Economic Theories of Fertility Choice*

Anne Hannusch[1] and Minchul Yum[2]

[1]University of Bonn and CEPR
[2]Virginia Commonwealth University and CEPR

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Abstract

Fertility is among the most consequential household choices, shaping not only family life but also the size, age structure, and productive capacity of future populations. This chapter reviews economic theories of fertility through a sequence of simple and tractable benchmark models that isolate central mechanisms and provide a common framework for comparing theories across fertility outcomes and institutional settings. We first examine how the opportunity cost of parental time, the quantity–quality trade-off, changes in survival and health, and reproductive control can account for the decline from high to lower fertility, the baby boom and bust, and changes in fertility cyclicality. We then turn to persistently low fertility in advanced economies, emphasizing bargaining within couples, parenting norms, labor-market institutions and family policies, childlessness, delayed childbearing, and reproductive technologies. Finally, we consider fertility in developing countries and its interaction with long-run economic growth, focusing on customary institutions, family planning, and models with endogenous population. We conclude by identifying promising avenues for future research.

Keywords: Fertility, Demographic Transition, Quantity–Quality Trade-off, Family Policy, Economic Growth, Population Dynamics

*Contacts: anne.hannusch@uni-bonn.de (Hannusch) and yumm@vcu.edu (Yum). In preparation for: *The Oxford Handbook of Fertility and Reproductive Health Economics*, edited by Kelly M. Jones and Damian Clarke. We are grateful for feedback from Sena Coskun, Husnu Dalgic, David de la Croix, Paula E. Gobbi, Georgi Kocharkov, Kanato Nakakuni, Michèle Tertilt, and Anson Zhou. Hannusch gratefully acknowledges financial support by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany's Excellence Strategy – EXC 2126/2 – 390838866, as well as through the CRC TR 224 (A03).

1 A Primer on Economic Models of Fertility

There are few forces that shape the long-run trajectory of an economy as profoundly as fertility. By shaping the size, growth rate, and age structure of the population, fertility has implications for labor supply, human capital accumulation, public finances, economic growth, and welfare. Its consequences depend on the stage of demographic change. Declining fertility can initially raise the working-age share of the population, while persistently low fertility eventually contributes to population aging and greater pressure on pension and healthcare systems. These contrasting effects have motivated a large literature on the determinants of fertility and the scope for policy.

The goal of this chapter is to provide an overview of economic theories of fertility through a sequence of simple and tractable benchmark models. Rather than reproducing the original formulations, these models isolate the mechanisms shaping fertility choices and trace their demographic and macroeconomic implications.[1]

Economic models of fertility can be organized along three main dimensions: the outcome studied, the mechanism emphasized, and the economic environment in which fertility is chosen. First, they study different fertility outcomes. Some focus on the number of births or surviving children, while others examine desired versus realized fertility, the timing and spacing of births, completed family size, childlessness, or births within and outside marriage. These outcomes are not interchangeable. For example, a decline in child mortality may reduce the number of births without changing the number of surviving children, while delayed childbearing may reduce completed fertility even if desired family size remains unchanged. The appropriate model therefore depends on the fertility margin under study.

Second, theories differ in the mechanisms that drive fertility choices. The main historical traditions provide a useful guide. In the Malthusian framework, fertility responds positively to income and feeds back into population growth and living standards (Malthus, 1798). Becker (1960) recast fertility as a household choice, distinguishing the number of children from expenditures on their quality. Becker and Lewis (1973), Willis (1973), and Becker and Tomes (1976) formalized the quantity–quality trade-off: greater investment per child raises the shadow price of an additional child, while a larger family raises the cost of increasing investment per child. Becker and Barro (1988) and Barro and Becker (1989) subsequently embedded fertility in dynastic models, making the size and welfare of future generations endogenous. Later work has incorporated survival and health,

[1]For broader surveys, see Hotz et al. (1997), Balbo et al. (2013), Doepke and Tertilt (2016), Greenwood et al. (2017), and Doepke et al. (2023).

reproductive control, bargaining within households, social norms, labor-market institutions, public policies, and biological constraints such as age-related infertility. Much of the literature can therefore be understood as studying how these forces alter the costs and benefits of childbearing or households' ability to translate fertility preferences into realized births.

Finally, fertility decisions are studied in different model environments. Some models are static and treat the household as a single decision maker, whereas collective and bargaining models allow partners to have distinct preferences and potentially conflicting fertility interests (Chiappori, 1992; Doepke and Kindermann, 2019). Other approaches embed fertility in dynamic life-cycle models, heterogeneous-agent economies, or theories of long-run economic growth. The relevant institutional setting also varies: while many theories were developed to explain fertility patterns in high-income countries, others emphasize features that are particularly important in developing economies, including customary law, family-planning institutions, and imperfect fertility control.

The three dimensions—the fertility outcome, the economic mechanism, and the modeling environment—organize the remainder of the chapter. The benchmarks that follow are deliberately not canonical reproductions of the original models. We often impose logarithmic preferences, linear technologies, identical children, simplified time constraints, and static timing to obtain transparent closed-form solutions. These assumptions may add to, omit, or modify elements of the original contributions. The resulting models should therefore be interpreted as tractable representations of particular mechanisms rather than as canonical formulations of the cited theories. Throughout, we relate them to the original studies and to other chapters in this Handbook.

2 From High to Low Fertility: Economic Explanations

A recurring feature of economic development is a shift from high to lower fertility, although the timing and pace of this shift have differed substantially across countries and historical periods (Doepke et al., 2023; Gobbi et al., 2026). Understanding why households choose fewer children as incomes rise and women's labor-market opportunities and reproductive technologies improve has been a central question in the economics of fertility. Rather than offering a comprehensive account of fertility decline, this section uses simple benchmark models to isolate several prominent economic mechanisms.

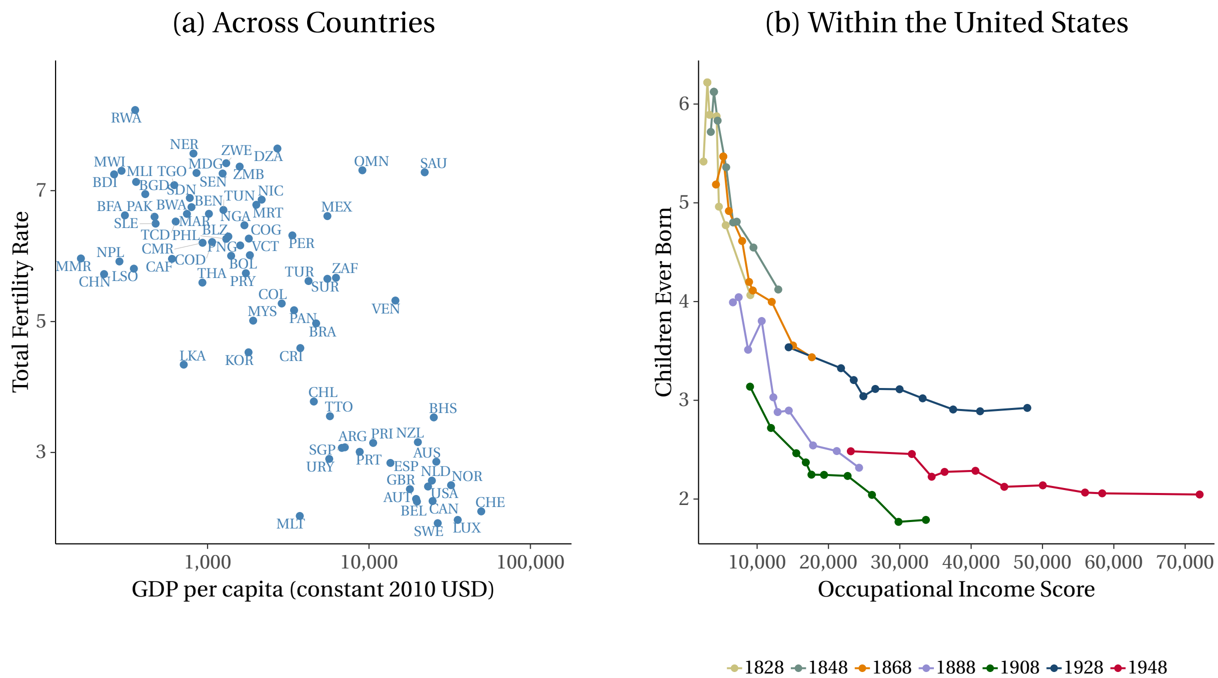

Figure 1: Negative Fertility–Income Relationship

Notes: Panel 1a plots the total fertility rate against the logarithm of GDP per capita across countries in 1970, following Doepke et al. (2023), Figure 2. Panel 1b plots selected U.S. birth cohorts from Jones and Tertilt (2008), Figure 4. Fertility is measured using children ever born in U.S. Census data. Income is proxied by occupational income scores (OIS).

2.1 Negative Fertility-Income Relationship

Historically, one of the most robust empirical regularities has been the negative relationship between fertility and income, both across countries and across households within countries.[2] Figure 1 illustrates both relationships: Panel 1a shows the relationship across countries at different levels of development, while Panel 1b shows the fertility–income gradient within the United States. Across cohorts, fertility declines as income rises. Within cohorts, richer households consistently have fewer children than poorer households, a pattern that has remained remarkably stable over time.

Becker (1960) introduced fertility into the standard economic framework by modeling the number of children as a choice variable that enters parents' utility and requires resources. His original framework distinguishes the number of children from expenditures on their quality. We will return to the notion of child quality in the next section.

[2]There are important exceptions. Doepke et al. (2023) show that, among OECD countries, the negative cross-country relationships between fertility and income have reversed since the 1980s. At the household level, Kim et al. (2024) document a positive association between fertility and family income in South Korea.

Following Becker, we assume that households can perfectly control fertility. Parents derive utility from both consumption goods (c) and children (n). Consumption requires monetary resources, while children require parental time, denoted by ℓ. In our exposition, we choose standard log preferences. Under these preferences, income and substitution effects of a higher wage exactly offset each other, implying that optimal fertility is independent of income. To generate the negative fertility–income relationship observed in the data, we introduce subsistence consumption.[3] This yields the following decision problem:[4]

$$\begin{aligned}
\max_{c,n} \quad & u(c,n) = \theta \ln(c+\bar{c}) + (1-\theta)\ln n \\
\text{s.t.} \quad & c = (1-\ell)w \\
& n = \phi\ell \\
& 0 \leq \ell \leq 1, \quad 0 < \theta < 1,
\end{aligned}$$

where w denotes the wage rate and ϕ captures parenting productivity. Solving for optimal fertility yields

$$n^* = (1-\theta)\phi\left(1+\frac{\bar{c}}{w}\right).$$

This simple decision problem generates a negative fertility–income relationship. When wages are low, market work yields little consumption above subsistence, so parental time is relatively inexpensive in terms of foregone consumption. As wages rise, the opportunity cost of parental time increases, leading parents to allocate more time to market work and reduce fertility. Thus, higher wages reduce fertility even in this simple static framework.[5]

2.2 Quantity-Quality Tradeoff

A second key mechanism emphasizes parental investments in children. Parents value both the number and quality of children. Because investments in child quality must be

[3] Becker (1960)'s original framework predicts that higher income raises both the desired number of children and expenditure per child. The negative fertility–income relationship in the raw data therefore does not arise directly from the income effect in his framework. Becker also discusses differences in contraceptive knowledge across income groups as one possible explanation for why actual fertility may decline with income. See Jones et al. (2010) for a detailed discussion of alternative modeling choices that can generate a negative fertility–income relationship.

[4] See also Greenwood et al. (2005) and Strulik (2008) for fertility models with subsistence consumption.

