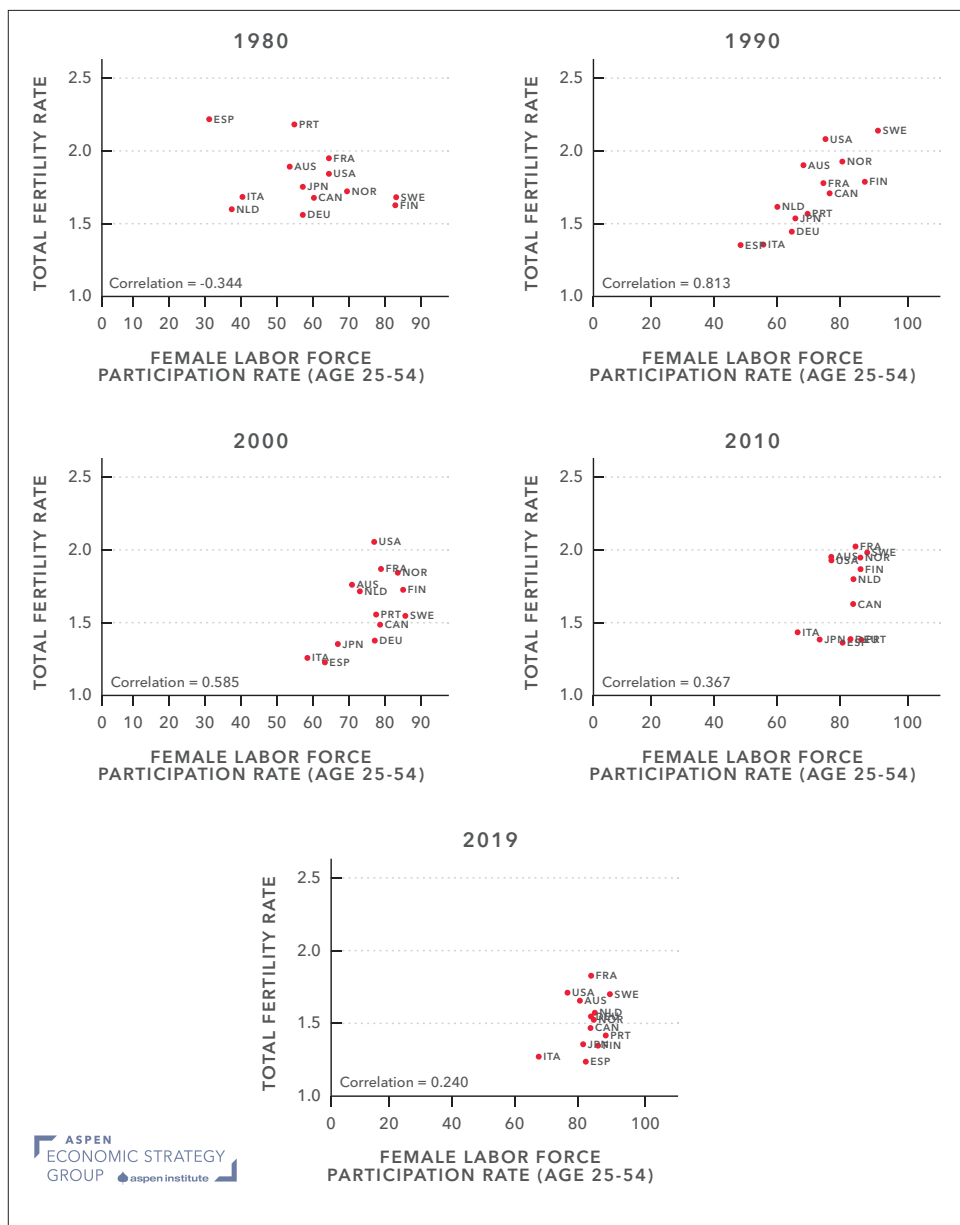
“The evidence suggests that the types of pro-natalist policies that have been implemented and evaluated in the United States and in other high-income countries are unlikely to lead to substantial or sustained increases to the birth rate.”

The evidence suggests that the types of pro-natalist policies that have been implemented and evaluated in the United States and in other high-income countries are unlikely to lead to substantial or sustained increases to the birth rate. It is noteworthy that in Japan, for instance, total government spending on families nearly quadrupled from 0.36 percent of GDP in 1990-1991 to 1.31 percent in 2015, on account of dedicated expansions in childcare provision, paid family leave, and child tax credits, among other pro-natalist policy initiatives. The country's total fertility rate has increased (potentially as a result), but it remains below 1.5 (Sobotka et al., 2019).

Olivetti and Petrongolo (2017) find that spending on early childhood education and childcare produce the strongest evidence for an effect of family policies on fertility. They conclude that “one extra percentage point of GDP spending [on such programs is] associated with 0.2 extra children per woman.” With the 2022 US GDP approaching \$25 trillion, that represents upwards of \$250 billion in additional spending per year. To put this amount in context, let's consider that President Biden's “Build Back Better” proposal called for \$100 billion in childcare spending over three years. Olivetti and Petrongolo's estimated fertility effect implies that \$100 billion on childcare spending over three years would lead to .03 more children per woman, or an increase in the TFR from 1.66 to 1.69, still far below replacement fertility.

Finally, we would be remiss if we did not acknowledge the recent Supreme Court ruling in *Dobbs v. Jackson Women's Health Organization*, which overturned the ruling of *Roe v. Wade* and increased state discretion over abortion policy. Given the likely state-level response and the results of past research, this ruling will likely lead to an increase in births in the United States. Levine (2004 and 2022) and Myers (2021)

Figure 6. Relationship Between Female Labor Force Participation Rates and Total Fertility Rates in OECD Countries



Sources: OECD Employment and Labour Market Statistics (2022), OECD (2022a).

forecast that overturning Roe will result in approximately 100,000 more births per year, representing roughly a 2.5 percent increase in the US birth rate. Even this dramatic change in abortion policy will lead to an increase in births that will not come close to bringing the overall US fertility rate to replacement level.

6. Conclusion

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. Our read of existing evidence suggests that an incremental pro-natalist policy agenda will have a limited effect on birth rates, although various elements of that agenda may be desirable for other reasons. Reversing the decline in the US fertility rate would likely require dramatic societal changes that alter preferences about having and raising children. Those changes, though, would need to come from outside the bounds of what we can now observe internationally; no environment for women and families among high-income countries currently presents a roadmap for dramatically increasing the domestic TFR.

Barring a reversal in the fertility decline, the United States could instead maintain the working-age population with a sizable increase in immigration. The nation could also adjust to a smaller working-age population with adaptive policies aimed at addressing macroeconomic and fiscal consequences. For instance, greater investments in human capital, productivity-enhancing infrastructure, and research and development could maintain overall productivity in the face of a smaller workforce. Meanwhile, securing the finances of old-age assistance programs including Social Security and Medicare will become increasingly imperative. US policymakers will need to contend with these issues if the recent, sustained decline in birth rates is not reversed.

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