

The Value of Life across Generations: Fertility and Parental Investment*

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Abstract

We study how fertility and parental investment shape the value of mortality improvements in a quantitative dynastic life-cycle model. Households choose fertility, saving, education spending, and inter-vivos transfers under earnings risk and borrowing constraints. We distinguish the own-life component of survival valuation from the dynastic value of a statistical life, which also incorporates the value parents assign to survival benefits received by their descendants. Calibrating the model to the pre-baby-boom United States, we find that the dynastic premium accounts for a substantial share of young households' valuation of a common survival improvement. Most of this premium arises from dynastic continuation, while education and financial transfers increase it further. Historical declines in maternal mortality and improvements in old-age survival both raise fertility. Lower maternal mortality reduces average investment per child, whereas improved old-age survival leaves it nearly unchanged. Investment rises in both cases among households whose fertility remains unchanged. The dynastic premium responds more strongly to improved old-age survival, while endogenous fertility materially changes both total dynastic valuation and its division between own-life and dynastic components. These findings connect the valuation of mortality improvements to the quantity-quality trade-off and show why the scope of a mortality change across generations matters for willingness to pay.

Keywords: Value of a Statistical Life, Mortality Risk, Fertility, Intergenerational Transmission, Education Investments

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1 Introduction

Improvements in survival are an important source of economic welfare that conventional measures of income growth do not fully capture. [Murphy and Topel \(2006\)](#) demonstrate the substantial economic value of improvements in health and longevity, while [Jones and Klenow \(2016\)](#) incorporate mortality into welfare comparisons across countries and over time.¹ These studies motivate a closer examination of what is captured by households' willingness to pay for lower mortality risk.

For parents who care about their descendants, the benefits of a lasting mortality improvement can extend beyond their own lives. Longer lives can alter both the value of having children and the value of investing in their future. The resulting adjustment in the quantity and quality of children is therefore important for understanding both family responses to mortality improvements and parents' willingness to pay for them. How does improved survival affect this trade-off, and how do fertility and parental investment shape the dynastic value of mortality reductions?

We address these questions in a quantitative dynastic life-cycle model in which households choose fertility, saving, education spending, and inter-vivos transfers. Following [Becker and Barro \(1988\)](#) and [Barro and Becker \(1989\)](#), parents value their own lifetime utility and the welfare of their descendants. Households differ in inherited assets, earnings capacity, ability, and altruism, and face earnings risk and borrowing constraints, as in a standard incomplete-markets framework ([Aiyagari 1994](#)). Children require parental time and financial resources, and childbirth exposes mothers to mortality risk. Education spending and transfers shape the economic circumstances inherited by the next generation. These investments also use resources that could otherwise finance parental consumption, linking the quantity-quality trade-off of [Becker and Lewis \(1973\)](#) to both the benefits of mortality improvements and the marginal utility of the resources used to pay for them.

We distinguish the life-cycle value of a statistical life (LVSL), which captures the own-life component of survival valuation, from the dynastic value of a statistical life (DVSL), which also includes parents' valuation of survival benefits accruing to their descendants. Our benchmark DVSL concerns a common improvement in young-adult survival across generations, expressed per unit of improvement in the current parent's survival probability. The

¹More recently, [Adhami et al. \(2026\)](#) quantify how population growth contributes to welfare growth when additional lives have positive value, and [Trammell and Jones \(2026\)](#) show how changes in the value of a statistical life can inform the measurement of living standards.

difference between DVSL and LVSL is the *dynastic premium*. Both measures are evaluated from the perspective of the current parent.²

We calibrate the baseline economy using U.S. mortality conditions in 1940 and fertility outcomes of women born in 1906–1910, together with moments on income, intergenerational persistence, saving, and parental investment. At the calibrated allocation, average DVSL among young households is approximately \$1.99 million, close to its target of \$2 million in 2000 dollars. We find that the dynastic premium is \$1.14 million, or about 57% of DVSL, compared with an LVSL of \$0.85 million. In other words, more than half of young households’ valuation of the common mortality improvement reflects the benefits they attach to improved survival among their descendants.

We further decompose the dynastic premium into a continuation component and contributions associated with inter-vivos transfers and parental education spending. The continuation component evaluates descendants’ survival benefits at the child’s inherited state when the current parent provides neither an inter-vivos transfer nor additional education spending. The child nevertheless retains the human capital generated by the baseline education input. A Shapley decomposition allocates the remaining premium between transfers and education, accounting for their interaction. The continuation component accounts for approximately 78% of the premium, education for 17%, and transfers for 5%. The premium therefore remains substantial without these investments by the current parent, while the resources provided to the child increase it further.

We then examine how mortality improvements affect the quantity-quality trade-off through two historical counterfactuals that update, separately, maternal mortality and old-age survival to their values one model period (20 years) after the baseline. These changes operate through different margins. Lower maternal mortality reduces a direct cost of childbearing, while improved old-age survival extends the expected lives of parents and their descendants. Holding the wage schedule and human-capital technology fixed, we recompute household decision rules under each change and evaluate the resulting outcomes using the baseline distribution of household states.³

We find that fertility increases by approximately 2.2% following the decline in maternal

²In other words, DVSL incorporates the value the parent assigns to benefits received by descendants; it is not the sum of willingness to pay across different generations.

³These exercises therefore isolate household responses to historically relevant mortality changes rather than providing a full transition accounting of the baby boom.

mortality and by 2.4% following the improvement in old-age survival. Lower maternal mortality reduces average investment per child, whereas higher old-age survival leaves it nearly unchanged. Among households whose fertility remains unchanged, however, investment per child rises in both exercises. This contrast shows how fertility adjustment and the resulting distribution of children across families can shape aggregate investment outcomes.

Both mortality changes also increase the dynastic premium when valuation is computed holding current-generation fertility at its baseline choice, with a larger response under improved old-age survival. Evaluating survival at counterfactual fertility attenuates the response of total DVSL but not necessarily that of the dynastic premium. Changes in family size affect current consumption and own-life valuation, while households entering parenthood acquire a dynastic component of survival value. Mortality improvements therefore reshape family allocations as well as the value attached to further improvements in survival.

Our analysis builds on the life-cycle literature on the valuation of mortality risk and longevity. [Arthur \(1981\)](#), [Rosen \(1988\)](#), and [Ehrlich and Chuma \(1990\)](#) develop life-cycle approaches in which the value of survival or life extension depends on age, resources, and consumption opportunities. [Murphy and Topel \(2006\)](#) provide a quantitative framework for measuring the economic value of improvements in health and longevity, while [Hall and Jones \(2007\)](#) connect the value of life to income and the demand for health spending. We bring these valuation questions into a model of heterogeneous households with endogenous fertility and parental investments.⁴ [Birchenall and Soares \(2009\)](#) incorporate altruism and endogenous fertility into mortality valuation, including parents' willingness to pay for reductions in child mortality and benefits accruing to future generations. We study adult survival across generations in a quantitative model of heterogeneous households with borrowing constraints and endogenous education spending and inter-vivos transfers. This framework allows us to examine how the dynastic premium varies across households, and how declining maternal mortality and improved old-age survival reshape the quantity-quality trade-off.

The modeling framework draws on the literature on endogenous fertility and dynastic preferences. [Becker and Lewis \(1973\)](#) formalize the interaction between the quantity and quality of children, while [Becker and Barro \(1988\)](#) and [Barro and Becker \(1989\)](#) link fertility to parental altruism in dynastic models. [Doepke \(2005\)](#) examines the fertility implications of

⁴Our analysis is also complementary to [Huetsch, Krueger, and Ludwig \(2026\)](#), who study medical expansion and longevity through endogenous directed technical change. We take mortality changes as given and examine their valuation and consequences for family decisions.

declining child mortality within this class of models. [de La Croix and Doepke \(2003\)](#) show how differential fertility and education connect inequality to growth, and [Cordoba, Liu, and Ripoll \(2016\)](#) examine fertility, social mobility, and long-run inequality in a heterogeneous-household setting.⁵ [Daruich and Kozłowski \(2020\)](#) incorporate endogenous fertility, education, and family transfers into a heterogeneous-agent life-cycle model to study intergenerational mobility. [Zhou \(2025\)](#) examines the macroeconomic consequences of family policies, emphasizing the quantity-quality trade-off. We draw on this literature to model fertility and intergenerational investments jointly, and examine how these choices shape mortality valuation and responses to improved survival.

Our framework also relates to quantitative heterogeneous-agent models of parental investment and intergenerational transmission. [Restuccia and Urrutia \(2004\)](#) and [Lee and Se-shadri \(2019\)](#) study how education investments shape the persistence of economic status, while [Fuchs-Schündeln et al. \(2022\)](#), [Jang and Yum \(2024\)](#) and [Daruich \(2026\)](#) examine the aggregate and intergenerational consequences of changes in schooling and early childhood investment. We study how these family links shape mortality valuation: parental investments affect descendants' opportunities and the value parents assign to their survival, while using resources that could finance current consumption. Endogenous fertility allows mortality improvements to change both family size and investment per child.