[5] The literature proposes alternative mechanisms that generate different fertility–income relationships. For example, Córdoba and Ripoll (2016) argue that intergenerational financial transfers are crucial for producing a negative income–fertility gradient. Bar et al. (2018) show that the ability to outsource childcare leads to a positive fertility-income relationship among very high-income households in the U.S.

made for every child, parents face a trade-off between having more children and investing more in each child. This distinction between child quantity and quality originates in Becker (1960) and was subsequently formalized and extended by Becker and Lewis (1973), Willis (1973), and Becker and Tomes (1976). It has since become a cornerstone of the demographic and macroeconomic literature and is widely used to study fertility behavior, human capital accumulation, and the demographic transition. The benchmark below is deliberately simpler than the original formulations.[6]

To capture this mechanism, we introduce child quality, q, into parental utility alongside consumption, c, and fertility, n. Children are identical and child quality depends on an innate component $a > 0$ and parental investment s, commonly interpreted as schooling or other quality-enhancing inputs. $\delta > 0$ measures the productivity of parental investment. Parents solve:

$$\begin{aligned}
\max_{c,n,s} \quad & \theta_c \ln c + \theta_n \ln n + \theta_q \ln q \\
\text{s.t.} \quad & c + sn = (1-\ell)w \\
& n = \phi\ell \\
& q = a + \delta s \\
& 0 \leq \ell \leq 1, \quad s \geq 0, \quad \theta_c + \theta_n + \theta_q = 1
\end{aligned}$$

The formulation makes the two components of the cost of children explicit. Because $n = \phi\ell$, each child requires $1/\phi$ units of parental time and therefore entails an opportunity cost w/ϕ. In addition, each child receives investment s. After substituting for ℓ, the resource constraint becomes

$$c + n\left(\frac{w}{\phi} + s\right) = w.$$

Thus, greater investment per child raises the cost of having an additional child, while a larger family raises the total cost of increasing investment per child. This is the central quantity–quality interaction emphasized in the original literature. Optimal parental

[6] Our benchmark is a deliberately simplified version of the original quantity–quality models. Becker and Lewis (1973) use a general utility function and derive the interaction from a nonlinear budget constraint in which the shadow price of quantity rises with quality and vice versa. Becker and Tomes (1976) additionally distinguish parental investment from endowed quality and study heterogeneity in endowments across children. We instead assume identical children, logarithmic preferences, a common exogenous endowment, a linear quality technology, and an explicit time cost of fertility in order to obtain transparent closed-form solutions.

investment s^*, child quality q^*, and fertility n^* are given by:

$$s^* = \frac{1}{\theta_n - \theta_q}\left(\frac{\theta_q w}{\phi} - \frac{\theta_n a}{\delta}\right), \qquad q^* = \frac{\theta_q}{\theta_n - \theta_q}\left(\frac{\delta w}{\phi} - a\right)$$
$$n^* = \frac{\theta_n - \theta_q}{1 - \theta_q}\left(\frac{\delta\phi}{\delta - \frac{a\phi}{w}}\right)$$

An interior solution with positive parental investment requires $\theta_n > \theta_q$ and $\theta_q \delta w > \theta_n a\phi$. Under these conditions, optimal investment in child quality s^* increases with wages, implying that child quality q^* also rises with income. In contrast, the optimal number of children n^* declines with wages. The model therefore generates the canonical quantity-quality trade-off: higher-income parents choose fewer children but invest more in each child. Chapter 6 of this Handbook provides a detailed overview of the quantity-quality theory of fertility and reviews the empirical literature testing its implications, including studies using twin births to identify the causal impact of fertility on children's education and health.

2.3 Longevity and Insurance from Children

Rising incomes over the past two centuries have been accompanied by substantial increases in life expectancy. Longer lifespans extend the expected retirement period and thus alter the incentives to save, invest in human capital, and have children. The effect of rising longevity on fertility, however, is theoretically ambiguous and depends on how individuals finance consumption in old age—through personal savings, support from children, or public pension systems.

Longevity and Old-Age Consumption We begin by examining how improvements in old-age survival affect fertility when individuals rely on personal savings to finance retirement. To capture this mechanism, we extend the baseline model to two periods. Parents allocate lifetime resources between current consumption, c, and old-age consumption, c_{old}. The parameter $\pi \in [0, 1]$ denotes the probability of surviving to old age and therefore captures life expectancy. The household's problem is

$$\begin{aligned}
\max_{\ell,c,c_{\text{old}}} \quad & \theta(\ln c + \pi \ln c_{\text{old}}) + (1-\theta)\ln(n) \\
\text{s.t.} \quad & c + \pi c_{\text{old}} = (1-\ell)w \\
& n = \phi\ell \\
& 0 \leq \ell \leq 1, \quad 0 < \theta < 1.
\end{aligned}$$

Optimal fertility is given by

$$n^* = \phi\frac{1-\theta}{1+\pi\theta}.$$

An increase in longevity raises the expected utility from future consumption, inducing parents to allocate more resources to old-age consumption. Because resources are limited, this reallocation reduces fertility, i.e., $\partial n^*/\partial\pi < 0$. In this framework, longer life expectancy lowers fertility by increasing the value of future consumption relative to childbearing. This mechanism features prominently in models linking the demographic transition to economic growth, including Zhang et al. (2003), Cervellati and Sunde (2005), and Soares (2005).[7]

Social Security and Old-Age Insurance from Children A second strand of the literature emphasizes the role of social security. When formal financial markets or public pension systems are underdeveloped, as was the case historically in Western Europe and in many developing economies today, children serve as a primary source of old-age support (Boldrin and Jones, 2002; Boldrin et al., 2015). In this setting, fertility partly reflects an insurance motive. To illustrate this mechanism, suppose that parents receive a transfer $v > 0$ from each child in old age rather than financing retirement through savings:

$$\begin{aligned}
\max_{\ell,c} \quad & \theta(\ln c + \pi \ln c_{\text{old}}) + (1-\theta)\ln(n) \\
\text{s.t.} \quad & c = (1-\ell)w \\
& c_{\text{old}} = vn \\
& n = \phi\ell \\
& 0 \leq \ell \leq 1, \quad 0 < \theta < 1
\end{aligned}$$

[7] Hwang and Kim (2023) distinguishes between expected and unexpected changes in life expectancy and shows how the timing and predictability of longevity gains affect fertility responses.

Optimal fertility is then

$$n^* = \phi \frac{1 - \theta + \theta\pi}{1 + \theta\pi}.$$

In contrast to the previous model, an increase in life expectancy now raises fertility, i.e., $\partial n^*/\partial \pi > 0$. When children provide old-age consumption, a longer expected retirement increases the value of having offspring. This mechanism also implies that the expansion of public pension systems can reduce fertility by substituting for the insurance role of children. To see this, suppose old-age consumption is supplemented by a public pension ψ,

$$c_{\text{old}} = vn + \psi.$$

Implicit differentiation yields $\partial n^*/\partial \psi < 0$: more generous pensions crowd out the insurance value of children and reduce fertility. Quantitative models built around this mechanism, such as Ehrlich and Kim (2007) and Boldrin et al. (2015), argue that the expansion of social security systems during the twentieth century contributed to the observed fertility decline.

These mechanisms highlight that the effect of rising longevity on fertility is not universal but depends critically on the institutional environment governing old-age support. More broadly, public policies beyond pension systems, such as cash transfers, housing programs, and childcare subsidies, can shape the economic incentives surrounding fertility decisions. Chapter 8 of this Handbook reviews the empirical evidence on how such social policies influence fertility and family formation.

2.4 Child Mortality

Declining mortality is one of the defining features of the demographic transition. Improvements in health, sanitation, and medical technology dramatically increased the survival chances of children over the past two centuries. A natural question is how these changes affected fertility decisions. Demographers have long argued that declining child mortality reduces fertility because parents no longer need to have as many children to achieve a desired number of surviving offspring. Economists have formalized this intuition in models of fertility choice (Eckstein et al., 1999; Strulik, 2004; Doepke, 2005).

To illustrate this mechanism, consider a simple extension of the baseline model in Section 2.1 that introduces a survival probability for children. Parents make decisions based on the expected number of surviving children and solve

$$\begin{aligned} \max_{c,n,\ell} \quad & \theta \ln c + (1-\theta) \ln sn \\ \text{s.t.} \quad & c = (1-\ell)w \\ & sn = \phi\ell \\ & 0 \leq \ell \leq 1, \quad 0 < \theta < 1 \end{aligned}$$

where $s \in (0,1)$ denotes the exogenous probability that a child survives. Thus, sn represents the *net fertility rate*, that is, the expected number of surviving children. Solving the problem yields the optimal fertility choice

$$n^* = \frac{\phi(1-\theta)}{s},$$

which implies $\partial n^*/\partial s < 0$. An increase in child survival (i.e., a decline in child mortality) therefore reduces the number of births required to achieve a given number of surviving children, leading to lower fertility.

However, this mechanism alone cannot account for the magnitude of fertility decline observed during the demographic transition. In the simple model above, net fertility sn^* remains constant. As emphasized by Doepke (2005), similar results arise in extended Barro–Becker frameworks (Barro and Becker, 1989). Additional mechanisms, such as the quantity–quality trade-off, child labor considerations, or old-age security motives, are required to generate the substantial declines in both gross and net fertility documented in the data.

2.5 Contraception and Premarital Sex

The spread of modern contraception coincided with profound changes in sexual behavior and marriage patterns. Together, these developments reshaped fertility decisions by altering both the risks associated with sexual activity and the social and economic consequences of childbearing.

In 1900, only about 6% of unmarried women engaged in premarital sex. By the 2000s, roughly three quarters of young women in the United States were sexually active before marriage (Greenwood and Guner, 2010). This shift, often referred to as the *sexual revolution*, occurred alongside major advances in contraception and rising educational attainment. Despite improved contraceptive technologies, the incidence of out-of-wedlock births among unmarried teenage girls rose from roughly 3% in 1920 to about

7.5% in 2000 (Fernández-Villaverde et al., 2014).

Explaining why teenage childbearing rose despite safer contraception poses an important theoretical puzzle. Improved contraception has two opposing effects. On the one hand, it reduces the probability that sexual activity results in pregnancy. On the other hand, safer sex lowers the expected cost of premarital sexual activity and may therefore increase the number of teenagers who choose to become sexually active. As a result, improvements in contraception may initially increase out-of-wedlock births before eventually reducing them.

To illustrate this mechanism, consider a simple model inspired by Greenwood (2019). A teenage girl chooses whether to engage in premarital sex. Let V_0 denote lifetime utility if she does not experience an out-of-wedlock birth and V_b the utility if she does, with $V_0 > V_b$. Sexual activity yields enjoyment ℓ (libido) but may result in pregnancy. Let $\kappa \in [0, 1]$ denote the probability of safe sex, capturing the effectiveness of contraception and knowledge about its use. If the girl abstains, she obtains utility $U_A = V_0$. If she engages in premarital sex, her expected utility is

$$U_S(\kappa) = \ell + \kappa V_0 + (1 - \kappa)V_b.$$

Therefore, the girl chooses sexual activity if $U_S(\kappa) > U_A$. We can define a threshold libido level ℓ^* at which the girl is indifferent:

$$\ell^* = (1 - \kappa)(V_0 - V_b).$$

As contraception becomes more effective (higher κ), the threshold ℓ^* falls, implying that more girls engage in premarital sex. Whether this leads to more or fewer out-of-wedlock births depends on the quantitative effects of safer sex and increased sexual activity. Suppose libido ℓ is uniformly distributed on $[0, \bar{\ell}]$. The share of girls engaging in premarital sex is

$$p(\kappa) \equiv \Pr(\ell \geq \ell^*(\kappa)) = \max\left\{0,\ 1 - \frac{(1 - \kappa)(V_0 - V_b)}{\bar{\ell}}\right\}.$$

The fraction of girls experiencing an out-of-wedlock birth equals the fraction who engage in premarital sex multiplied by the probability that pregnancy occurs:

$$b(\kappa) = (1 - \kappa)p(\kappa).$$

Out-of-wedlock births therefore depend on two opposing forces:

$$\frac{db(\kappa)}{d\kappa} = \underbrace{-p(\kappa)}_{\text{safer sex}} + \underbrace{(1-\kappa)\frac{dp}{d\kappa}}_{\text{increased sexual activity}}.$$

Improved contraception reduces pregnancy risk but simultaneously encourages sexual activity. Figure 2 illustrates these opposing forces. Panel 2a shows that the share of girls engaging in premarital sex rises with contraceptive effectiveness as the expected cost of sexual activity falls. Panel 2b shows the resulting hump-shaped pattern in nonmarital births. At low levels of contraceptive effectiveness, the increase in sexual activity dominates the reduction in pregnancy risk, causing nonmarital births to rise. At higher levels, the decline in pregnancy risk dominates, and nonmarital births fall.

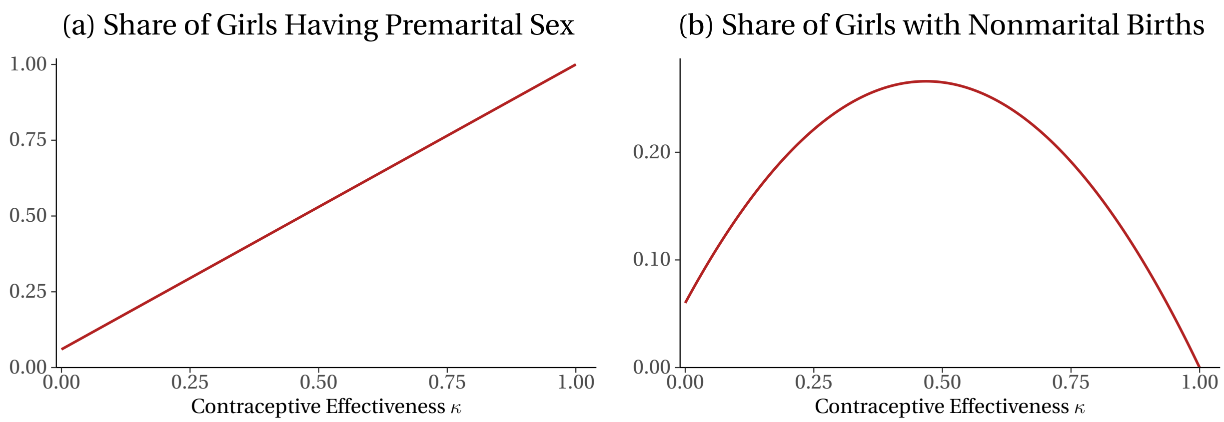

Figure 2: The Effect of Contraceptive Effectiveness

Notes: We simulate the model as contraceptive effectiveness, κ, varies from 0 to 1. Libido ℓ is uniformly distributed on $[0, \bar{\ell}]$. Panel 2a plots the share of girls who engage in premarital sex, $p(\kappa)$, and Panel 2b plots the fraction who experience a nonmarital birth, $b(\kappa) = (1-\kappa)p(\kappa)$. The model is parameterized with $V_0 - V_b = 2.35$ and $\bar{\ell} = 2.5$.

Several studies develop related mechanisms. Greenwood and Guner (2010) explain the joint rise in contraceptive effectiveness and nonmarital childbearing in the United States. Fernández-Villaverde et al. (2014) emphasize the role of changing social norms, showing how declining stigma increased premarital sexual activity. Di Nola et al. (2025) show that welfare-state institutions, including sex education policies, also shape teenage pregnancy outcomes. Chapter 13 of this Handbook reviews recent trends in teenage childbearing, their consequences, and the role of policy.

More broadly, reproductive technologies can affect fertility through several margins beyond teenage premarital births. In addition to reducing the probability of conception conditional on sexual activity, they may alter sexual behavior, marital fertility, and the timing of marriage and motherhood. Their empirical effects therefore vary across outcomes and institutional settings. For example, Bailey (2010) finds that the pill accelerated the decline in marital fertility after 1960, while Myers (2017) shows that access to abortion enabled many women to postpone marriage and motherhood.

2.6 The Baby Boom and Baby Bust

The mid-twentieth century brought a striking reversal to the long-run decline in fertility. After falling for decades, fertility rose sharply in many industrialized countries, including the United States, Canada, Australia, and parts of Western Europe, in what became known as the *baby boom*, before declining again during the subsequent *baby bust*. Although often associated with the years following World War II, the timing and magnitude of the boom varied across countries, motivating a large literature seeking to explain its causes.

Relative Income Hypothesis A classic explanation is the *relative income hypothesis* proposed by Easterlin (1961). According to this view, fertility depends not simply on current income, but on income relative to material aspirations formed during childhood. To capture this idea, we augment the benchmark model with a consumption reference c_{-1}, representing the standard of living in the parental household. Let $\chi > 0$ measure the strength of these aspirations, so that the reference level is χc_{-1} (Abel, 1990; Campbell and Cochrane, 1999). The household solves

$$\begin{aligned} \max_{c,n} \quad & \theta \ln(c - \chi c_{-1}) + (1-\theta) \ln n \\ \text{s.t.} \quad & c = (1-\ell)w \\ & n = \phi \ell \\ & 0 \le \ell \le 1, \quad 0 < \theta < 1 \end{aligned}$$

Optimal fertility is

$$n^* = (1-\theta)\phi \left[1 - \chi \left(\frac{w}{c_{-1}} \right)^{-1} \right].$$

Fertility therefore increases with *relative income* $\frac{w}{c_{-1}}$. When wages are high relative to childhood living standards, fertility rises. Easterlin argued that the relatively small cohorts born during the Great Depression entered the expanding postwar labor market with modest consumption aspirations. Their unusually high relative income encouraged childbearing and contributed to the baby boom. When the much larger baby boom cohorts later entered the labor market, greater cohort competition weakened their relative economic position and contributed to the subsequent baby bust.

Chapter 7 of this Handbook reviews evidence for earlier cohorts and presents new cohort-level data suggesting that relative income may also help explain today's low fertility rates.

Productivity in the Home Greenwood et al. (2005) propose that the 20th-century evolution of women's labor supply and fertility, including the baby boom and the subsequent bust, was driven by what is now termed the *second industrial revolution* in the household. Rapid technological progress introduced labor-saving household appliances, such as running water, electricity, washing machines, and dishwashers. These innovations significantly lowered the time required for housework, thereby altering the fundamental trade-off between market work and parenting and shaping the fertility dynamics of the mid-century.

Recall the baseline model from Section 2.1. Optimal fertility is

$$n^* = (1-\theta)\phi\left(1+\frac{\bar{c}}{w}\right).$$

Technological improvements in the household can be interpreted as an increase in parenting productivity ϕ.[8] Over the twentieth century, both wages w and household productivity ϕ increased. These changes generated two opposing forces: higher wages reduced fertility in the benchmark model, while technological innovation in the home increased fertility by lowering the effective cost of parenting. During the mid-century burst of household innovation, the increase in ϕ temporarily offset the effect of rising wages, generating the baby boom. Once this burst subsided while wages continued to rise, the wage channel regained dominance, leading to the baby bust.

Medical Progress Another theory of the baby boom emphasizes medical advances that lowered the health burden of pregnancy and childbirth (Albanesi and Olivetti, 2016). To capture this mechanism, consider a version of the baseline model with an additional

[8] See Greenwood (2019) for a more general treatment using a CES home production function.

time cost κ of pregnancy per birth:[9]

$$\begin{aligned}
\max_{n,\ell} \quad & \theta \ln(c+\bar{c}) + (1-\theta)\ln n \\
\text{s.t. } & c = w(1-\ell-\kappa n) \\
& n = \phi\ell
\end{aligned}$$

Optimal fertility is

$$n^* = \frac{\phi(1-\theta)}{1+\kappa\phi}\left(1+\frac{\bar{c}}{w}\right)$$

A decline in κ lowers the effective time cost of a child and therefore raises fertility. Albanesi and Olivetti (2016) document a sharp reduction in maternal mortality and morbidity between 1930 and 1960 and show that these improvements can account for a substantial share of the joint rise in fertility and married women's labor force participation. In our simplified framework, rapid medical progress can temporarily offset the negative fertility effect of rising wages. Once improvements in maternal health slow while wages continue to rise, the wage effect again dominates, contributing to the subsequent baby bust.

Part V of this Handbook examines the economics of reproductive health in greater detail. In particular, Chapter 32 reviews the determinants and policy implications of maternal health in developed countries.

Labor Market Competition Among Women Doepke et al. (2015) emphasize the role of labor market dynamics. They argue that the surge in female labor demand during World War II permanently increased labor force participation among older women. As these women remained in the workforce after the war, younger cohorts faced stronger labor market competition. Reduced employment opportunities encouraged younger women to leave the labor force earlier and start families sooner, contributing to the postwar baby boom.

[9] As in Albanesi and Olivetti (2016), we represent the maternal health burden associated with pregnancy and childbirth as a time cost that reduces the mother's available time. See Greenwood (2019, Chapter 2) for an alternative formulation in which childbirth-related health shocks reduce mothers' subsequent labor-market productivity.

2.7 Income Risk and the Cyclicality of Fertility

The cyclical response of fertility is theoretically ambiguous. A recession reduces household income, which tends to lower fertility, but it may also reduce the opportunity cost of maternal time, which tends to raise fertility. In many severe downturns, including the Great Depression, the income effect appears to have dominated and fertility declined. Consistent with this procyclical pattern, Jones and Schoonbroodt (2016) develop a general-equilibrium model with dynastic altruism, an age-structured population, and aggregate productivity shocks, in which fluctuations in household income generate procyclical fertility.

The postwar U.S. experience, however, reveals a change in the sign of this relationship. Coskun and Dalgic (2024) document that fertility was countercyclical during the 1960s but became procyclical around the mid-1970s and increasingly so thereafter. They relate this shift to rising female labor-force participation and earnings, together with gender differences in employment cyclicality. As women's earnings became more important to household finances, withdrawing maternal labor from the market became particularly costly during downturns, when women's relatively stable income provides insurance against shocks to male earnings.

To illustrate a reduced-form version of these forces, consider a model in which fertility decisions interact with uninsurable income risk and the gender composition of earnings. Women earn an acyclical wage w_f and choose market hours, while men work full time. Let $\mu_m(s)$ denote mean male earnings in aggregate state $s \in \{B, R\}$, where B denotes a boom and R a recession. Further, assume that $\mu_m(B) > \mu_m(R)$, reflecting the empirical pattern that men tend to work in more cyclical occupations than women (Coskun and Dalgic, 2024). Finally, σ_m^2 indexes the underlying volatility of male earnings. Expected household consumption conditional on state s is

$$\mathbb{E}[c|s] = \left(1 - \frac{n}{\phi}\right) w_f + \mu_m(s).$$

Households cannot fully insure against male income risk. To capture the insurance role of women's earnings in reduced form, assume that the pass-through of male earnings risk to household consumption increases when women devote more time to parenting:

$$\mathrm{Var}(c|s) = \sigma_m^2 \left(\kappa_0 + \kappa_1 g(s)\frac{n}{\phi}\right), \qquad g(s) \equiv \frac{\mu_m(s)}{w_f} \qquad \kappa_0, \kappa_1 > 0.$$

The term in parentheses measures the household's exposure to male earnings risk. Consumption risk therefore rises with the underlying volatility of male earnings, the time devoted to parenting, and the household's reliance on male rather than female earnings. To retain tractability, preferences over consumption take a mean–variance form and households derive utility from consumption and children:

$$u(c(s), n) = \theta \ln \left(\mathbb{E}[c|s] - \frac{1}{2} \operatorname{Var}(c|s) \right) + (1 - \theta) \ln n$$
$$= \theta \ln \left[\left(1 - \frac{n}{\phi} \right) w_f + \mu_m(s) - \frac{1}{2} \sigma_m^2 \left(\kappa_0 + \kappa_1 g(s) \frac{n}{\phi} \right) \right] + (1 - \theta) \ln n,$$

Assuming an interior solution, optimal fertility is

$$n^* = (1 - \theta)\phi \cdot \frac{w_f + \mu_m(s) - a}{w_f + b\frac{\mu_m(s)}{w_f}},$$

where $a \equiv \frac{1}{2}\sigma_m^2 \kappa_0$ and $b \equiv \frac{1}{2}\sigma_m^2 \kappa_1$ capture risk exposure.

Two forces determine fertility in this framework. First, children require maternal time, so their opportunity cost increases with the female wage w_f. Second, when women reduce market work to care for children, households become more exposed to uninsurable male income risk. This *risk-exposure channel* is stronger when income volatility σ_m^2 and relative male income $g(s) = \mu_m(s)/w_f$ are high. Holding mean income fixed, higher income risk reduces fertility: $\partial n^*(s)/\partial \sigma_m^2 < 0$. Consistent with this prediction, Chabé-Ferret and Gobbi (2025) show that declines in aggregate economic uncertainty can substantially increase fertility. They estimate that the lower uncertainty faced by women born in 1910 relative to those born in 1933 can account for an increase in completed fertility of 0.4–0.6 children.

The model also captures how the cyclical behavior of fertility depends on female wages.[10] When w_f is low, households rely heavily on male earnings and the relative male income $g(s)$ is high. Because male income is higher in booms, the model implies greater exposure to income risk in booms. If this risk-exposure channel outweighs the positive income effect, fertility is countercyclical (Butz and Ward, 1979; Buckles et al., 2021). As female wages rise, households become less dependent on male earnings and the risk-exposure channel weakens. The positive income effect of a boom can then dominate, making fertility procyclical.

Figure 3 illustrates this mechanism. At low female wages, fertility is lower in booms

[10] More generally, the relationship between female wages and the cyclicality of fertility need not be monotonic in this reduced-form model. The sign of the fertility response to mean male earnings depends on $w_f^2 - bw_f + ab$. The parameterization in Figure 3 is chosen to illustrate the transition from countercyclical to procyclical fertility over the relevant range of female wages.

than in recessions; at higher female wages, the reverse is true. The model therefore provides a simple explanation for why fertility has become more procyclical as women's labor force participation and earnings have increased. In addition to this state-contingent response, the full dynamic model of Coskun and Dalgic (2024) generates a precautionary effect on the average level of fertility. Because childbearing reduces mothers' labor earnings, households may choose fewer children ex ante to preserve women's labor-market attachment and earnings in future downturns, when female income is particularly valuable as insurance against shocks to male earnings.[11]

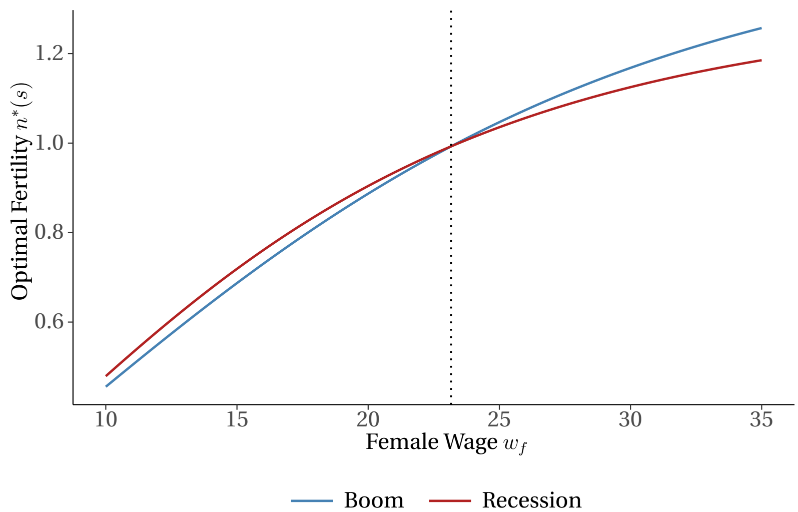

Figure 3: Fertility in Booms and Recessions as a Function of w_f

Notes: Simulating optimal fertility choices in booms ($s = B$) and recessions ($s = R$). Male earnings are given by $\mu_m(B) = 35$ and $\mu_m(R) = 17$. The remaining parameters are set to $\theta = 0.2$, $\phi = 1.5$, $\sigma_m^2 = 1$, $\kappa_0 = 8$, $\kappa_1 = 56$.