The paper also speaks to the empirical VSL and benefit-transfer literature. Following the early labor-market contribution of [Thaler and Rosen \(1976\)](#), a large literature estimates willingness to pay for mortality-risk reductions; see [Kniesner and Viscusi \(2019\)](#). Our analysis suggests that the portability of these estimates across applications may depend on who benefits from the mortality improvement and whether its benefits extend across generations. The dynastic premium provides a structural basis for assessing whether intergenerational benefits are already embedded in an empirical VSL estimate and how that estimate should be interpreted, transferred, or adjusted across mortality contexts, rather than prescribing a uniform correction.

Finally, our historical applications relate to research on maternal health and family outcomes. [Loudon \(1992\)](#) documents the historical evolution of maternal care and mortality. [Jayachandran and Lleras-Muney \(2009\)](#) show that declining maternal mortality can increase female

⁵[Kim, Tertilt, and Yum \(2024\)](#) develop a quantitative model of endogenous fertility and parental education spending to study status externalities and low fertility. Their model does not feature dynastic utility. We adapt elements of its family-decision structure and embed them in a dynastic framework with mortality risk.

education by extending the expected horizon over which its returns are received. [Albanesi and Olivetti \(2016\)](#) study the role of improvements in maternal health and related medical progress in the evolution of fertility and women’s labor supply. We complement this work by examining the dynastic valuation of declining maternal mortality and its implications for fertility and investment in children, and by contrasting these effects with improved survival later in life.

The remainder of the paper proceeds as follows. Section 2 presents the model and defines the valuation concepts. Section 3 describes the calibration. Section 4 presents baseline valuations and decomposes the dynastic premium. Section 5 examines the historical mortality changes, and Section 6 concludes.

2 Model and the Dynastic Value of Statistical Life

We build a four-period dynastic life-cycle model with mortality risk. Households choose fertility, saving, education spending, and inter-vivos transfers while facing earnings risk and borrowing constraints. Parents value their own lifetime utility and the welfare of their descendants, so family choices determine both the resources inherited by the next generation and the value parents assign to its survival. This structure allows us to define and distinguish the life-cycle and dynastic values of a statistical life.

2.1 Demographics, heterogeneity, and timing

Individuals live for up to four adult periods, indexed by $j = 1, \dots, 4$. Each period lasts 20 years and corresponds to ages 20–39, 40–59, 60–79, and 80–99, respectively. Households work in the first two periods and receive retirement income in the last two. We represent the household by one decision maker and use female mortality to describe its survival. The model therefore abstracts from separate choices and survival states for spouses. Fertility n denotes the number of children per household.

A young household enters adulthood with assets a_1 , earnings capacity e_1 , and ability ϕ . Initial assets are determined by transfers from its parents, while earnings capacity reflects its ability and the education investment received during childhood. Ability also governs the

conditional distribution of offspring ability, denoted by $F(\phi_k|\phi)$, where the subscript k refers to the next generation.

At the beginning of the first period, the household observes its altruism type α and chooses fertility from the finite set $\{0, 1, \dots, \bar{n}\}$. Fertility is chosen before offspring ability ϕ_k is observed. After observing ϕ_k , the household chooses education spending per child s , inter vivos transfers per child a_k , and saving for its own second period a_2 . The model represents offspring by a common child state, with the same education spending and transfer for each child. In the second period, an earnings shock z is realized. This shock affects second-period earnings and the income on which retirement benefits are based.

Altruism is drawn independently across generations from a common distribution, independently of inherited states. Thus, a parent's altruism is known when fertility is chosen, whereas the altruism of the next generation is integrated out in its continuation value. Ability, in contrast, is transmitted across generations through $F(\phi_k|\phi)$. We specify the intergenerational ability process as

$$\log \phi_k = \rho_\phi \log \phi + \varepsilon_{\phi,k}, \quad \varepsilon_{\phi,k} \sim N(0, \sigma_\phi^2). \quad (1)$$

Thus, ρ_ϕ governs intergenerational persistence and σ_ϕ is the standard deviation of the innovation to log ability.

2.2 Preferences and dynastic altruism

While alive, the household receives flow utility from consumption c

$$u(c) = \frac{c^{1-\sigma}}{1-\sigma} + b, \quad (2)$$

where $\sigma > 0$ governs consumption curvature and $1/\sigma$ is the elasticity of intertemporal substitution. The parameter $b > 0$ is a utility flow from being alive (Hall and Jones 2007). Its level matters for survival valuation because utility after death is normalized to zero. Future own-life utility is discounted by β per model period.

Parents also value the dynastic utility of their children (Becker and Barro 1988; Barro and

Becker 1989). Conditional on realized types and choices, the objective takes the form

$$V_1 + \alpha g(n)W' - \delta \mathbf{1}_{\{n>0\}}, \quad (3)$$

where V_1 denotes the parent's own expected lifetime utility, W' is the child's dynastic continuation value, and $\delta \geq 0$ is a fixed utility cost of parenthood.⁶ Preferences are additive between own lifetime utility and offspring dynastic utility. The altruism parameter α and the fertility aggregator $g(n)$ determine the weight on the next generation.

We allow altruism to differ across households according to

$$\alpha \sim F_\alpha(\alpha), \quad \mathbb{E}[\alpha] = \mu_\alpha, \quad \frac{\text{SD}(\alpha)}{\mathbb{E}[\alpha]} = \sigma_\alpha, \quad (4)$$

where $\mu_\alpha > 0$ denotes mean altruism and $\sigma_\alpha \geq 0$ its coefficient of variation.⁷ Altruism is drawn independently across households and generations. This heterogeneity allows households with similar resources to make different fertility and investment choices, which helps the model match the negative income-fertility relationship in the data.⁸

Following Cordoba, Liu, and Ripoll (2016), we use an exponential fertility aggregator and normalize the weight for a one-child family:

$$g(n) = \frac{1 - \exp(-\epsilon n)}{1 - \exp(-\epsilon)}, \quad \epsilon > 0. \quad (5)$$

This specification satisfies $g(0) = 0$ and $g(1) = 1$. Consequently, α is the altruistic weight for a one-child family, while ϵ controls how rapidly the additional weight declines with fertility.⁹

⁶The fixed utility cost captures nonpecuniary costs of entering parenthood, such as reduced flexibility, and helps match childlessness while preserving altruistic motives for parental investment. For related fixed costs of parenthood, see Gobbi (2013) and Baudin, De La Croix, and Gobbi (2015).

⁷The numerical support is restricted to ensure that $\alpha > 0$. Because altruism is independently redrawn across generations, a sufficient condition for the ex-ante dynastic recursion to be a contraction is $\mathbb{E}[\alpha]g(\bar{n}) < 1$. We impose this condition in the calibration.

⁸Jones, Schoonbroodt, and Tertilt (2010) emphasize preference heterogeneity as a potential explanation for the observed negative income-fertility relationship.

⁹The continuous extension of g is increasing and concave, with fertility elasticity $\epsilon n / [\exp(\epsilon n) - 1]$ for $n > 0$. Unlike a power aggregator with a constant fertility elasticity, this elasticity falls with n . Additional children therefore contribute progressively less to the total altruistic weight. The aggregator is also bounded, which is useful when controlling the dynastic continuation weight in the numerical solution.

2.3 Income, child costs, and intergenerational transmission

The first-period budget constraint is

$$c_1 + a_2 + ns + na_k = (1 - \lambda n)e_1 + (1 + r)a_1, \quad (6)$$

where r is the interest rate on the non-state-contingent assets a_j over a model period. Each child requires a fraction λ of first-period time, reducing earnings by λe_1 . Education and transfers are measured per child, so their total resource costs are ns and na_k . Consumption must be positive, and saving, education spending, and transfers are nonnegative.

Education spending determines the child's initial adult earnings capacity according to

$$e_k = A_h \phi_k (\theta + s)^\nu, \quad A_h > 0, \quad \theta > 0, \quad 0 < \nu < 1, \quad (7)$$

similar to the human-capital production of [de La Croix and Doepke \(2003\)](#). The parameter A_h determines the scale of earnings capacity and ν governs the curvature of the technology. The input θ provides positive earnings capacity even in the absence of parental education spending. The child enters adulthood with assets a_k , earnings capacity e_k , and ability ϕ_k . Parents therefore affect their children's opportunities through both financial transfers and human capital.

In the second period, earnings capacity before the realization of earnings risk is $e_2 = \zeta e_1$, where $\zeta > 1$ captures life-cycle wage growth ([Lagakos et al. 2018](#)). After first-period saving has been chosen, the household draws a one-time log earnings shock ([Huggett, Ventura, and Yaron 2011](#))

$$z \sim F_z(z), \quad \mathbb{E}[z] = 0, \quad \text{Var}(z) = \sigma_z^2.$$

The shock is independent across households and generations and is realized at the beginning of the second period. Second-period earnings are $\exp(z)e_2$. The shock is permanent in the sense that realized earnings capacity, $e_3 = \exp(z)e_2$, also determines retirement income; no additional earnings shocks occur at later ages. The remaining budget constraints are

$$c_2 + a_3 = \exp(z)e_2 + (1 + r)a_2, \quad (8)$$

$$c_3 + a_4 = \mathcal{P}e_3 + (1 + r)a_3, \quad (9)$$

$$c_4 = \mathcal{P}e_3 + (1 + r)a_4, \quad (10)$$

where $\mathcal{P} \in (0, 1)$ is the retirement-income replacement rate. Households are subject to borrowing constraints: $a_2, a_3, a_4 \geq 0$. We abstract from accidental bequests: assets held at death do not generate transfers to descendants in the model. Intergenerational financial transfers are instead chosen explicitly in the first period.

2.4 Mortality and the household problem

First-period survival depends on fertility:

$$\pi_{1,n} = \tilde{\pi}_1 \exp(-\kappa n), \quad \kappa \geq 0, \quad (11)$$

where $\tilde{\pi}_1$ is survival in the absence of the mortality risk associated with childbirth and κ is the maternal mortality hazard per birth. Survival from period 2 to period 3 is π_2 , and survival from period 3 to period 4 is π_3 . These later survival probabilities do not depend on fertility. All individuals die after the fourth period.

The survival probabilities weight the parent's own future utility. The offspring continuation term in equation (3) is not multiplied by the parent's survival probability. Education and inter-vivos transfers are chosen in the first period, and the model does not introduce a separate effect of subsequent parental death on the child's inherited state. Thus, death ends the parent's own utility flow but does not eliminate the value assigned to descendants in the parent's dynastic objective.

We describe the household problem backward from the final period. The value in $j = 4$ is

$$V_4(a_4, e_3) = u(\mathcal{P}e_3 + (1 + r)a_4). \quad (12)$$

In the third period, the household solves

$$V_3(a_3, e_3) = \max_{a_4 \geq 0} \{u(c_3) + \beta \pi_3 V_4(a_4, e_3)\}, \quad (13)$$

subject to equation (9). In the second period, after observing z , it solves

$$V_2(a_2, e_2, z) = \max_{a_3 \geq 0} \{u(c_2) + \beta \pi_2 V_3(a_3, \exp(z)e_2)\}, \quad (14)$$

subject to equation (8).

In the first period, conditional on fertility and realized child ability, the household solves

$$P(a_1, e_1, \phi_k, \alpha; n) = \max_{a_2, s, a_k \geq 0} \left\{ u(c_1) + \beta \pi_{1,n} \mathbb{E}_z[V_2(a_2, \zeta e_1, z)] \right. \\ \left. + \alpha g(n) W(a_k, e_k, \phi_k) - \delta \mathbf{1}_{\{n>0\}} \right\}, \quad (15)$$

subject to equations (6) and (7). For a childless household, the offspring term is absent and we set $s = a_k = 0$.

The ex-ante dynastic value, before the altruism draw, is given by

$$W(a_1, e_1, \phi) = \mathbb{E}_\alpha \left[\max_{n \in \{0, 1, \dots, \bar{n}\}} \mathbb{E}_{\phi_k | \phi} [P(a_1, e_1, \phi_k, \alpha; n)] \right]. \quad (16)$$

The ordering of the expectations and maximization reflects the timing: parents choose fertility after observing altruism but before observing child ability, and choose investments after observing child ability. In a stationary environment, the same function W applies to each generation. We use a prime below when helpful to distinguish the offspring's value from that of the current parent. Prices and the income environment are taken as given.

2.5 Stationary Equilibrium

A stationary equilibrium consists of optimal household value and policy functions and an invariant distribution of young households. This distribution is reproduced across generations by fertility choices, parental education spending and inter-vivos transfers, and the transmission of ability: households with more children contribute proportionately more weight to the next generation. The corresponding cross-sectional distribution over ages is generated by optimal saving, earnings shocks, and survival, accounting for differences in cohort size. Stationarity refers to these normalized distributions and is consistent with non-zero population growth. Appendix A.1 provides the formal laws of motion and the equilibrium definition.

2.6 Life-cycle and dynastic values of statistical life

We express the marginal value of survival in units of current consumption. Let x_j denote a one-time transfer added to the period- j budget constraint. At an optimum, the marginal

value of these resources in the household's objective is $u'(c_j) = c_j^{-\sigma}$. The direct contribution of a marginal increase in own survival to own-life utility is $\beta \mathbb{E}_j[V_{j+1}]$, since own utility upon death is zero. We therefore define the life-cycle value of statistical life (LVSL) as

$$LVSL_j \equiv \beta c_j^\sigma \mathbb{E}_j[V_{j+1}], \quad j = 1, 2, 3, \quad (17)$$

where the expectation is conditional on information available at the time of valuation. At age 1, it integrates over the future earnings shock z . All quantities are evaluated at the choices made in the dynastic model, so parental investment and altruism can affect LVSL through consumption and saving even though LVSL values only the parent's own remaining life.

To define dynastic VSL (DVSL), consider a small permanent improvement h in the common first-period survival environment:

$$\pi_{1,n}(h) = (\tilde{\pi}_1 + h) \exp(-\kappa n), \quad h = 0 \text{ in the reference environment.} \quad (18)$$

The change applies to the current household and all subsequent generations. Holding fertility fixed locally, the change in the current parent's actual survival probability is $\partial \pi_{1,n} / \partial h = \exp(-\kappa n)$.

Consider a household after its altruism and child ability are known, and evaluate its conditional value at the fertility it has chosen. Write this optimized value as $P^*(h, x_1)$, suppressing its other arguments. Away from a fertility threshold and at points where the value is differentiable, the envelope theorem gives

$$\left. \frac{\partial P^*}{\partial h} \right|_{h=0} = \beta \exp(-\kappa n) \mathbb{E}_z[V_2] + \alpha g(n) \left. \frac{\partial W'(a_k, e_k, \phi_k; h)}{\partial h} \right|_{h=0}. \quad (19)$$

Here the derivative of W' holds the inherited child state fixed, while allowing descendants to optimize in the changed environment. The current parent's adjustments in saving, education, and transfers do not enter separately into the first-order welfare derivative, because these choices were optimal in the reference environment.

We define dynastic VSL per unit increase in the current parent’s actual survival probability:

$$DVSL_1 \equiv \frac{\partial P^*/\partial h|_{h=0}}{\partial P^*/\partial x_1|_{h=0}} \left(\frac{\partial \pi_{1,n}}{\partial h} \right)^{-1} \quad (20)$$

$$= LVSL_1 + \alpha g(n) c_1^\sigma \exp(\kappa n) \frac{\partial W'(a_k, e_k, \phi_k; h)}{\partial h} \Big|_{h=0}. \quad (21)$$

The second term is the *dynastic premium*. It captures the value to the current household of descendants facing the same improved survival environment. For a childless household, this term is zero. For a small change dh , willingness to pay is approximately $DVSL_1 \exp(-\kappa n) dh$ in current consumption units.

This definition distinguishes the scope of the survival improvement from its units of measurement. Both LVSL and DVSL are expressed per unit change in current survival, but DVSL also includes benefits to future generations. Note that the valuation is conditional on realized types and expressed in each household’s own consumption units; reported averages are formed after calculating these household-level values. Discrete fertility thresholds can generate kinks, so the local formulas apply on a given optimal fertility branch.

3 Quantitative Implementation

We calibrate the model to a U.S. baseline combining mortality conditions around 1940 with the fertility experience of women born in 1906–1910. The calibration provides a common starting point for studying the effects of improvements in maternal and older-age survival. We first describe the historical counterparts of the model, then discuss externally assigned parameters and the joint calibration of the remaining parameters.

3.1 Historical baseline and empirical counterparts

We use the 1940 female period life table to describe baseline survival. Period mortality summarizes the age-specific mortality environment at a given date, without incorporating the subsequent mortality improvements experienced by an actual birth cohort. This distinction is useful for our counterfactual exercises, which change selected survival parameters relative to a common baseline. As in the model, female survival describes the single decision maker representing the household.

Fertility targets come from the 1906–1910 U.S. birth cohorts, observed at ages 40–44 in 1950, as reported by [Baudin, De La Croix, and Gobbi \(2015\)](#). These women provide a counterpart for family formation before the postwar baby boom, although their reproductive years are not confined to the prewar period. We use their reported fertility as an approximation to completed fertility. We target mean completed fertility of 2.30 children per woman.¹⁰

We combine these historical demographic targets with standard moments of earnings, wealth, and intergenerational investment. The latter are drawn from the sources described below and do not all refer to 1940. The baseline should therefore be interpreted as a calibrated economy with pre-baby-boom demographic conditions, rather than a reconstruction of every feature of the U.S. economy in that year.