3 Understanding Persistently Low Fertility

In most advanced economies, fertility has fallen persistently below replacement and childlessness has become increasingly common. At the same time, women's educational attainment now matches or exceeds that of men in many countries, reshaping household dynamics and labor market opportunities. Competition over children's future prospects has intensified, reinforcing quantity–quality trade-offs. New medical

[11] Our static mean–variance benchmark is designed to illustrate the cyclical mechanism and does not fully capture this forward-looking precautionary response. Mean–variance approximations can attenuate or eliminate precautionary effects that depend on higher-order curvature in expected utility.

technologies, such as assisted reproductive technologies, have also altered the biological and economic constraints of childbearing. These developments call for new theoretical mechanisms that shape low-fertility environments.[12]

3.1 Bargaining over Fertility

The models considered so far adopt a unitary representation of the household: the household behaves as if its members shared a common objective. Collective household models instead allow partners to have distinct preferences and require only that household allocations be Pareto efficient (Chiappori, 1992; Chiappori and Mazzocco, 2017).[13] This distinction is especially important for fertility because a birth generally requires both partners' consent, while the costs and benefits of childbearing may be distributed unequally between them. Doepke and Kindermann (2019) formalize this idea. We illustrate their central mechanism using a simplified two-stage bargaining model. Two partners bargain over the decision to have a child $b \in \{0,1\}$. Each partner $g \in \{f,m\}$ derives utility from consumption c_g and receives a utility gain from having a child v_g:

$$u_g(c_g, b) = c_g + bv_g.$$

Market wages are w_f for women and w_m for men. Having a child entails a consumption cost ϕ. If the couple cooperates, joint consumption exhibits economies of scale, captured by $\alpha > 0$, so that:

$$c_f + c_m = (1+\alpha)(w_f + w_m - \phi b).$$

Under *full commitment*, partners can commit ex ante to future transfers. A child is born $(b = 1)$ whenever the joint benefit exceeds the total cost:

$$v_f + v_m \geq \phi(1+\alpha).$$

If this condition holds, transfers can be arranged such that both partners are better off and disagreement never arises.

The outcome changes under *limited commitment*. Suppose the couple decides whether to have a child in the first stage but cannot commit to future transfers. After the fertility

[12]Chapter 16 of this Handbook examines the economic consequences of persistently low fertility in advanced economies and discusses policies designed to address these challenges.

[13]See Blundell et al. (2005) for an extension of the collective framework to households with children and public consumption.

outcome is realized, consumption is negotiated in a second stage, with the gains from cooperation split equally between the partners. Without a child, each partner's outside option is to consume their own income: $\bar{u}_f(b = 0) = w_f$ and $\bar{u}_m(b = 0) = w_m$. If a child is born, the childcare costs are divided according to fixed shares λ_f and λ_m, with $\lambda_f + \lambda_m = 1$ and $\lambda_f > \lambda_m$, implying a larger domestic burden for the mother.[14] Recent work emphasizes that such asymmetries may arise from persistent gender norms and mismatches in expectations about household roles.[15] With a child, the partner's outside options are:

$$\bar{u}_f(b = 1) = w_f + v_f - \lambda_f \phi, \quad \bar{u}_m(b = 1) = w_m + v_m - \lambda_m \phi. \tag{1}$$

Because the mother bears a larger share of the childcare cost, having a child imposes a larger burden on her. Anticipating this outcome, she evaluates fertility not only based on the utility gain v_f, but also on the costs she will bear once the child is born. Since the father cannot commit ex ante to compensate her for this larger burden, she may veto the birth.

Formally, each partner agrees to have a child only if

$$v_f \geq \left(\lambda_f + \frac{\alpha}{2}\right)\phi, \quad v_m \geq \left(\lambda_m + \frac{\alpha}{2}\right)\phi. \tag{2}$$

Fertility therefore operates as a veto decision: a child is born only if both participation constraints are satisfied. Together, the two individual constraints reproduce the full-commitment condition, $v_f + v_m \geq (1 + \alpha)\phi$, but the converse does not hold. The joint benefit of a child may exceed its total cost even though the individual constraint of one partner is violated. If childcare costs fall disproportionately on the mother (high λ_f), her participation threshold is higher, and she may oppose a birth that would be beneficial from the household's joint perspective. Limited commitment can therefore reduce fertility below the full-commitment benchmark.

Chapter 9 of the Handbook documents widespread disagreement over desired fertility and reviews how parenting costs, bargaining within couples, limited commitment, and asymmetric information shape fertility outcomes.

[14] Our benchmark model treats these shares as fixed. Xi and Zhou (2026) instead endogenize the division of childcare and the norm governing it within a limited-commitment bargaining model. When women's relative wages rise faster than the norm adjusts, childcare remains disproportionately concentrated on mothers, raising the shadow price of children and reducing fertility.

[15] For example, Goldin (2025) argues that highly educated women increasingly prefer partners with more egalitarian views of childcare and household responsibilities, while many men continue to hold more traditional expectations. Anticipating an unequal distribution of parenting costs within couples raises the effective burden borne by women and can reduce fertility.

3.2 Status Concerns and Parenting Norms

In many high-income countries, parenting has become increasingly intensive, with growing expectations that parents devote substantial time and resources to their children's education and development (Doepke and Zilibotti, 2019). Such parenting norms may reinforce the quantity–quality trade-off and contribute to persistently low fertility.

One way to formalize these pressures is through status concerns or comparison motives: parents value not only their child's quality, but also how it compares relative to a social benchmark (Kim et al., 2024). Consider a standard quantity–quality model augmented with comparison motives:

$$
\begin{aligned}
\max_{c,n,s} \quad & \theta_c \ln c + \theta_n \ln n + \theta_q \ln\big(q - \chi\tilde{q}\big) \\
\text{s.t.} \quad & c + sn = (1-\ell)w \\
& n = \phi\ell, \quad q = \delta s \\
& 0 \le \ell \le 1, \quad \theta_c, \theta_n, \theta_q > 0, \quad \theta_c + \theta_n + \theta_q = 1 \\
& 0 \le \chi < 1, \quad q - \chi\tilde{q} > 0.
\end{aligned}
$$

The term $\ln(q - \chi\tilde{q})$ captures status concerns: parents value their child's quality q relative to a benchmark $\tilde{q}$, determined by the behavior of other parents. The parameter χ measures the strength of comparison motives.[16]

Taking $\tilde{q}$ as given, optimal per-child investment s^* and fertility n^* are:

$$
s^* = \frac{\theta_q \delta w + \theta_n \phi \chi \tilde{q}}{\delta\phi(\theta_n - \theta_q)}, \qquad n^* = \frac{\phi w \delta(\theta_n - \theta_q)}{(1-\theta_q)\big(\delta w + \phi\chi\tilde{q}\big)}.
$$

A higher benchmark quality $\tilde{q}$ induces parents to invest more per child and have fewer children, with comparison motives governing the strength of this channel.

In equilibrium, the benchmark quality must be consistent with individual choices, implying $\tilde{q} = q$ under the simplifying assumption of identical households, yielding

$$
q^{\text{eq}} = \frac{\theta_q \delta w}{\phi\big(\theta_n(1-\chi) - \theta_q\big)}, \qquad n^{\text{eq}} = \frac{\phi\big(\theta_n(1-\chi) - \theta_q\big)}{(1-\theta_q)(1-\chi)}.
$$

As comparison motives strengthen, status competition increases investment per child and reduces equilibrium fertility.

Because each household takes the social benchmark as given, it does not internalize

[16] Assume that $\theta_n(1-\chi) > \theta_q$, which ensures the existence of an interior equilibrium.

how its own investment raises the standard faced by other parents—a form of externalities. The resulting equilibrium can therefore feature excessive status-oriented investment and inefficiently low fertility. Kim et al. (2024) and Mahler et al. (2025) show that taxes on status-oriented investments can potentially restore the socially efficient allocation. Ho and Wang (2024) find that a ban on private tutoring and a cap on education costs increases fertility in a heterogeneous-agent model with endogenous marriage and fertility.

Parenting norms are only one of several social and cultural forces that shape fertility. Nakakuni et al. (2026) review theoretical and empirical research on a broader range of social norms affecting fertility. Chapter 10 of this Handbook examines how fertility norms are transmitted and diffuse across individuals, families, and regions. Chapter 12 focuses on son preference and gender bias, including dowry systems, patrilineal inheritance, and expectations about old-age support, and discusses their implications for stopping behavior, birth spacing, and prenatal selection.

3.3 Family Policies and Labor Market Institutions

Persistently low fertility in many advanced economies has renewed interest in pro-natal family policies, such as childcare subsidies, tax benefits, cash transfers, and parental leave. While such policies can increase fertility, their effects vary widely across countries and policy designs (Olivetti and Petrongolo, 2017; Doepke et al., 2023; Hart et al., 2024). Their effectiveness depends in part on the broader institutional environment, particularly on whether labor market structures and workplace practices allow parents to combine parenting and careers.

Structural models provide a useful framework for studying these interactions by distinguishing short-run responses, such as the timing of births, from long-run outcomes such as completed fertility and welfare effects (Erosa et al., 2010). In standard fertility models, transfers raise fertility by relaxing the household resource constraint. Consistent with this prediction, Adda et al. (2017) and Cruces and Rodríguez-Román (2025) find that child benefits increase fertility in the short run, with smaller effects on completed fertility. In a heterogeneous-agent life-cycle model for the United States, Zhou (2025) shows that transfers raise fertility primarily among low-income households, but may also reduce investment per child, increasing inequality.

Beyond financial incentives, workplace flexibility is central to the compatibility of careers and children (Goldin, 2014). Rigid schedules, long hours, or limited control over working time make it difficult to reconcile careers and parenting (Guner et al., 2026). To illustrate this mechanism, consider a version of the baseline model that includes leisure and an additional time cost of children arising from workplace inflexibility:

$$\begin{aligned}\max_{c,n,\ell,h} \quad & \theta \ln c + \gamma \ln n + (1-\theta-\gamma)\ln(1-h-\ell-\eta w n) \\ \text{s.t.} \quad & c = wh, \\ & n = \phi \ell, \\ & 0 \le h, \ell \le 1.\end{aligned}$$

The term $\eta w n$ captures the additional time burden of raising children in inflexible jobs, where $\eta > 0$ measures the severity of workplace frictions. These frictions may reflect rigid schedules, minimum-hours requirements, or expectations of long working hours. Optimal fertility is given by

$$n^* = \frac{\gamma}{1/\phi + \eta w},$$

which shows that greater labor-market inflexibility (higher η) reduces fertility by increasing the effective time cost of children.

Quantitative models confirm the importance of these mechanisms. Guner et al. (2024) study split-shift schedules in Spain and find that eliminating this fixed daily cost of work raises fertility by about 6%. They also show that reducing employment risk among temporary workers can increase both fertility and female employment. For Korea, Kim and Yum (2025) emphasize minimum-hours requirements and barriers to entering or re-entering stable career tracks. Removing these barriers increases completed fertility and changes the effects of parental leave reforms.[17]

3.4 Childlessness and the Extensive Margin of Fertility

Many fertility models treat the number of children as a continuous choice and therefore abstract from the discrete decision of whether to become a parent. It is useful to distinguish between the *extensive margin* (whether to have any children) and the *intensive margin* (how many children to have conditional on becoming a parent). This distinction has become increasingly important because childlessness can reach 30% in some female cohorts in advanced economies (Gobbi, 2013).

Baudin et al. (2015) document two key patterns. First, conditional on having children, fertility declines with education. Second, childlessness is U-shaped in education:

[17] Yamaguchi (2019) builds a structural model incorporating dual labor markets in Japan and studies the effects of parental leave policies on fertility.