3.2 Externally set parameters

Table 1 reports the externally set parameters. We set consumption curvature to $\sigma = 1.5$ and the annual risk-free interest rate to 4%, so that the return over a model period is $r = 1.04^{20} - 1$. The age-earnings parameter is $\zeta = 1.30$, guided by [Lagakos et al. \(2018\)](#), and the retirement-income replacement rate is $\mathcal{P} = 0.40$. Following [de La Croix and Doepke \(2003\)](#), we set the curvature of the human-capital technology to $\nu = 0.635$.

Let l_x denote the number of survivors to exact age x in the life table’s hypothetical cohort. The 1940 female period table gives conditional survival probabilities of $l_{40}/l_{20} = 0.9443$, $l_{60}/l_{40} = 0.8291$, and $l_{80}/l_{60} = 0.3701$. We use the latter two ratios directly for π_2 and π_3 . Young-adult survival requires an adjustment because the observed ratio already includes maternal deaths, whereas the model specifies survival conditional on fertility as $\pi_{1,n} = \tilde{\pi}_1 \exp(-\kappa n)$. The 1940 maternal mortality rate of 376 deaths per 100,000 live births implies $\kappa = 0.00377$. Adjusting observed young-adult survival for maternal mortality using mean completed fertility, we set $\tilde{\pi}_1 = 0.9525$.¹¹

Child-rearing time costs are incurred during the first working period. We set $\lambda = 0.208$ so that the time cost of one child equals 15% of the present value of working-life earnings net

¹⁰The childlessness rate is 0.203 and mean completed fertility conditional on motherhood is 2.883, implying unconditional mean completed fertility of $(1 - 0.203) \times 2.883 = 2.298$. This is a cohort fertility target, rather than the period total fertility rate in 1940.

¹¹Specifically, we set $\kappa = -\log(1 - 376/100,000)$. Exact matching of average survival would require $\tilde{\pi}_1 = 0.9443/\mathbb{E}[\exp(-\kappa n)]$. We use the approximation $\tilde{\pi}_1 \approx 0.9443 \exp(\kappa \bar{n}^{\text{data}}) = 0.9525$, where $\bar{n}^{\text{data}} = 2.298$. Note that this does not impose an exact survival match under the model’s endogenous fertility distribution.

Table 1: Externally set parameters

Parameter	Value	Interpretation	Source or basis
σ	1.50	Consumption curvature	CRRA benchmark
$\tilde{\pi}_1$	0.9525	Young-adult survival absent maternal risk	1940 female period table, adjusted
π_2	0.8291	Survival from age 40 to 60	1940 female period table
π_3	0.3701	Survival from age 60 to 80	1940 female period table
r	$1.04^{20} - 1$	Interest rate per model period	4% annual rate
ζ	1.30	Age-earnings profile	Lagakos et al. (2018)
$\mathcal{P}$	0.40	Retirement replacement rate	Benchmark
κ	0.00377	Maternal mortality hazard per birth	U.S. Vital Statistics, 1940
ν	0.635	Human-capital curvature	de la Croix and Doepke (2003)
λ	0.208	Child-rearing time cost per child	Lifetime time-cost benchmark

Notes: One period is 20 years. Survival probabilities are based on SSA female period life-table ratios. The adjustment to $\tilde{\pi}_1$ and the mapping from lifetime time costs to λ are described in the text.

of this time cost (Cordoba, Liu, and Ripoll 2016).¹²

3.3 Internally calibrated parameters and model fit

We jointly calibrate the remaining eleven parameters by minimizing an equally weighted sum of squared percentage deviations between the model-generated moments and their empirical counterparts reported in Table 2. The table associates each parameter with a particularly informative target, but these associations are not separate, one-parameter calibrations. Fertility, saving, and investment choices jointly determine the model moments.

The utility flow from being alive, b , is disciplined by a VSL target of \$2 million in 2000 dollars. We map this benchmark to mean young-adult dynastic VSL, which values a common survival improvement benefiting the current generation and its descendants. This mapping is a calibration assumption: it treats the empirical benchmark as informative about this broader willingness to pay. An estimate for a purely individual risk change need not measure the

¹²Abstracting from mortality and earnings risk, we set $\lambda e_1 / [(1 - \lambda)e_1 + \zeta e_1 / (1 + r)] = 0.15$, which implies $\lambda = 0.15[1 + \zeta / (1 + r)] / 1.15 = 0.208$. The denominator excludes retirement income and deducts the first-period time cost from earnings. This calculation maps the lifetime benchmark into the model's 20-year period.

Table 2: Internally calibrated parameters and model fit

Parameter	Value	Target moment	Data	Model
b	7.06	Dynastic VSL (millions of 2000 dollars)	2.00	1.99
μ_α	0.402	Inter-vivos transfers / GDP	0.020	0.019
β	0.603	Capital-output ratio, K/Y	0.150	0.148
ρ_ϕ	0.212	Intergenerational income elasticity	0.350	0.361
σ_ϕ	0.493	$\text{Var}(\log y_1)$	0.550	0.583
σ_z	0.469	$\text{Var}(\log y_2) - \text{Var}(\log y_1)$	0.180	0.174
A_h	3.56	Average income (normalization)	1.00	0.971
δ	4.51	Childlessness rate	0.203	0.202
θ	0.048	Education expenditures / GDP	0.073	0.074
ϵ	0.526	Completed fertility, bottom income half	2.58	2.52
σ_α	0.205	Completed fertility, top income half	2.01	1.95

Notes: Parameters are calibrated jointly. Fertility targets include childless households. The bottom and top income groups each represent half of the population. Sources and the construction of the targets are discussed in the text. Reported values are rounded.

same object.¹³

We approximate a normal distribution of altruism using five-point Gauss–Hermite quadrature. Specifically,

$$\alpha_i = \mu_\alpha(1 + \sigma_\alpha z_i), \quad \Pr(\alpha = \alpha_i) = p_i, \quad i = 1, \dots, 5, \quad (22)$$

where the nodes and weights are normalized so that $\sum_i p_i z_i = 0$ and $\sum_i p_i z_i^2 = 1$.¹⁴ Mean altruism, μ_α , is disciplined by inter-vivos transfers relative to GDP, with a target of 0.020 guided by McGarry (1999). The discount factor β is informed by the capital-output ratio. Measured relative to output over a 20-year period, the target of 0.150 corresponds to capital worth three years of annual output. The parameters ρ_ϕ and σ_ϕ govern persistence and innovation dispersion in the intergenerational ability process. We use an intergenerational income elasticity of 0.350, close to the U.S. family-income estimates of Chetty et al. (2014), together with a target of $\text{Var}(\log y_1) = 0.550$ to discipline these parameters jointly. The subsequent increase in earnings dispersion over the life cycle, $\text{Var}(\log y_2) - \text{Var}(\log y_1)$, is

¹³Consequently, the calibrated level of dynastic VSL is not an independent validation of the model; the division between own-life value and the dynastic premium is a model implication examined in the next section.

¹⁴The standardized nodes are $(-2.857, -1.356, 0, 1.356, 2.857)$, with respective probabilities $(0.0113, 0.2221, 0.5333, 0.2221, 0.0113)$.

used separately to discipline the second-period earnings shock. These inequality moments are based on [Heathcote, Perri, and Violante \(2010\)](#).

The productivity scale A_h normalizes mean income to one. The fixed utility cost of parenthood, δ , provides a separate margin for matching childlessness. The education-technology shift θ is informed by education spending relative to GDP, targeted at 0.073 following [de La Croix and Doepke \(2003\)](#). Because this shift affects the return to parental education spending, it also interacts with fertility and altruism in determining investment per child.

Next, we use fertility differences by income to discipline the curvature of the fertility aggregator, ϵ , and altruism heterogeneity, σ_α . Following the specification in the model section, $g(1) = 1$, so μ_α measures the mean altruistic weight for a one-child family. The parameter σ_α is the coefficient of variation of altruism under this discretization.¹⁵ Variation in altruism allows households with similar resources to make different fertility and investment choices. To construct the fertility targets, we combine the aggregate cohort mean of 2.30 we computed in Section 3.1 with a bottom-top income fertility gap of 0.57, based on [Jones and Tertilt \(2008\)](#).¹⁶

The model closely matches the VSL target, childlessness, the capital-output ratio, education spending, and the intergenerational income elasticity. It also reproduces the targeted negative income–fertility relationship. Completed fertility is 2.52 in the lower-income half and 1.95 in the upper-income half, generating a gap of 0.57 children, as in the data. Both fertility levels are somewhat below their respective targets, so mean completed fertility is 2.23, compared with 2.30 in the data. The model modestly overstates the cross-sectional variance of log income, generating 0.583 relative to the target of 0.550, while the increase in income dispersion over the working life is 0.174 relative to a target of 0.180.

4 Baseline Valuation and the Dynastic Premium

We begin by comparing the own-life and dynastic values of a common survival improvement in the baseline economy. We then decompose the resulting dynastic premium into a contin-

¹⁵At the calibrated parameter values, $\mu_\alpha g(\bar{n}) = 0.863$, where $\bar{n} = 4$ is the maximum fertility choice. Thus, the calibration satisfies the sufficient condition for the ex-ante dynastic recursion stated in Section 2.2.

¹⁶Specifically, centering this gap around the aggregate mean gives $n_L^{\text{data}} = \bar{n}^{\text{data}} + \frac{0.57}{2} = 2.58$ and $n_H^{\text{data}} = \bar{n}^{\text{data}} - \frac{0.57}{2} = 2.01$.

Table 3: Baseline value of statistical life

	Value	Share of $DVSL_1$
Life-cycle VSL, $LVSL_1$	\$851,790	42.8%
Dynastic premium, $DVSL_1 - LVSL_1$	\$1,137,834	57.2%
Dynastic VSL, $DVSL_1$	\$1,989,625	100.0%

uation component and the contributions of parental financial transfers and human-capital investment. Finally, we examine how the life-cycle value of survival varies with age.

The magnitude of the dynastic premium Table 3 reports the population means of the life-cycle and dynastic values of statistical life at age 1. All values are expressed in 2000 dollars. As defined in Section 2.6, both objects are measured per unit increase in the current parent’s survival probability. The distinction is that $LVSL_1$ values only the parent’s own remaining lifetime utility, whereas $DVSL_1$ also incorporates the value that the parent assigns to the survival benefits received by future generations under a common permanent mortality improvement.

The mean dynastic VSL is approximately \$1.99 million, compared with a life-cycle VSL of about \$0.85 million. The dynastic premium is therefore approximately \$1.14 million and accounts for 57.2% of dynastic VSL. Equivalently, incorporating the survival benefits received by future generations raises the current generation’s willingness to pay by about 134% relative to the value based only on its own remaining lifetime utility.

The large difference between the two measures does not result merely from attaching an additional value to an existing child. The survival improvement is permanent, so it affects the child, the child’s descendants, and subsequent generations. The child’s continuation value therefore incorporates the entire sequence of future dynastic responses. At the same time, the size of the premium depends on the parent’s altruism, fertility, current marginal utility of consumption, and the economic state inherited by the child.

Decomposing the dynastic premium We quantify how the resources transferred by the current parent affect the dynastic premium. Consider a household at its baseline choices and realized types. Holding the current parent’s fertility n^* , consumption c_1^* , altruism α , and

child ability ϕ_k fixed, define

$$\mathcal{D}(a, e) \equiv \alpha g(n^*)(c_1^*)^\sigma \exp(\kappa n^*) \frac{\partial W'(a, e, \phi_k; h)}{\partial h} \Big|_{h=0}. \quad (23)$$

The function $\mathcal{D}(a, e)$ measures the dynastic premium when the child enters adulthood with assets a and earnings capacity e . The current parent's choices are held fixed in this calculation, but the child and all subsequent generations optimize conditional on the inherited state.

Let

$$e_k^0 = A_h \phi_k \theta^\nu \quad \text{and} \quad e_k^* = A_h \phi_k (\theta + s^*)^\nu, \quad (24)$$

where e_k^0 is the child's earnings capacity without discretionary education spending by the current parent and e_k^* is earnings capacity under the parent's baseline education choice. We evaluate the dynastic premium at four inherited states:

$$\begin{aligned} D_{00} &= \mathcal{D}(0, e_k^0), & D_{10} &= \mathcal{D}(a_k^*, e_k^0), \\ D_{01} &= \mathcal{D}(0, e_k^*), & D_{11} &= \mathcal{D}(a_k^*, e_k^*). \end{aligned} \quad (25)$$

The final term corresponds to the child's actual baseline inherited state and therefore satisfies

$$D_{11} = DVSL_1 - LVSL_1. \quad (26)$$

We define the continuation component as $C = D_{00}$. This component measures the value of descendants' exposure to the permanent survival improvement when the current parent provides neither financial transfers nor discretionary education spending. The child nevertheless receives the baseline earnings input θ , and subsequent generations continue to make optimal fertility, saving, and investment choices.

Financial transfers and human-capital investment interact in shaping the child's decisions and continuation value. We therefore use a Shapley decomposition, which averages the marginal contribution of each inherited resource over the two possible orderings. The contribution of inter-vivos transfers is

$$S_a = \frac{1}{2} [(D_{10} - D_{00}) + (D_{11} - D_{01})], \quad (27)$$

Table 4: Decomposition of the baseline dynastic premium

Component	Value	Share
Continuation, C	\$886,533	77.9%
Inter-vivos transfers, S_a	\$60,723	5.3%
Human capital, S_e	\$190,578	16.8%
Total dynastic premium	\$1,137,834	100.0%

and the contribution of human capital is

$$S_e = \frac{1}{2} [(D_{01} - D_{00}) + (D_{11} - D_{10})]. \quad (28)$$

By construction, the three components add up exactly:

$$DVSL_1 - LVSL_1 = C + S_a + S_e. \quad (29)$$

This is an accounting decomposition of the baseline dynastic premium. It measures how the inherited state created by the current parent’s baseline investments affects the value of descendants’ survival. It does not measure changes in parental investment induced by a mortality improvement. Those behavioral responses are examined in Section 5.

Table 4 reports the decomposition result. We calculate each component at the household level and then average using the baseline population weights. The reported shares equal the mean of each component divided by the mean dynastic premium. The continuation component accounts for 77.9% of the dynastic premium. Thus, most of the premium arises because the permanent mortality improvement propagates through the dynasty even when the current parent provides no financial transfers or discretionary education spending. The inherited resources created by the current parent account for the remaining 22.1%. Human-capital investment is the larger of these channels, contributing 16.8% of the premium, while inter-vivos transfers contribute 5.3%.

These contributions should not be interpreted simply as the direct value of the dollars transferred or spent on education. Assets and earnings capacity change the child’s consumption, saving, fertility, and parental-investment choices. The Shapley terms incorporate the resulting effect on the child’s entire dynastic continuation value.

Table 5: Life-cycle value of statistical life by age

Model period	Age range	Mean $LVSL_j$
$j = 1$	20–39	\$851,790
$j = 2$	40–59	\$5,262,118
$j = 3$	60–79	\$4,482,286

The life-cycle profile of the value of survival The age profile of VSL is theoretically ambiguous. Standard life-cycle models imply that a shorter remaining lifetime tends to reduce the value of survival, but changes in consumption, wealth, and marginal utility over the life cycle can offset this effect (Rosen 1988; Ehrlich and Chuma 1990).

The same forces operate in our model. Recall from equation (17) that

$$LVSL_j = \beta c_j^\sigma \mathbb{E}_j[V_{j+1}], \quad j = 1, 2, 3. \quad (30)$$

The equation makes two opposing forces transparent. First, the continuation value $\mathbb{E}_j[V_{j+1}]$ generally declines as the remaining lifetime shortens. Second, the conversion of utility into current consumption units depends on current marginal utility through c_j^σ . Consequently, VSL need not decline monotonically with age.

As shown in Table 5, life-cycle VSL is much lower in the first period than in the second and third periods. A key reason is that the first period is also the childbearing and investment stage. Child-rearing time costs, education spending, inter-vivos transfers, and saving all reduce current consumption. Because the marginal utility of consumption is correspondingly high, households are willing to surrender fewer units of current consumption for a given utility gain from survival. In the second period, these direct child-related expenditures are no longer incurred and consumption is substantially higher, raising the consumption-equivalent value of survival. The shorter remaining horizon eventually becomes dominant, causing $LVSL_3$ to fall below $LVSL_2$.

The low value of $LVSL_1$ does not mean that it excludes the value of survival at older ages. The continuation value V_2 already includes the utilities obtained in all subsequent periods, weighted by discounting and survival. Rather, $LVSL_1$ measures the value of reaching those future ages in units of consumption at age 1. The comparison with $LVSL_2$ therefore concerns the date and units at which the same remaining-life utility is valued, not whether later life is included.

Appendix A.2 separates the consumption and continuation-value components of LVSL. Improved older-age survival raises continuation values but reduces consumption. The continuation-value effect dominates at younger ages, whereas the decline in consumption and the resulting increase in its marginal utility help explain the lower LVSL at age 3.

5 Historical Mortality Improvements

We use the calibrated model to conduct two historical experiments. In each experiment, we update one mortality parameter from its 1940 baseline value to its value one model period (20 years) later, while holding the other parameters fixed. The first experiment introduces the decline in maternal mortality, and the second introduces the increase in survival at older ages. These changes occur at different stages of the life cycle and have different connections to fertility. Maternal mortality directly affects the survival cost of childbirth, whereas older-age mortality affects the expected duration of life after childbearing. Comparing the two experiments shows how the timing and nature of mortality improvements shape family choices and the value of survival.