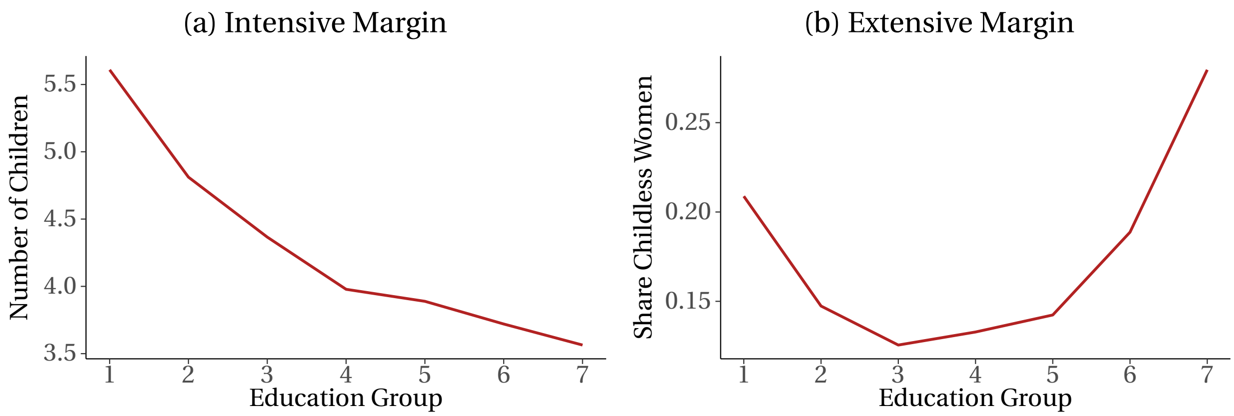

Figure 4: Intensive and Extensive Margins of Fertility

Notes: The data come from the 5% sample of the 1990 U.S. Census. The sample includes women aged 45 and older. Fertility is measured by children ever born. Education is grouped into seven categories: (1) No schooling; (2) Primary schooling; (3) Less than high school; (4) High school degree, (5) Some college; (6) Four-year bachelor's degree; (7) More than a four-year bachelor's degree.

it is highest among the least and the most educated women. Figure 4 illustrates these patterns using data from the 1990 U.S. Census.

Baudin et al. (2015) refer to childlessness among the least educated women as "social sterility": these women are biologically capable of having children, but cannot afford to do so. At the top of the education distribution, high wages raise the opportunity costs of parental time, making childlessness more likely among highly educated women.

To capture these mechanisms, we use female wages w_f as a reduced-form measure of education. We introduce $\nu > 0$, which makes utility well defined at zero fertility, and a fixed cost of motherhood $\underline{c}_f > 0$. The household solves

$$\begin{aligned} \max_{c,n,\ell} \quad & \theta \ln c + (1-\theta)\ln(n+\nu) \\ \text{s.t.} \quad & c + \underline{c}_f \mathbb{I}(n>0) = (1-\ell)w_f + w_m - \tau w_f^2 n, \\ & n = \phi\ell \\ & 0 \le \ell \le 1, \quad 0 < \theta < 1, \quad \nu, \tau > 0 \end{aligned}$$

The term $\tau w_f^2 n$ captures career costs associated with motherhood that rise more than proportionally with female wages.[18] Conditional on becoming a parent and assuming

[18]This specification is motivated by evidence in Goldin (2014) that career penalties are particularly severe in high-paying occupations.

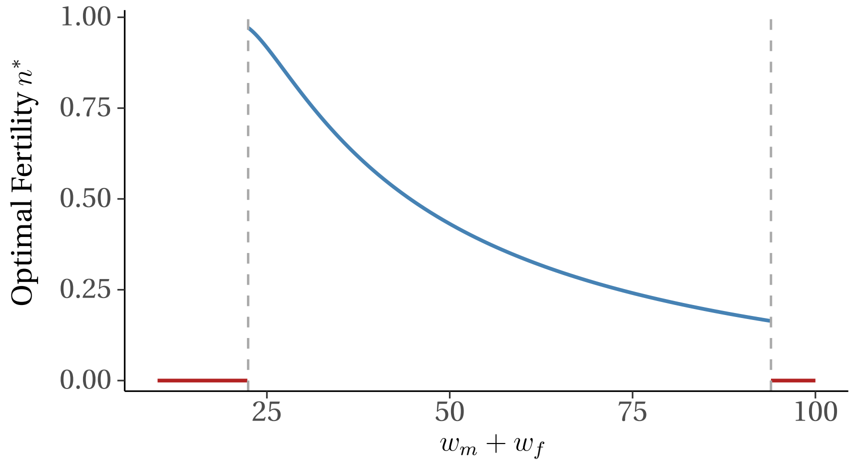

Figure 5: Childlessness and Fertility when Wages (w_f, w_m) Vary

Notes: The figure plots optimal fertility along a one-dimensional wage path. Female wage w_f rises from 0.05 to 50, while the male wage w_m rises from 10 to 50, with observations paired by their position on the two wage grids. Thus, combined earnings $w_f + w_m$ rise from 10.05 to 100, while the gender wage gap closes: the female-to-male wage ratio w_f/w_m rises from 0.005 to 1. The horizontal axis therefore captures both rising household earnings and convergence between female and male wages. The remaining parameters of the decision problem are $\theta = 0.45$, $\phi = 12$, $\nu = 0.3$, $\underline{c}_f = 15$, and $\tau = 0.065$.

an interior solution, optimal fertility is

$$n^*_{int} = \frac{(1-\theta)(w_m + w_f - \underline{c}_f)}{\frac{w_f}{\phi} + \tau w_f^2} - \theta\nu.$$

Let U_{int} denote utility evaluated at the optimal interior fertility choice n^*_{int}. If the household remains childless, utility is $U_0 \equiv \theta \ln(w_m + w_f) + (1-\theta)\ln \nu$.

Combining the extensive and intensive margins yields

$$n^* = \begin{cases} 0, & \text{if} \quad U_0 > U_{int} \\ n^*_{int} & \text{otherwise}. \end{cases}$$

Figure 5 illustrates the two routes to childlessness. At very low income levels, households cannot afford the fixed cost $\underline{c}_f$, leading to childlessness. As income rises, fertility becomes positive. However, when female wages become sufficiently high, the opportunity cost of time and the wage penalty associated with motherhood dominate, making childlessness optimal again. The model therefore generates a U-shaped relationship between education and childlessness, as in the data.

Chapter 15 of this Handbook examines the extensive margin in greater depth, including the roles of economic constraints, delayed childbearing, partnership dynamics, and changing family norms.

3.5 Delayed Childbirth and Infertility Risk

Rising female education and labor force participation have strengthened incentives to invest in careers before having children. Delaying childbirth allows women to accumulate experience and raise future earnings, but also increases the risk of infertility at older ages. Figure 6 documents the rise in the mean age at first birth and the growing use of assisted reproductive technology (ART) for six OECD countries.

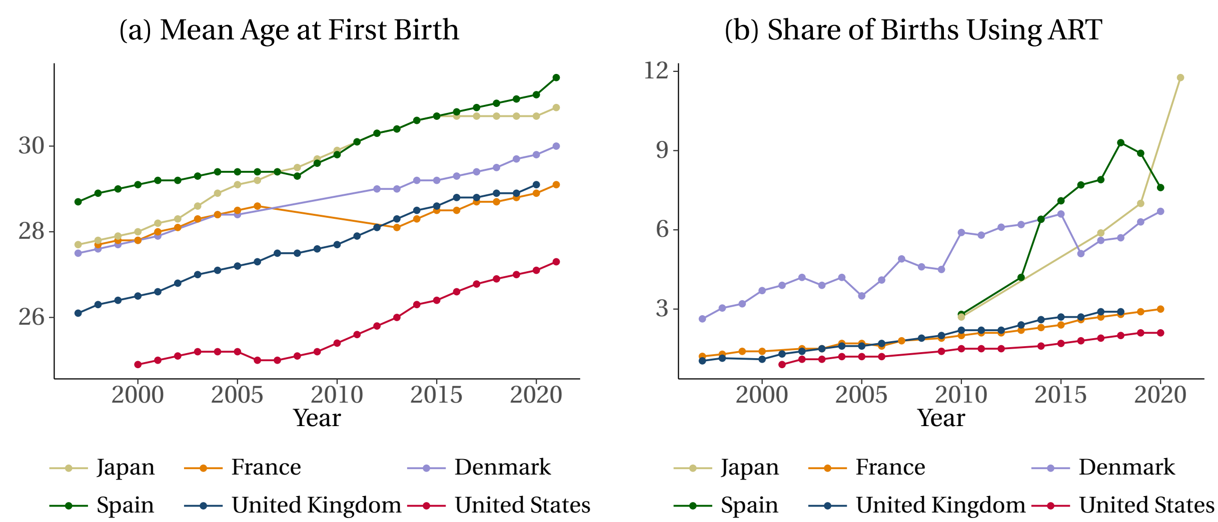

Figure 6: Delayed Childbearing and ART Use

Notes: ART stands for assisted reproductive technology. Data for mean age at first birth come from the OECD database. Data for the share of births using assisted reproductive technology are collected from ESHRE for European countries and the CDC for the United States.

To capture the trade-off between career investment and fertility risk, consider a two-period model in which a woman has children either early or late, but not in both periods. Having children requires parental time ℓ, with $n = \phi\ell$. For simplicity, consumption receives the same utility weight $\theta_c > 0$ in both periods, while $\theta_n > 0$ is the utility weight on children. If the woman has children early, she reduces market work in period 1 but works full time in period 2. Her value is

$$V_E = \max_{0<\ell_E<1} \left\{\theta_c \ln\left[w(1-\ell_E)\right] + \theta_c \ln w + \theta_n \ln(\phi\ell_E)\right\}.$$

If she postpones childbearing and works full time in period 1, her period-2 wage rises to $(1+\rho)w$, where $\rho > 0$ is the return to early career investment. However, postponing childbirth involves infertility risk: in period 2, childbearing is successful only with probability $p_n < 1$, so the value of postponement is[19]

$$V_L = \max_{0<\ell_L<1} \left\{\theta_c \ln w + \theta_c \ln\big[(1+\rho)w(1-\ell_L)\big] + \theta_n \ln(p_n \phi \ell_L)\right\}.$$

The first-order conditions imply that optimal parental time is the same under early and late childbearing:

$$\ell_E^* = \ell_L^* = \frac{\theta_n}{\theta_c + \theta_n}.$$

Substituting these choices into the two value functions, all terms common to the two alternatives cancel, leaving

$$V_L - V_E = \theta_c \ln(1+\rho) + \theta_n \ln p_n.$$

The first term is the utility gain from higher future earnings, while the second captures the cost of infertility risk. The woman is indifferent between early and late childbearing when $V_L = V_E$, which yields the threshold

$$p_n^* = \frac{1}{(1+\rho)^{\theta_c/\theta_n}}.$$

Women delay childbirth whenever $p_n > p_n^*$. A higher return to early career investment, ρ, lowers the threshold probability required for postponement. The woman is therefore willing to delay childbearing even when the probability of successful late childbearing is lower. Reproductive technologies that raise p_n also make postponement more attractive. ART may therefore both mitigate age-related infertility and strengthen incentives to delay childbearing.

More elaborate models add uncertainty, option values, and marriage-market interactions. de la Croix and Pommeret (2021) model childbearing as an irreversible investment with an option value when motherhood increases income risk. Sommer (2016) shows that uninsurable earnings risk can induce precautionary postponement and reduce completed fertility as conception probabilities decline with age. Low (2024) studies how women's human capital and reproductive capacity jointly shape marriage-market sorting. Chapter 29 of this Handbook reviews the effects of ART on education, careers, marriage, and fertility.

[19] For tractability, fertility utility depends on expected rather than realized fertility.

4 Fertility in Developing Countries and Economic Growth

The demographic transition, the shift from high fertility and mortality rates to low levels of both, originated in Northern Europe in the late eighteenth century and has since spread across the world (Delventhal et al., 2024). Yet many canonical theories of fertility decline were developed from the historical or contemporary experience of high-income countries. This section turns to mechanisms that are particularly salient in developing economies, including customary institutions, imperfect fertility control, and the interaction between fertility and economic growth.

4.1 Fertility in Developing Countries

Across the world, lower fertility is generally associated with higher human capital and GDP per capita and with lower child and maternal mortality, broadly consistent with the theories discussed in Section 2. These variables, however, explain much less of the within-country variation in fertility declines over the past half century. For example, fertility declines have been substantially smaller than predicted by improvements in economic and health conditions in Sub-Saharan Africa, whereas declines in Latin America and East Asia have been substantially larger than predicted. Gobbi et al. (2026) argue that family institutions mediate how fertility responds to economic and health improvements. In Sub-Saharan Africa, for example, statutory law often coexists with customary law, a system of locally rooted rules and norms historically developed within ethnic communities. Customary law regulates areas such as marriage and divorce (bride price and polygyny), inheritance and land rights, and dispute resolution within communities.

Customary Law: Polygyny Polygyny is a form of marriage in which one man is married to multiple women at the same time. It has historically been practiced in many societies, particularly in parts of Sub-Saharan Africa, the Middle East, and Asia, and is often governed by customary law. Today, polygyny remains prevalent in several Sub-Saharan African countries.

To understand the effect of polygyny on fertility, consider a man with income y who chooses consumption c, the number of wives f, and the total number of children n. Each wife requires the payment of a bride price p. Children are costly to raise, and the total cost of raising children is assumed to be convex in the number of children and decreasing in the number of wives, given by $\frac{n^2}{f}$. The man therefore solves:

$$\max_{c,n,f} \quad \theta \ln c + (1-\theta)\ln n, \qquad 0<\theta<1$$
$$\text{s.t.} \quad c + pf + \frac{n^2}{f} = y,$$
$$c>0,\ n>0,\ f>0.$$

Optimal choices are given by:

$$n^* = (1-\theta)\frac{y}{2\sqrt{p}} \qquad\qquad f^* = (1-\theta)\frac{y}{2p}.$$

Polygyny arises whenever $f^* > 1$, or $p < \frac{1-\theta}{2}y$. The model highlights a key trade-off: additional wives are costly because of the bride price, but they reduce the convex costs of childbearing by allowing births to be spread across multiple wives. When bride prices are sufficiently low relative to income, men optimally choose to marry multiple wives.