5.1 Design of the exercises

Both exercises start from the same baseline and change one mortality parameter at a time. In the maternal-mortality exercise, we reduce κ from 0.00377 to 0.00037, corresponding to the dramatic decline in maternal mortality from 376 to 37 deaths per 100,000 live births documented by [Albanesi and Olivetti \(2016\)](#). We hold $\tilde{\pi}_1$, π_2 , and π_3 fixed. Survival during the childbearing period therefore improves through the reduction in the mortality risk associated with each birth.

In the older-age-survival exercise, we increase π_3 from 0.3701 to approximately 0.507, using the corresponding female period life-table survival probabilities in 1940 and 1960. This change reflects the extension of U.S. mortality improvements to older ages documented by [Cutler and Meara \(2004\)](#). All other mortality parameters remain fixed. This change increases the probability of reaching the final period of life without directly changing the survival cost of childbirth.

In each exercise, households anticipate that the new mortality environment applies to themselves and subsequent generations. We resolve the value functions and decision rules, taking prices and all non-mortality parameters as given. We then evaluate family choices on the baseline distribution of initial household states. The exercises therefore isolate responses to mortality improvements conditional on the inherited distribution; they do not describe the transition to a new stationary distribution.

Let μ_0 denote this baseline distribution, including the relevant heterogeneity over which outcomes are averaged, and let n^q , s^q , and a_k^q denote decisions in environment q . Mean fertility and child-weighted investment are calculated as

$$\begin{aligned}\bar{n}^q &= \int n^q d\mu_0, \\ \bar{s}_{\text{child}}^q &= \frac{\int n^q s^q d\mu_0}{\int n^q d\mu_0}, \quad \bar{a}_{\text{child}}^q = \frac{\int n^q a_k^q d\mu_0}{\int n^q d\mu_0}.\end{aligned}\tag{31}$$

The same counterfactual fertility choices enter the numerator and denominator of each per-child measure. Changes in these measures can therefore reflect both changes in investment decisions and changes in the distribution of children across households.

Family outcomes use the counterfactual policy rules. For valuation, we instead evaluate the recomputed value functions on the baseline state distribution while holding each current household's fertility at its baseline choice; all other choices, including saving, education spending, and inter-vivos transfers, are reoptimized. Because VSL is a local willingness-to-pay measure conditional on household circumstances, this convention compares the same household at the same family size and isolates the effect of the new mortality environment, including changes in descendants' continuation values, from endogenous fertility adjustment. Appendix A.4 reports valuations at counterfactual fertility, which also incorporate the associated changes in current consumption and resources per child.

In both environments, $DVSL_1$ continues to price the same local permanent perturbation h to first-period survival defined in Section 2.6. In particular, the older-age exercise asks how higher π_3 changes the value of a marginal first-period survival improvement. Neither exercise reports total willingness to pay for the discrete historical change in κ or π_3 .

Table 6: Family responses to historical mortality improvements

	Baseline	Lower maternal mortality	Higher old-age survival
Completed fertility	2.23	2.28 (+2.2%)	2.29 (+2.4%)
Childlessness rate	20.2%	19.5%	18.7%
Households changing fertility	—	4.2%	3.6%
<i>Investment per child</i>			
Education	0.0323	0.0314 (−3.0%)	0.0322 (−0.4%)
Inter-vivos transfers	0.00834	0.00822 (−1.4%)	0.00839 (+0.6%)
Total	0.04065	0.03958 (−2.6%)	0.04056 (−0.2%)
<i>Investment per household</i>			
Education	0.0722	0.0716 (−0.8%)	0.0735 (+1.9%)
Inter-vivos transfers	0.0186	0.0188 (+0.8%)	0.0192 (+2.9%)
Total	0.0908	0.0903 (−0.5%)	0.0927 (+2.1%)

Notes: Decision rules are reoptimized in each environment and evaluated on the baseline distribution of initial household states. Per-child investments are child-weighted as in equation (31). Investments are reported in model units. Figures in parentheses report percentage changes relative to the baseline.

5.2 Fertility and parental investment

Table 6 reports family outcomes. Both mortality improvements raise fertility.¹⁷ Lower maternal mortality reduces average investment per child, whereas higher old-age survival leaves total investment per child nearly unchanged, despite changes in its composition and in total spending per household.

Lower maternal mortality raises completed fertility by 0.050 children, or 2.2%. The childlessness rate falls by approximately 0.7 percentage points, and 4.2% of households change their fertility choice. The mechanism is direct: reducing κ lowers the survival cost of additional births.

Average education spending per child falls by 3.0%, while transfers per child fall by 1.4%.

¹⁷The results suggest that both historical mortality developments could have contributed to the increase in fertility during the baby-boom era. However, note that the analysis holds the inherited distribution and non-mortality environment fixed, and the two changes are implemented separately.

Table 7: Changes in investment per child by fertility response

	Lower maternal mortality		Higher old-age survival	
	Full population	Fertility non-adjusters	Full population	Fertility non-adjusters
Education	−3.0%	+0.5%	−0.4%	+1.2%
Inter-vivos transfers	−1.4%	+2.3%	+0.6%	+2.6%
Total investment	−2.6%	+0.9%	−0.2%	+1.5%

Notes: Entries are percentage changes in child-weighted investment per child. The full-population columns allow both fertility choices and the resulting child weights to change. The non-adjuster columns restrict the calculation to households choosing the same fertility in both environments. These households account for 95.8% and 96.4% of the household population in the maternal-mortality and older-age-survival exercises, respectively. Because the statistics are child-weighted, these household shares do not represent their weights in the reported averages. Childless households receive zero weight.

Total investment per child consequently declines by 2.6%. The corresponding changes in investment per household are considerably smaller: education spending falls by 0.8%, transfers rise by 0.8%, and their sum declines by about 0.5%. The expansion in family size therefore accounts for much of the decline in investment measured per child.

Higher old-age survival raises completed fertility by 0.053 children, or 2.4%, and reduces childlessness by approximately 1.6 percentage points. Only 3.6% of households change fertility. This response occurs despite the absence of a direct link between π_3 and child-birth. Longer expected lives affect parents' life-cycle plans and the value they assign to the continuation of their children's dynasties, increasing the attractiveness of parenthood and additional children in the calibrated economy.

In this exercise, education spending per child falls by only 0.4%, while inter-vivos transfers per child rise by 0.6%. Total investment per child is therefore nearly unchanged. Because fertility increases, education spending and transfers per household rise by 1.9% and 2.9%, respectively. Thus, improved old-age survival increases total resources devoted to children without materially changing average investment per child.

Households with unchanged fertility. To distinguish investment responses from changes in family size, we separately examine households whose fertility remains unchanged. For each experiment, we identify this group using the baseline and counterfactual fertility choices and compare its child-weighted investments across the two environments.

Table 7 shows that investment per child rises among households whose fertility remains unchanged. Under lower maternal mortality, education spending rises by 0.5% and transfers by 2.3%, producing a 0.9% increase in total investment per child. Under higher old-age survival, the corresponding increases are 1.2%, 2.6%, and 1.5%.

The full-population averages therefore do not represent a common reduction in investment across households. Appendix Table A4 decomposes this contrast. Although fertility adjusters constitute a small share of households, their share of children increases substantially in both experiments. Child-weighted investment among these households falls sharply, and the reallocation of children toward them further weakens the full-population investment response. The adjuster group includes both households entering parenthood and existing parents having additional children. Its response therefore combines discrete changes in family size with changes in investment and should not be interpreted as the behavior of a representative existing parent.

5.3 Changes in the value of survival

Table 8 reports survival valuations and the Shapley decomposition of the dynastic premium. These calculations hold the current parent's fertility at its baseline value, as described above. Dollar values use the same baseline conversion in all environments.

Lower maternal mortality. Lower maternal mortality reduces $LVSL_1$ by approximately 0.6% but raises $DVSL_1$ by 0.5%. The dynastic premium increases by 1.3%, from approximately \$1.14 million to \$1.15 million.

The decline in $LVSL_1$ does not imply that lower maternal mortality reduces welfare. VSL is a marginal willingness-to-pay measure evaluated in the new environment, rather than the welfare gain from moving to that environment. Recall that

$$LVSL_1 = \beta \mathbb{E}_z[V_2]c_1^\sigma. \quad (32)$$

Lower κ directly increases the probability of reaching period 2 but does not directly change the value of life conditional on reaching that period. The mean conditional continuation value changes very little, while mean first-period consumption falls from 0.3571 to 0.3557

Table 8: Survival valuation across mortality environments conditional on baseline fertility

	Baseline	Lower maternal mortality	Higher old-age survival
Life-cycle VSL, $LVSL_1$	\$851,790	\$846,708 (−0.6%)	\$860,366 (+1.0%)
Dynastic VSL, $DVSL_1$	\$1,989,625	\$1,999,661 (+0.5%)	\$2,050,589 (+3.1%)
Dynastic premium	\$1,137,834	\$1,152,953 (+1.3%)	\$1,190,224 (+4.6%)
Premium / $DVSL_1$	57.2%	57.7%	58.0%
<i>Components of the dynastic premium</i>			
Continuation	\$886,533	\$924,455 (+4.3%)	\$948,620 (+7.0%)
Inter-vivos transfers	\$60,723	\$63,554 (+4.7%)	\$66,848 (+10.1%)
Human capital	\$190,578	\$164,944 (−13.5%)	\$174,755 (−8.3%)

Notes: Household-weighted means in 2000 dollars. Value functions are recomputed in each mortality environment and evaluated on the baseline state distribution and at baseline fertility. All other current choices are reoptimized conditional on baseline fertility. $DVSL_1$ values the local common first-period survival perturbation h , not the full historical mortality change. The premium is decomposed using the procedure in Section 4. Figures in parentheses report percentage changes relative to the baseline.

as households reoptimize their other choices. The resulting increase in the marginal utility of current consumption lowers willingness to pay in consumption units.

The increase in dynastic VSL is driven by the dynastic premium. Its continuation component rises by 4.3%, and the contribution of inter-vivos transfers rises by 4.7%. These increases are partially offset by a 13.5% decline in the human-capital contribution. The continuation component therefore accounts for more than the net increase in the premium.

Higher older-age survival. Higher π_3 increases $LVSL_1$ by approximately 1.0% and $DVSL_1$ by 3.1%. The dynastic premium rises by 4.6%, reaching approximately \$1.19 million.

Unlike lower maternal mortality, higher old-age survival directly raises the parent’s continuation value at age 2 by increasing the prospect of reaching the final period. This effect is partly offset by the greater value of current resources as households plan for a longer retirement. Mean first-period consumption falls from 0.3571 to 0.3538, while the mean of $\beta\mathbb{E}_z[V_2]$ rises from 4.5455 to 4.6549. The continuation-value effect dominates, so mean $LVSL_1$ increases.

The continuation component of the dynastic premium rises by 7.0%, and the contribution of financial transfers rises by 10.1%. The human-capital contribution falls by 8.3%, partially offsetting these increases. Because descendants also benefit from improved old-age survival, the continuation component accounts for more than the overall increase in the premium.

The human-capital contribution should not be interpreted as a direct measure of education spending. It measures how the inherited human capital created by the current parent’s education choice affects descendants’ marginal survival valuation. Moreover, the decomposition conditions on baseline fertility, whereas the family outcomes in Table 6 allow fertility to adjust. The changes in the Shapley contribution therefore need not coincide with the changes in education spending per child.

Valuation with fertility adjustment The preceding results hold current fertility at its baseline choice. Appendix A.4 instead evaluates survival valuations at each household’s counterfactual fertility. Although only 4.2% and 3.6% of households change fertility in the two exercises, the resulting changes in current consumption materially affect their willingness to pay for survival. Under lower maternal mortality, the average $DVSL_1$ response changes from an increase of 0.5% at baseline fertility to a decline of 0.5% at counterfactual fertility. Under higher old-age survival, the increase is reduced from 3.1% to 1.8%.

Endogenous fertility does not uniformly attenuate the dynastic premium itself. The premium rises by 1.4% under lower maternal mortality and by 6.0% under higher old-age survival when evaluated at counterfactual fertility. In the latter exercise, some initially childless households enter parenthood and thereby acquire a dynastic component of survival valuation. These results distinguish changes in total dynastic VSL from changes in its division between the own-life and dynastic components.

6 Conclusion

We develop a quantitative dynastic life-cycle model to study how fertility and parental investments shape the value of survival. The model distinguishes the value of the current parent’s own survival from the additional value assigned to survival benefits received by future generations. In the calibrated baseline, dynastic VSL at childbearing ages is approximately \$1.99 million, compared with a life-cycle VSL of \$0.85 million. The resulting dynastic premium is

approximately \$1.14 million, or 57% of dynastic VSL. Approximately 78% of the premium arises from dynastic continuation evaluated without discretionary education spending or financial transfers by the current parent. The remaining 22% reflects the inherited resources created by these investments, with education contributing more than transfers.

The historical exercises show that the timing of mortality improvements matters for both family choices and survival valuation. Lower maternal mortality and improved old-age survival both raise fertility. Lower maternal mortality reduces average investment per child, whereas improved old-age survival leaves it nearly unchanged. Among households retaining the same fertility, however, investment per child rises in both environments. Mortality improvements can therefore reshape the quantity-quality trade-off even when wages and the human-capital technology remain fixed. Conditional on baseline fertility, the dynastic premium rises under both mortality changes, primarily through dynastic continuation, and responds more strongly to improved old-age survival. Evaluating survival at counterfactual fertility attenuates the response of total dynastic VSL but does not necessarily attenuate the dynastic premium. Even fertility changes among a relatively small share of households can therefore have meaningful effects on marginal survival valuation.

These findings connect the quantity-quality and dynastic fertility tradition ([Becker and Lewis 1973](#); [Barro and Becker 1989](#)) with the life-cycle valuation of mortality improvements ([Murphy and Topel 2006](#); [Hall and Jones 2007](#)). The broader implication is that dynastic motives do not generate a uniform adjustment to the value of statistical life. The value that a current household assigns to a mortality improvement depends on which ages and generations benefit, as well as on the fertility and investment decisions connecting those generations. Our DVSL is a private willingness-to-pay measure from the current parent's perspective, rather than a population-wide sum of welfare gains. Transferring VSL estimates across mortality contexts therefore requires attention to the scope and persistence of the underlying risk reduction and to the family circumstances of those who value it.

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A Online Appendix

A.1 Distributional Dynamics and Stationary Equilibrium

We characterize a stationary equilibrium at the externally specified interest rate and wage schedule. Household decisions determine the distribution of inherited resources across generations and the distribution of surviving households over the life cycle. Stationarity requires these normalized distributions to remain unchanged, although population size may grow or decline.

Distribution across generations. Let $x = (a, e, \phi, \alpha)$ denote a young household's state, and let μ_t denote its distribution among households entering adulthood at date t , normalized to unit mass. Write the optimal fertility choice as $n(x)$. Conditional on child ability ϕ' , parental transfers and education spending determine the child's inherited state:

$$a' = a_k(x, \phi'), \quad e' = A_h \phi' [\theta + s(x, \phi')]^\nu.$$

Child ability follows the intergenerational transition specified above, while the child's altruism is drawn independently from F_α . These transitions and the parental investment policies induce a probability kernel $K(B \mid x)$, giving the probability that a child of a household in state x enters adulthood with a state in the set B .

The distribution of entering households evolves according to

$$\mu_{t+1}(B) = \frac{\int n(x) K(B \mid x) \mu_t(dx)}{\int n(x) \mu_t(dx)}. \quad (\text{A1})$$

Thus, households with more children contribute proportionately more to the next generation, while childless households do not contribute to its distribution. Under the convention that one household represents a pair of adults, the gross growth factor of entering cohorts is

$$G_t = \frac{1}{2} \int n(x) \mu_t(dx). \quad (\text{A2})$$

The factor of one-half cancels from the normalized distribution in equation (A1). A stationary distribution μ is a fixed point of this law of motion, with associated cohort growth factor G .

Distribution over the life cycle. Let $Q_j(B \mid x)$ denote the transition probability to a set of age- $(j + 1)$ states, conditional on survival, induced by optimal saving and the exogenous shocks. Survival is $\pi_1(x) = \tilde{\pi}_1 \exp[-\kappa n(x)]$ at the first age and π_j at ages $j = 2, 3$. Starting from the entering-cohort measure $m_1 = \mu$, the stationary age-specific measures satisfy

$$m_{j+1}(B) = \frac{1}{G} \int \pi_j(x) Q_j(B \mid x) m_j(dx), \quad j = 1, 2, 3. \quad (\text{A3})$$

The survival probability accounts for mortality, while division by G accounts for differences in the sizes of successive entering cohorts. The cross-sectional distribution is obtained by normalizing these measures:

$$\Lambda_j(B) = \frac{m_j(B)}{\sum_{\ell=1}^4 m_\ell(\mathcal{X}_\ell)}, \quad j = 1, \dots, 4, \quad (\text{A4})$$

where $\mathcal{X}_\ell$ is the state space at age ℓ .

A stationary equilibrium consists of household value and policy functions, an entering-cohort distribution μ , a cohort growth factor G , and age-specific cross-sectional measures $\{\Lambda_j\}_{j=1}^4$ such that: households optimize given prices, mortality risks, and descendants' value functions; μ and G satisfy equations (A1) and (A2); and the cross-sectional distribution satisfies equations (A3) and (A4).