Tertilt (2005) embeds this mechanism in a richer model linking polygyny, fertility, savings, and economic development. Under polygyny, competition among men for wives gives rise to positive bride prices. Since fathers receive these payments when daughters marry, children, especially daughters, become a profitable investment. This encourages higher fertility while reducing incentives to accumulate physical capital for old-age support. In contrast, when monogamy is enforced, bride prices typically become dowries (i.e., payments from the bride's family), making children financially costly and encouraging lower fertility and higher savings.[20] In the calibrated model, banning polygyny reduces fertility by around 40%, increases savings by about 70%, and more than doubles output per capita.

Customary Law: Impartible Inheritance Inheritance customs likely emerged from a combination of economic, institutional, and cultural forces. *Partible inheritance* refers to systems in which land is divided among all heirs, whereas under *impartible inheritance* land is transferred to a single heir, typically the eldest son.

From an economic perspective, impartible inheritance was more likely to emerge where land was the primary source of wealth and small plots of land reduced agricultural productivity (Fontenay et al., 2025). In such settings, partible inheritance gives

[20] Marriage institutions may themselves evolve endogenously with economic development. For example, de la Croix and Mariani (2015) develop a theory in which political conflict among men and women of different socioeconomic groups leads societies to transition from polygyny to monogamy and eventually serial monogamy as income and human capital rise.

households an incentive to limit the number of children to avoid dividing land into inefficiently small parcels. Consequently, fertility tends to be higher under impartible inheritance, where land is transmitted to a single heir, than under partible inheritance.

To illustrate this mechanism, consider a household with land endowment L that chooses consumption c and fertility n:

$$\begin{aligned} \max_{c,n} \quad & \theta \ln c + (1-\theta)\ln(ny_i'), \qquad 0<\theta<1 \\ \text{s.t.} \quad & c = (1-\ell)y \\ & n = \phi\ell \end{aligned}$$

where y denotes parental income and ℓ is the fraction of parental time devoted to parenting. Children generate utility through their future income y_i', which depends on the inheritance system $i \in \{I, P\}$.

Households rely on subsistence agriculture. First consider what happens under *impartible inheritance* customs ($i = I$). Land is passed on to a single heir, but all children work collectively on the family farm. In this case, the children's future income grows proportionally with their number. Total future income is thus given by $ny_I' = A(L)n$, where $A(L)$ captures the productivity of land. The marginal benefit of having children is therefore constant. Optimal fertility, n_I^*, is given by

$$n_I^* = (1-\theta)\phi.$$

Under *partible inheritance* ($i = P$), land is divided equally among all children. Since farming is more productive on large plots, the fragmentation of land reduces the productivity and the total output: $ny_P' = A(L)n^\alpha$, where $\alpha \in (0,1)$ captures the extent to which land fragmentation reduces productivity.

The optimal number of children under partible inheritance n_P^* is thus

$$n_P^* = (1-\theta)\phi\frac{\alpha}{\theta + (1-\theta)\alpha}.$$

The two inheritance regimes generate different fertility incentives. Under partible inheritance, land fragmentation reduces the marginal benefit of additional children. Since $\alpha < 1$, fertility is lower under partible inheritance than under impartible inheritance, $n_P^* < n_I^*$. Empirical evidence is consistent with this prediction. Fontenay et al. (2025) find that women from ethnic groups practicing impartible inheritance in Sub-Saharan Africa have roughly one additional child. Similarly, Gay et al. (2025) show that inheritance customs contributed to regional fertility differences in France and that the introduction of partible inheritance after the French Revolution contributed to the country's early fertility decline.

Contraception and Human Capital Investment Bhattacharya and Chakraborty (2017) and Strulik (2017) emphasize the effect of contraceptive progress on human-capital accumulation. By narrowing the gap between desired and realized fertility, better fertility control reduces unintended births and frees resources for investment in each child. It can therefore reinforce the quantity–quality trade-off and contribute to long-run development.

To illustrate this mechanism, let n_t^d denote desired fertility, which is taken as given, and n_t realized fertility. When fertility control is imperfect,

$$n_t = n_t^d + u_t(1 - \kappa_t),$$

where $u_t > 0$ denotes the number of potential unintended births in the absence of effective fertility control and $\kappa_t \in [0, 1]$ measures contraceptive effectiveness. Thus, $\kappa_t = 1$ implies $n_t = n_t^d$. Each realized child requires $\phi > 0$ units of parental time for basic childcare and receives educational investment e_t. Normalizing the parental time endowment to one gives $n_t(\phi + e_t) = 1$. Substituting for realized fertility and solving for e_t yields[21]

$$e_t = \frac{1}{n_t^d + u_t(1 - \kappa_t)} - \phi.$$

Suppose that human capital evolves according to $h_{t+1} = (1 + Ae_t)h_t$, with $A > 0$. The net growth rate of human capital, g_t, is therefore:

$$g_t \equiv \frac{h_{t+1} - h_t}{h_t} = Ae_t = A\left(\frac{1}{n_t^d + u_t(1 - \kappa_t)} - \phi\right).$$

Figure 7 illustrates these comparative statics for a desired family size of three. As contraceptive effectiveness rises, realized fertility approaches desired fertility. The resulting decline in unintended births frees parental time for educational investment, raising the net growth rate of human capital. The economy therefore moves from a high-fertility, low-investment allocation toward one with lower realized fertility and greater investment per child.

[21] For educational investment to be nonnegative, $e_t \geq 0$, the fixed childcare time $n_t\phi$ must not exceed the parental time endowment: $n_t\phi \leq 1$.

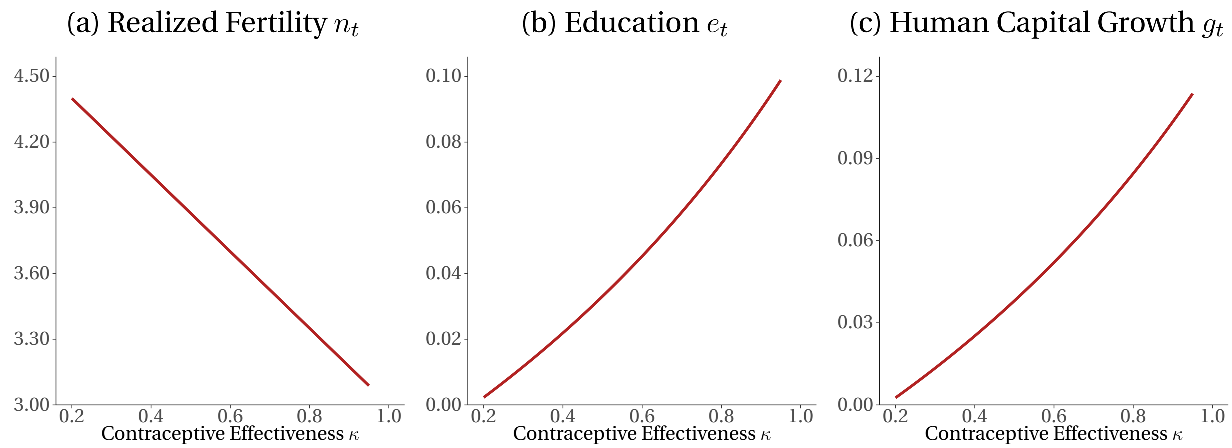

Figure 7: Economic Transition and Contraceptive Effectiveness κ

Notes: The figure plots realized fertility, educational investment per child, and the net growth rate of human capital as contraceptive effectiveness κ_t varies from 0.20 to 0.95. The following parameters are assumed: $n^d = 3.0$, $u = 1.75$, $\phi = 0.225$, and $A = 1.15$. The lower bound on κ_t ensures that educational investment is nonnegative throughout the simulated range.

Cavalcanti et al. (2020) document that about 39% of pregnancies in the developing world are unplanned, with particularly large gaps between realized and desired fertility among poorer households. In an overlapping-generations model calibrated to Kenya, policies that lower monetary and nonmonetary barriers to contraception or improve its effectiveness reduce unintended fertility, increase investment in children's human capital, and raise long-run income.

The empirical effects of family-planning programs are nevertheless more mixed than this benchmark mechanism suggests. Chapter 20 of this Handbook shows that expanded access to modern contraception often increases contraceptive use but has only modest effects on fertility, suggesting a potentially important role for social norms, religion, and family institutions. Chapter 21 examines how political, legal, and institutional constraints shape access to abortion and its effects on fertility, health, education, and earnings. We return to the broader relationship between fertility and economic growth in Section 4.2.

Family Size Norms and Population Control Policies Fertility choices may reflect not only economic incentives but also pressure to conform to prevailing family-size norms. Models typically capture this pressure through a utility cost of deviating from a reference group's fertility. Some studies define the norm using contemporaneous peers or average fertility within a social group (Palivos, 2001; Manski and Mayshar, 2003; Ciliberto et al., 2016), while others emphasize its intergenerational transmission (de Silva and Tenreyro, 2020; Guo et al., 2026).[22]

de Silva and Tenreyro (2020), for example, incorporate evolving family-size norms into a quantitative model of endogenous fertility and human-capital accumulation. Parents value both the number and quality of children but incur a cost when their fertility deviates from the prevailing norm, which evolves as a weighted average of past fertility and replacement-level fertility. Calibrating the model to developing countries in 1960, the authors find that human capital accumulation alone produces only a modest fertility decline. Population-control policies that promote smaller family norms, by contrast, substantially accelerate the decline.

Part III of this Handbook examines the determinants of access to family planning, contraception, and abortion in low- and middle income countries in greater depth.

4.2 Fertility in Theories of Economic Growth

Population plays sharply different roles across theories of economic growth. In the Malthusian framework, fertility rises with income while land is fixed. Productivity gains therefore raise living standards only temporarily: higher income increases fertility and population, which reduces land per person until income returns toward subsistence. In the long run, technological progress is absorbed primarily by a larger population rather than by sustained growth in income per capita. See Greenwood (2019, Chapter 2) for a simple formal treatment of the Malthusian framework.

Most modern growth models break this feedback by treating population growth as exogenous. In the Solow (1956) model, faster population growth dilutes capital and lowers steady-state output per worker. Idea-based growth models instead assign population a potentially growth-enhancing role. In Romer (1990), a larger population expands the pool of researchers and accelerates idea production. Jones (2022) shows the converse implication: persistent population decline reduces the future supply of researchers and may eventually bring idea-driven growth to a halt.[23]

The contrast is stark. Malthusian theory views population primarily as pressure on a fixed resource, the Solow model emphasizes capital dilution, and idea-based growth models view people as producers of new ideas. Yet, with the exception of the Malthusian framework (and the extension in Jones (2022)), fertility is usually taken as exogenous. The models considered next fill this gap by allowing households to choose both

[22] Nakakuni et al. (2026) review theoretical and empirical research on family-size norms as part of a broader discussion of social norms and fertility.

[23] Jones (2022) first considers exogenous population decline and then develops an extension in which fertility is chosen through the allocation of time between market work and childbearing.

the number of children and human capital investment, thereby linking population dynamics and human-capital accumulation to economic growth.

Growth with Endogenous Fertility and Human Capital Building on the quantity–quality framework in Section 2.2, a subsequent literature placed fertility at the center of economic growth analysis. Early contributions include Becker and Barro (1988) and Barro and Becker (1989), who develop a dynastic model in which fertility decisions are embedded within an intergenerational altruism framework. In these frameworks, fertility becomes a forward-looking investment decision that determines both the size and the human capital of future generations.

To illustrate the core mechanism in a tractable way, we consider a simplified framework in which households choose consumption, the number of children, and educational investment in each child, while firms produce output using labor in competitive markets. Parents derive utility from their own consumption, the number of children, and educational investment per child:

$$
\begin{aligned}
\max_{c_t, n_t, e_t} \quad & \theta_c \ln(c_t - \underline{c}) + \theta_n \ln n_t + \theta_h \ln h_{t+1}, \qquad \theta_c + \theta_n + \theta_h = 1 \\
\text{s.t.} \quad & c_t = w_t \left[1 - n_t(\phi + e_t)\right] \\
& h_{t+1} = h_t(1 + \psi_t e_t)^{\eta}, \qquad 0 < \eta < 1.
\end{aligned}
$$

Here, c_t is parental consumption, n_t fertility, and e_t educational investment per child. Each child requires a fixed amount $\phi > 0$ of basic childcare time in addition to educational time e_t. The parameter $\underline{c} > 0$ denotes subsistence consumption,[24] $\psi_t > 0$ measures the productivity of educational investment, and η governs diminishing returns. Since childcare and education use parental time, the cost of children rises with the wage rate w_t.

Solving the household problem yields the optimal education decision

$$
e_t^* = \frac{\theta_h \eta}{\theta_n - \theta_h \eta} \phi - \frac{\theta_n}{\psi_t(\theta_n - \theta_h \eta)},
$$

and optimal fertility

$$
n_t^* = \frac{\theta_n}{\theta_c + \theta_n} \cdot \frac{1 - \underline{c}/w_t}{\phi + e_t^*}.
$$

These expressions highlight the central quantity-quality trade-off. An increase in the

[24]The subsistence term ensures that fertility rises with income once subsistence consumption is covered.

productivity of education ψ_t raises the return to investing in children, leading households to increase educational investment per child, e_t^*, while reducing fertility, n_t^*.[25] By contrast, higher wages w_t raise income net of subsistence and, when subsistence consumption is covered, tend to increase fertility through an income effect.

Let m_t denote the available market time per adult: $m_t \equiv 1 - n_t(\phi + e_t)$. Aggregate output Y_t is produced by competitive firms using total effective labor H_t:

$$Y_t = A_t H_t, \qquad H_t = N_t m_t h_t,$$

where N_t is the adult population and A_t denotes total factor productivity. Output per worker is given by

$$y_t = \frac{Y_t}{N_t m_t} = A_t h_t,$$

so that improvements in human capital translate into higher future income. With linear production, the wage per unit of market time is $w_t = A_t h_t$. Fertility chosen in period t determines the size of the next adult generation $N_{t+1} = n_t N_t$, while educational investment determines its human capital h_{t+1}. Next period's output per worker is

$$y_{t+1} = A_{t+1} h_{t+1} = A_{t+1} h_t (1 + \psi_t e_t^*)^{\eta}.$$

Fertility thus affects aggregate output through the size of the next generation, while educational investment raises output per worker through human-capital accumulation. In this benchmark, the shift from child quantity to child quality is driven by a rise in the productivity of education, ψ_t. An increase in total factor productivity A_t alone raises wages and, through the income effect, tends to increase rather than reduce fertility.

Figure 8 illustrates the impact of changes in the productivity of education ψ_t. Panels 8a–8c show that a higher ψ_t increases investment in child quality and reduces fertility, reflecting the quantity–quality trade-off. The resulting increase in human capital raises next-period output per worker, y_{t+1}, implying that improvements in the productivity of education translate into economic growth.

Richer dynamic models develop these mechanisms in several directions. Becker et al. (1990) generate poverty traps through the interaction of fertility and human-capital accumulation, while Galor and Weil (1996, 2000) embed the quantity–quality trade-off in theories of the demographic transition and long-run growth. de La Croix and Doepke (2003) show how fertility differentials across households can transmit income inequality

[25] An interior household solution requires $w_t > \underline{c}$, $\theta_n > \theta_h \eta$, $\psi_t > \frac{\theta_n}{\theta_h \eta \phi}$. Within this region, a rise in the productivity of education increases educational investment per child and reduces fertility.

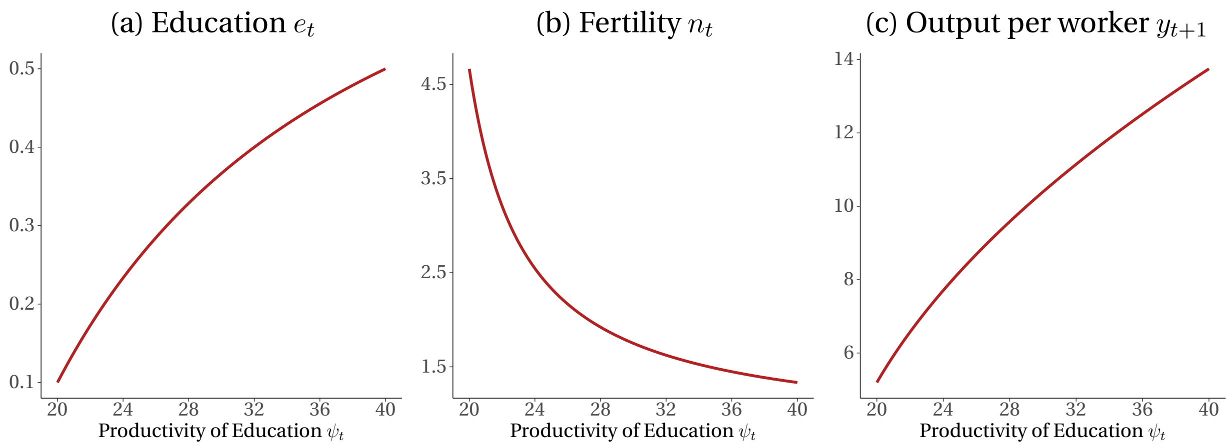

Figure 8: Quality and Quantity of Children and Economic Growth

Notes: We simulate the model as the productivity of education ψ_t ranges from 20 to 40. The model is parameterized as follows: $\theta_c = 0.08$, $\theta_n = 0.32$, $\theta_h = 0.60$, $\phi = 0.06$, $\underline{c} = 0.2$, $\eta = 0.5$ and $h_t = 1$. We restrict the calibration to an interior solution of the household problem.

into aggregate human-capital accumulation, and Manuelli and Seshadri (2009) extend the framework to incorporate health capital.

The Demographic Transition Around the World Recent quantitative models embed endogenous fertility into theories of long-run growth to explain differences in the timing and speed of the demographic transitions across countries. Delventhal et al. (2024) develop a framework, in which households choose both the number of children and educational investment, generating a standard quantity-quality trade-off. The economy combines a land-intensive ancient sector with a modern sector that relies more heavily on skilled labor. Production and medical technologies originate in a frontier economy, calibrated to Great Britain, and diffuse across countries, with the speed of diffusion declining with geographic distance from the frontier.

The model generates a three-stage demographic transition. In the first stage, the economy is in a Malthusian regime characterized by high fertility and high mortality, stagnant productivity and medical knowledge, and low educational investment. In the second stage, improvements in medical technology reduce mortality, while fertility remains initially high, generating a temporary surge in population growth. Finally, continued technological progress raises the demand for skilled labor and the returns to human capital. Parents respond by having fewer children and investing more in each child, moving the economy toward a low-fertility, high-human-capital regime. The model replicates cross-country differences in the timing of fertility decline, the faster pace of later transitions, and the accompanying rise in educational attainment. Despite a vast literature on the determinants of fertility transitions and the link to economic growth (Chatterjee and Vogl, 2018), important questions remain about how demographic change contributes to economic development and why these mechanisms vary across countries.

5 Avenues for Future Research

Over the past century, the economic analysis of fertility has evolved from explaining the long-run fertility decline to understanding the persistence of very low fertility and its macroeconomic consequences. The theories reviewed in this chapter highlight the interaction of economic incentives, technology, institutions, and social norms in shaping fertility behavior. Yet important questions remain about how these forces interact, how they vary across countries and over time, and how policy can respond. We conclude by highlighting several promising avenues for future research.

Marriage Markets and Fertility Most childbearing occurs within partnerships, but marriage formation and fertility are still analyzed separately in much of the literature. Recent work has begun to bridge this gap by endogenizing marriage and fertility decisions.[26] Despite these advances, relatively little work examines how marriage-market outcomes and fertility decisions interact.[27] In addition, most existing models remain static. Dynamic equilibrium models incorporating marriage markets, fertility, and child investment therefore remain a promising direction. Early contributions such as Caucutt et al. (2002) and Greenwood et al. (2003) point the way.

Fertility, Business Cycles, and Stabilization Policies Fertility responds to aggregate economic conditions (Cumming and Dettling, 2024; Dettling and Kearney, 2026), but the fertility effects of policy-driven aggregate fluctuations are less well understood. How do interest-rate changes, fiscal transfers, unemployment insurance, and tax reforms affect conceptions, birth timing, completed fertility, and investment in children? Models that distinguish temporary postponement from permanent reductions in fertility have

[26] For example, Kitao and Nakakuni (2026), building on Greenwood et al. (2021), incorporate gender differences to study the joint decline in marriage and fertility in Japan. Myong et al. (2020) extend the model of Baudin et al. (2015) by introducing social norms governing marriage and childbearing, while Ho and Wang (2024) incorporate a quality-of-children margin.

[27] An exception is Kennes and Knowles (2024), who develop an equilibrium matching model to explain the rise in births to unmarried women in the United States.

the potential to link the economics of demographic change to the macroeconomic stabilization literature.

Economics of Fatherhood Fatherhood remains one of the least developed margins of fertility theory. Most models treat fertility either as a woman's decision or as the choice of a representative couple, leaving limited room for heterogeneity in men's partnership formation, fertility, and investment in children. Models incorporating male childlessness, nonresident fatherhood, child-support obligations, and paternal time investment could help explain socioeconomic differences in fatherhood and their consequences for children and inequality. Chapter 14 of this Handbook examines these issues in greater depth.

Heterogeneous Demographic Transitions and Economic Growth Canonical growth models typically generate a common sequence: technological progress raises the returns to human capital, parents substitute from child quantity to quality, and lower fertility is accompanied by rising income per capita. Yet the timing, speed, and economic consequences of fertility decline vary widely across countries (Delventhal et al., 2024). In some historical settings, fertility began to fall before sustained economic growth, while parts of Sub-Saharan Africa have experienced fertility declines without gains in income or human capital (Gobbi et al., 2026; Gobbi and Hannusch, 2026). Understanding these heterogeneous paths could clarify when fertility decline is a cause, a consequence, or merely a correlate of economic development.

Welfare and Policy with Endogenous Population Policy evaluation is especially challenging when fertility is endogenous. Family policies affect not only the allocation of resources among existing households but also the size and composition of future generations. Fertility choices may create fiscal, human-capital, and idea-production externalities that households do not internalize, while policies that alter who will exist raise difficult questions about the appropriate social-welfare criterion. Quantifying these externalities and clarifying the relevant welfare criterion are essential for evaluating pronatal policies, family-planning programs, and other interventions that shape population dynamics.

References

Abel, A. B. (1990). Asset Prices under Habit Formation and Catching up with the Joneses. *American Economic Review 80*(2), 38–42.

Adda, J., C. Dustmann, and K. Stevens (2017). The Career Costs of Children. *Journal of Political Economy 125*(2), 293–337.

Albanesi, S. and C. Olivetti (2016). Gender Roles and Medical Progress. *Journal of Political Economy 124*(3), 650–95.

Bailey, M. J. (2010). "Momma's Got the Pill": How Anthony Comstock and Griswold v. Connecticut Shaped US Childbearing. *American Economic Review 100*(1), 98–129.

Balbo, N., F. C. Billari, and M. Mills (2013). Fertility in Advanced Societies: A Review of Research. *European Journal of Population 29*(1), 1–38.

Bar, M., M. Hazan, O. Leukhina, D. Weiss, and H. Zoabi (2018). Why Did Rich Families Increase their Fertility? Inequality and Marketization of Child Care. *Journal of Economic Growth 23*(4), 427–463.

Barro, R. and G. Becker (1989). Fertility Choice in a Model of Economic Growth. *Econometrica 57*(2), 481–501.

Baudin, T., D. de la Croix, and P. E. Gobbi (2015). Fertility and Childlessness in the United States. *American Economic Review 105*(6), 1852–1882.

Becker, G. S. (1960). *An Economic Analysis of Fertility.* Princeton University Press.

Becker, G. S. and R. J. Barro (1988). A Reformulation of the Economic Theory of Fertility. *Quarterly Journal of Economics 103*(1), 1–25.

Becker, G. S. and H. G. Lewis (1973). On the Interaction between the Quantity and Quality of Children. *Journal of Political Economy 81*(2), S279–S288.

Becker, G. S., K. M. Murphy, and R. Tamura (1990). Human Capital, Fertility, and Economic Growth. *Journal of Political Economy 98*(5, Part 2), S12–S37.

Becker, G. S. and N. Tomes (1976). Child Endowments and the Quantity and Quality of Children. *Journal of Political Economy 84*(4), S143–S162.

Bhattacharya, J. and S. Chakraborty (2017). Contraception and the Demographic Transition. *Economic Journal 127*(606), 2263–2301.

Blundell, R., P.-A. Chiappori, and C. Meghir (2005). Collective Labor Supply with Children. *Journal of Political Economy 113*(6), 1277–1306.

Boldrin, M., M. De Nardi, and L. E. Jones (2015). Fertility and Social Security. *Journal of Demographic Economics 81*(3), 261–299.

Boldrin, M. and L. E. Jones (2002). Mortality, Fertility, and Saving in a Malthusian Economy. *Review of Economic Dynamics 5*(4), 775–814.

Buckles, K., D. Hungerman, and S. Lugauer (2021). Is Fertility a Leading Economic Indicator? *Economic Journal 131*(634), 541–565.

Butz, W. P. and M. P. Ward (1979). The Emergence of Countercyclical U.S. Fertility. *American Economic Review 69*(3), 318–328.

Campbell, J. Y. and J. H. Cochrane (1999). By Force of Habit: A Consumption-based Explanation of Aggregate Stock Market Behavior. *Journal of Political Economy 107*(2), 205–251.

Caucutt, E. M., N. Guner, and J. Knowles (2002). Why Do Women Wait? Matching, Wage Inequality, and the Incentives for Fertility Delay. *Review of Economic Dynamics 5*(4), 815–855.

Cavalcanti, T., G. Kocharkov, and C. Santos (2020). Family Planning and Development: Aggregate Effects of Contraceptive Use. *Economic Journal 131*(634), 624–657.

Cervellati, M. and U. Sunde (2005). Human Capital Formation, Life Expectancy, and the Process of Development. *American Economic Review 95*(5), 1653–1672.