A.2 Consumption and Continuation Values in Life-Cycle VSL

The life-cycle value of survival depends on both the utility gain from survival and the marginal utility of current consumption. Define

$$B_j \equiv \beta \mathbb{E}_j[V_{j+1}]. \quad (\text{A5})$$

Then

$$LVSL_j = c_j^\sigma B_j. \quad (\text{A6})$$

For households with positive consumption and $B_j > 0$,

$$\ln LVSL_j = \sigma \ln c_j + \ln B_j. \quad (\text{A7})$$

Table A1: Consumption and continuation-value components of LVSL

Age	Environment	Mean $\ln c_j$	Mean $\ln B_j$	Mean $\ln LVSL_j$	Population share used
$j = 1$	Baseline	-1.1639	1.4973	-0.2486	1.0000
	Lower maternal mortality	-1.1679	1.4973	-0.2545	1.0000
	Higher old-age survival	-1.1727	1.5208	-0.2382	1.0000
$j = 2$	Baseline	-0.1641	1.2033	0.9572	0.9988
	Higher old-age survival	-0.1858	1.2698	0.9912	0.9996
$j = 3$	Baseline	-0.0979	0.8623	0.7154	0.9955
	Higher old-age survival	-0.1452	0.9283	0.7106	0.9955

Notes: Values are in raw model units before the common conversion into dollars. Each scenario uses baseline fertility and baseline state weights. Log means are calculated over cells with $c_j > 0$ and $B_j > 0$, with weights normalized over the included cells. Within each row,

$$\text{mean}(\ln LVSL_j) = \sigma \text{mean}(\ln c_j) + \text{mean}(\ln B_j),$$

up to rounding, with $\sigma = 1.5$. Sample coverage differs slightly across environments at age 2, so that comparison also incorporates a small change in the set of included cells. Changes in mean log LVSL need not equal percentage changes in arithmetic mean LVSL. Older-age results under lower maternal mortality are omitted because they coincide with the baseline.

Averaging this identity over the same households separates the consumption and continuation-value components of mean log LVSL. With common weights and sample coverage across environments, changes in mean log LVSL can therefore be decomposed into changes in these two components.

Table A1 reports the relevant log means for the baseline-fertility evaluation used in the main text. Under lower maternal mortality, the young household's continuation-value component is essentially unchanged, while the consumption contribution falls by approximately $1.5 \times (-0.0040) = -0.0060$. The decline in mean log $LVSL_1$ therefore primarily reflects the higher marginal utility of current consumption.

Under improved old-age survival, continuation values rise while consumption falls. At age 1, the mean log continuation value increases by approximately 0.0235, while the consumption contribution is $1.5 \times (-0.0088) = -0.0132$. The continuation-value effect dominates, producing an increase in mean log $LVSL_1$. The same qualitative pattern holds at age 2. At age 3, the consumption contribution is approximately -0.0710 , slightly exceeding the 0.0660 increase in the continuation-value component, so mean log $LVSL_3$ falls.

Table A2: Investment per child by fertility adjustment

Mortality change	Household group	Mass	Education	Transfers	Total
Lower maternal mortality	Unchanged fertility	95.8%	+0.5%	+2.3%	+0.9%
	Changed fertility	4.2%	−62.4%	−75.9%	−64.5%
	All households	100.0%	−3.0%	−1.4%	−2.6%
Higher old-age survival	Unchanged fertility	96.4%	+1.2%	+2.6%	+1.5%
	Changed fertility	3.6%	−38.5%	−41.9%	−39.0%
	All households	100.0%	−0.4%	+0.6%	−0.2%

Notes: Investment entries are percentage changes in child-weighted investment per child. Group masses are household shares. Groups are defined separately in each mortality experiment. Both baseline and counterfactual outcomes are evaluated using the baseline distribution of initial household states.

A.3 Investment Responses by Fertility Adjustment

Table A2 separates households that retain their baseline fertility from those that change it. The latter constitute a small share of households but make discrete changes in family size, so their responses can have a substantial effect on child-weighted investment averages.

Among fertility adjusters, average fertility rises by approximately 71% under lower maternal mortality and 127% under higher old-age survival. Their total spending on children falls by approximately 39% in the first exercise but rises by approximately 39% in the second. Thus, a large decline in investment per child need not imply a comparable decline in total resources devoted to children. It reflects the combination of discrete fertility adjustment and the reallocation of parental resources across a larger number of children.

A.4 Survival Valuation with Fertility Adjustment

The main-text valuation results evaluate the counterfactual environment at each current household’s baseline fertility. Here we instead evaluate survival valuation at the counterfactual fertility choice. Both calculations use the baseline distribution of initial household states. Comparing them shows how endogenous family-size adjustment changes marginal willingness to pay for survival.

Table A3 separates households whose fertility remains unchanged from those whose fertility changes. Group membership is defined separately for each experiment, and the same households are compared across the baseline and counterfactual columns within each group.

Only 4.2% of households change fertility under lower maternal mortality, but their average $LVSL_1$ falls by 50.2% and their $DVSL_1$ falls by 24.8% at their new fertility choices. Under higher old-age survival, 3.6% change fertility; their average $LVSL_1$ falls by 63.1% and their $DVSL_1$ by 27.5%. These declines reflect the reduction in current consumption associated with larger families. For households retaining their baseline fertility, the valuation changes coincide with those reported in the main text.

At the aggregate level, evaluating the lower-maternal-mortality economy at counterfactual fertility changes the $DVSL_1$ response from an increase of 0.5% to a decline of 0.5%. Under higher old-age survival, the increase is reduced from 3.1% to 1.8%. The dynastic premium nevertheless rises by 1.4% and 6.0%, respectively. In the old-age-survival exercise, this larger premium response partly reflects households entering parenthood and thereby acquiring a positive dynastic component of survival valuation.

These results concern marginal willingness to pay for survival at the counterfactual allocation. They do not measure the welfare gains from the historical mortality improvements. Changes in consumption and its marginal utility can reduce consumption-equivalent survival valuations even when households benefit from the improved mortality environment.

A.5 Fertility Adjusters and Investment per Child

Table A3: Survival valuations at counterfactual fertility

Household group	Measure	Baseline	Counterfactual	Change
<i>Panel A: Lower maternal mortality</i>				
Unchanged fertility (95.8%)	$LVSL_1$	847	842	−0.6%
	$DVSL_1$	1,998	2,008	+0.5%
	Dynastic premium	1,151	1,166	+1.3%
Changed fertility (4.2%)	$LVSL_1$	953	474	−50.2%
	$DVSL_1$	1,800	1,353	−24.8%
	Dynastic premium	847	879	+3.8%
All households	$LVSL_1$	852	827	−3.0%
	$DVSL_1$	1,990	1,980	−0.5%
	Dynastic premium	1,138	1,154	+1.4%
<i>Panel B: Higher old-age survival</i>				
Unchanged fertility (96.4%)	$LVSL_1$	818	825	+0.9%
	$DVSL_1$	1,978	2,038	+3.1%
	Dynastic premium	1,160	1,213	+4.6%
Changed fertility (3.6%)	$LVSL_1$	1,755	648	−63.1%
	$DVSL_1$	2,307	1,673	−27.5%
	Dynastic premium	552	1,025	+85.6%
All households	$LVSL_1$	852	819	−3.9%
	$DVSL_1$	1,990	2,025	+1.8%
	Dynastic premium	1,138	1,206	+6.0%

Notes: Household-weighted means in thousands of 2000 dollars. Baseline valuations use baseline fertility; counterfactual valuations use each household's counterfactual fertility. Both columns use the baseline distribution of initial household states and the same baseline income normalization for the dollar conversion. Groups are defined by whether fertility changes in the corresponding experiment. The dynastic premium equals $DVSL_1 - LVSL_1$. Levels and percentage changes are rounded separately.

Table A4: Fertility adjustment and changes in investment per child

	Lower maternal mortality			Higher old-age survival		
	Full population	Non-adjusters	Fertility adjusters	Full population	Non-adjusters	Fertility adjusters
<i>A. Change in investment per child (%)</i>						
Education	−3.0	+0.5	−62.4	−0.4	+1.2	−38.5
Inter-vivos transfers	−1.4	+2.3	−75.9	+0.6	+2.6	−41.9
Total investment	−2.6	+0.9	−64.5	−0.2	+1.5	−39.0
<i>B. Population shares (%)</i>						
Households	100	95.8	4.2	100	96.4	3.6
Children, baseline	100	96.9	3.1	100	98.1	1.9
Children, counterfactual	100	94.8	5.2	100	95.9	4.1
<i>C. Contributions to the aggregate change (percentage points)</i>						
Within non-adjusters		+0.8			+1.4	
Within fertility adjusters			−2.1			−0.7
Reallocation of children	−1.3			−0.9		
Total	−2.6			−0.2		

Notes: Panel A reports percentage changes in child-weighted investment per child. Non-adjusters choose the same fertility in both environments; all fertility adjusters increase fertility. The adjuster columns compare group-level child-weighted averages across environments. Because child weights change and some initially childless households enter parenthood, these entries are not average household-level percentage changes holding the set of children fixed. Panel B reports household shares and children shares; the latter are the weights entering the full-population averages. Panel C decomposes the aggregate percentage change into within-group changes evaluated using baseline child shares and a reallocation component evaluated at counterfactual investment levels. Childless households receive zero weight.