Chabé-Ferret, B. and P. E. Gobbi (2025). Economic Uncertainty and Fertility Cycles: Baby Boom and Busts in Twentieth Century America. Unpublished.

Chatterjee, S. and T. Vogl (2018). Escaping Malthus: Economic Growth and Fertility Change in the Developing World. *American Economic Review 108*(6), 1440–1467.

Chiappori, P.-A. (1992). Collective Labor Supply and Welfare. *Journal of Political Economy 100*(3), 437–467.

Chiappori, P.-A. and M. Mazzocco (2017). Static and Intertemporal Household Decisions. *Journal of Economic Literature 55*(3), 985–1045.

Ciliberto, F., A. R. Miller, H. S. Nielsen, and M. Simonsen (2016). Playing the Fertility Game at Work: An Equilibrium Model of Peer Effects. *International Economic Review 57*(3), 827–856.

Córdoba, J. C. and M. Ripoll (2016). Intergenerational Transfers and the Fertility–Income Relationship. *Economic Journal 126*(593), 949–977.

Coskun, S. and H. C. Dalgic (2024). The Emergence of Procyclical Fertility: The Role of Breadwinner Women. *Journal of Monetary Economics 142*, 103523.

Cruces, L. and F. J. Rodríguez-Román (2025). Financial Incentives to Fertility: From Short to Long Run. Working Paper, Goethe University Frankfurt.

Cumming, F. and L. Dettling (2024). Monetary Policy and Birth Rates: The Effect of Mortgage Rate Pass-through on Fertility. *Review of Economic Studies 91*(1), 229–258.

de La Croix, D. and M. Doepke (2003). Inequality and Growth: Why Differential Fertility Matters. *American Economic Review 93*(4), 1091–1113.

de la Croix, D. and F. Mariani (2015). From Polygyny to Serial Monogamy: A Unified Theory of Marriage Institutions. *Review of Economic Studies 82*(2), 565–607.

de la Croix, D. and A. Pommeret (2021). Childbearing Postponement, Its Option Value, and the Biological Clock. *Journal of Economic Theory 193*, 105231.

de Silva, T. and S. Tenreyro (2020). The Fall in Global Fertility: A Quantitative Model. *American Economic Journal: Macroeconomics 12*(3), 77–109.

Delventhal, M. J., J. Fernández-Villaverde, and N. Guner (2024). Demographic Transitions Across Time and Space. *NBER Working Paper No. 29480.*

Dettling, L. and M. S. Kearney (2026). Liquidity Constraints and Birth Outcomes Over the Business Cycle. *NBER Working Paper No. 30937.*

Di Nola, A., G. Kocharkov, J. Mellert, and H. Wang (2025). Teenage Childbearing and the Welfare State. *Macroeconomic Dynamics 29*, e31.

Doepke, M. (2005). Child Mortality and Fertility Decline: Does the Barro-Becker Model Fit the Facts? *Journal of Population Economics 18*(2), 337–366.

Doepke, M., A. Hannusch, F. Kindermann, and M. Tertilt (2023). The Economics of Fertility: a New Era. In *Handbook of the Economics of the Family, Vol. 1,* Chapter 4. Elsevier.

Doepke, M., M. Hazan, and Y. D. Maoz (2015). The Baby Boom and World War II: A Macroeconomic Analysis. *Review of Economic Studies 82*(3), 1031–1073.

Doepke, M. and F. Kindermann (2019). Bargaining over Babies: Theory, Evidence, and Policy Implications. *American Economic Review 109*(9), 3264–3306.

Doepke, M. and M. Tertilt (2016). Families in Macroeconomics. In *Handbook of Macroeconomics, Vol. 2,* Chapter 23. North Holland.

Doepke, M. and F. Zilibotti (2019). *Love, Money, and Parenting: How Economics Explains the Way We Raise Our Kids.* Princeton and Oxford: Princeton University Press.

Easterlin, R. A. (1961). The American Baby Boom in Historical Perspective. *American Economic Review 51*(5), 869–911.

Eckstein, Z., P. Mira, and K. I. Wolpin (1999). A Quantitative Analysis of Swedish Fertility Dynamics: 1751–1990. *Review of Economic Dynamics 2*(1), 137–165.

Ehrlich, I. and J. Kim (2007). Social Security and Demographic Trends: Theory and Evidence from the International Experience. *Review of Economic Dynamics 10*(1), 55–77.

Erosa, A., L. Fuster, and D. Restuccia (2010). A General Equilibrium Analysis of Parental Leave Policies. *Review of Economic Dynamics 13*(4), 742–758.

Fernández-Villaverde, J., J. Greenwood, and N. Guner (2014). From Shame to Game in one Hundred Years: An Economic Model of the Rise in Premarital Sex and its De-stigmatization. *Journal of the European Economic Association 12*(1), 25–61.

Fontenay, S., P. E. Gobbi, and M. Goñi (2025). Fertility in Sub-Saharan Africa: The Role of Inheritance. CEPR Discussion Paper 20275.

Galor, O. and D. N. Weil (1996). The Gender Gap, Fertility and Growth. *American Economic Review 86*(3), 374–387.

Galor, O. and D. N. Weil (2000). Population, Technology, and Growth: From Malthusian Stagnation to the Demographic Transition and Beyond. *American Economic Review 90*(4), 806–828.

Gay, V., P. E. Gobbi, and M. Goñi (2025). Revolutionary Transition: Inheritance Change and Fertility Decline. *Journal of Political Economy*. Forthcoming.

Gobbi, P. E. (2013). A Model of Voluntary Childlessness. *Journal of Population Economics 26*(3), 963–982.

Gobbi, P. E. and A. Hannusch (2026). The Missing Demographic Dividend. Working Paper.

Gobbi, P. E., A. Hannusch, and P. Rossi (2026). Family Institutions and the Global Fertility Transition. *Journal of Economic Perspectives 40*(1), 47–70.

Goldin, C. (2014). A Grand Gender Convergence: Its Last Chapter. *American Economic Review 104*(4), 1091–1119.

Goldin, C. (2025). The Downside of Fertility. NBER Working Paper No. 34268.

Greenwood, J. (2019). *Evolving Households: The Imprint of Technology on Life*. Mit Press.

Greenwood, J. and N. Guner (2010). Social Change: The Sexual Revolution. *International Economic Review 51*(4), 893–923.

Greenwood, J., N. Guner, and J. A. Knowles (2003). More on Marriage, Fertility, and the Distribution of Income. *International Economic Review 44*(3), 827–862.

Greenwood, J., N. Guner, and R. Marto (2021). The Great Transition: Kuznets Facts for Family-Economists. In S. Lundberg and A. Voena (Eds.), *Handbook of Family Economics*. Elsevier North-Holland.

Greenwood, J., N. Guner, and G. Vandenbroucke (2017). Family Economics Writ Large. *Journal of Economic Literature 55*(4), 1346–1434.

Greenwood, J., A. Seshadri, and G. Vandenbroucke (2005). The Baby Boom and Baby Bust. *American Economic Review 95*(1), 183–207.

Guner, N., E. Kaya, A. Ruggieri, and V. Sánchez-Marcos (2026). Firms, Flexibility, and Fertility. CEPR Discussion Paper No. 21120.

Guner, N., E. Kaya, and V. Sánchez-Marcos (2024). Labor Market Institutions and Fertility. *International Economic Review 65*(3), 1551–1587.

Guo, R., L. Lin, J. Yi, and H. Zhu (2026). The Intergenerational Impact of Birth-Control Policies on Fertility: The Role of Norms. *Economic Journal*, ueag063.

Hart, R. K., J. Bergsvik, A. Fauske, and W. Kim (2024). Causal Analysis of Policy Effects on Fertility. *Handbook of Labor, Human Resources and Population Economics*, 1–25.

Ho, C. and Y. Wang (2024). Social Institutions and Low Birth Rates. Working Paper, Singapore Management University.

Hotz, V. J., J. A. Klerman, and R. J. Willis (1997). The Economics of Fertility in Developed Countries. In M. Rosenzweig and O. Stark (Eds.), *Handbook of Population and Family Economics*, Volume 1A, Chapter 7, pp. 275–347. Elsevier.

Hwang, J. and S. K. Kim (2023). Unexpected Longevity, Intergenerational Policies, and Fertility. *Journal of Population Economics 36*(3), 1607–1640.

Jones, C. I. (2022). The End of Economic Growth? Unintended Consequences of a Declining Population. *American Economic Review 112*(11), 3489–3527.

Jones, L. E. and A. Schoonbroodt (2016). Baby Busts and Baby Booms: The Fertility Response to Shocks in Dynastic Models. *Review of Economic Dynamics 22*, 157–178.

Jones, L. E., A. Schoonbroodt, and M. Tertilt (2010). Fertility Theories: Can They Explain the Negative Fertility-Income Relationship? In J. Shoven (Ed.), *Demography and the Economy*, pp. 43–100.

Jones, L. E. and M. Tertilt (2008). An Economic History of Fertility in the U.S.: 1826-1960. In P. Rupert (Ed.), *Frontiers of Family Economics*, Volume 1. Emerald Press.

Kennes, J. and J. Knowles (2024). Unmarried Births: Accounting and Equilibrium Analysis, 1960-1995. *Review of Economic Dynamics 52*, 84–109.

Kim, D. and M. Yum (2025). Parental Leave Policies, Fertility, and Labor Supply. *CEPR Discussion Paper No. 19951.*

Kim, S., M. Tertilt, and M. Yum (2024). Status Externalities in Education and Low Birth Rates in Korea. *American Economic Review 114*(6), 1576–1611.

Kitao, S. and K. Nakakuni (2026). On the Trends of Technology, Family Formation, and Women's Time Allocation. CRC-TR-224 Discussion Paper Series No. 735.

Low, C. (2024). The Human Capital-Reproductive Capital Trade-off in Marriage Market Matching. *Journal of Political Economy 132*(2), 552–576.

Mahler, L., M. Tertilt, and M. Yum (2025). Policy Concerns in an Era of Low Fertility: The Role of Social Comparisons and Intensive Parenting. *Brookings Papers on Economic Activity*. Forthcoming.

Malthus, T. R. (1798). An Essay on the Principle of Population. Chapter V. *Oxford World's Methods. Econometrica 37*(3), 424–438.

Manski, C. F. and J. Mayshar (2003). Private Incentives and Social Interactions: Fertility Puzzles in Israel. *Journal of the European Economic Association 1*(1), 181–211.

Manuelli, R. and A. Seshadri (2009). Explaining International Fertility Differences. *Quarterly Journal of Economics 124*(2), 771–807.

Myers, C. K. (2017). The Power of Abortion Policy: Reexamining the Effects of Young Women's Access to Reproductive Control. *Journal of Political Economy 125*(6), 2178–2224.

Myong, S., J. Park, and J. Yi (2020). Social Norms and Fertility. *Journal of the European Economic Association.* jvaa048.

Nakakuni, K., M. Tertilt, and M. Yum (2026). Low Fertility Around the World: The Role of Social Norms. Prepared for New Frontiers in Fertility, edited by James J. Heckman.

Olivetti, C. and B. Petrongolo (2017). The Economic Consequences of Family Policies: Lessons from a Century of Legislation in High-Income Countries. *Journal of Economic Perspectives 31*(1), 205–230.

Palivos, T. (2001). Social Norms, Fertility and Economic Development. *Journal of Economic Dynamics and Control 25*(12), 1919–1934.

Romer, P. M. (1990). Endogenous Technological Change. *Journal of Political Economy 98*(5, Part 2), S71–S102.

Soares, R. (2005). Mortality Reductions, Educational Attainment, and Fertility Choice. *American Economic Review 95*(3), 580–601.

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics 70*(1), 65–94.

Sommer, K. (2016). Fertility Choice in a Life Cycle Model with Idiosyncratic Uninsurable Earnings Risk. *Journal of Monetary Economics 83*, 27–38.

Strulik, H. (2004). Child Mortality, Child Labour and Economic Development. *Economic Journal 114*(497), 547–568.

Strulik, H. (2008). Geography, Health, and the Pace of Demo-Economic Development. *Journal of Development Economics 86*(1), 61–75.

Strulik, H. (2017). Contraception and Development: A Unified Growth Theory. *International Economic Review 58*(2), 561–584.

Tertilt, M. (2005). Polygyny, Fertility, and Savings. *Journal of Political Economy 113*(6), 1341–1371.

Willis, R. J. (1973). A New Approach to the Economic Theory of Fertility Behavior. *Journal of Political Economy 81*(2), S14–S64.

Xi, X. and A. Zhou (2026). The Dynamics of Gender Norms and Fertility Decline. Accepted for publication at *International Economic Review*.

Yamaguchi, S. (2019). Effects of Parental Leave Policies on Female Career and Fertility Choices. *Quantitative Economics 10*(3), 1195–1232.

Zhang, J., J. Zhang, and R. Lee (2003). Rising Longevity, Education, Savings, and Growth. *Journal of Development Economics 70*(1), 83–101.

Zhou, A. (2025). The Macroeconomic Consequences of Family Policies. Conditionally accepted at *Review of Economic Studies*.