Fiscal Demographic Reversal*

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Abstract

We study how rising longevity affects the long-run real interest rate in an overlapping-generations model with mortality risk and accidental bequests to the young. Longer lives increase retirement saving, which tends to lower the interest rate, but they also reduce such bequests and shift asset payoffs from young savers to surviving retirees, weakening aggregate saving. Public debt amplifies this second force. When debt is sufficiently high, further increases in longevity eventually raise the steady-state interest rate. Thus, longevity need not continue to depress interest rates: with large public debt, the relationship between longevity and the interest rate becomes non-monotonic.

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1 Introduction

Over the past several decades, life expectancy has risen substantially in advanced economies. Because longer lifespans increase the need for retirement saving, longevity is often cited as a factor contributing to the decline in the natural rate of interest (Carvalho, Ferrero, and Nechio, 2016; Aksoy et al. 2019; Gagnon, Johannsen, and López-Salido, 2021). Goodhart and Pradhan (2020), however, argue that longevity also increases dissaving among the elderly and may eventually reverse the declining trend in the interest rate, a possibility they describe as the *great demographic reversal*. Understanding how longevity affects long-run interest rates is relevant for macroeconomic theory as well as for fiscal policy as the fiscal consequences of public debt depend importantly on the relation between the interest rate and the growth rate.[1]

This paper investigates how rising longevity affects the long-run real interest rate. We build on the canonical two-period overlapping-generations model of Diamond (1965) by introducing mortality risk between youth and old age. Households survive into old age with a constant probability. Otherwise, they die and pass their accumulated assets to the next generation as accidental bequests, following Abel (1985).

The main result is that public debt can make the steady-state effect of longevity on the interest rate non-monotonic. When government debt is low, higher longevity lowers the interest rate throughout. When government debt is sufficiently high, however, further increases in longevity eventually raise the interest rate, so that the relationship between longevity and the interest rate becomes U-shaped. Public debt therefore matters not only because it adds to the stock of interest-bearing assets, but also because it changes how asset payoffs are allocated across generations.

The intuition is simple. Longer lives increase saving for retirement, which is the standard force pushing interest rates down. Longer lives, however, also change who ultimately receives and spends aggregate asset payoffs. When more households survive into old age, a smaller share of asset payoffs is passed on to the young and a larger share is spent by retirees. Because the young are the saving cohort in the model, this intergenerational reallocation weakens aggregate saving. Public debt magnifies the effect by increasing the volume of interest-bearing claims whose payoffs are retained by surviving retirees rather than recycled to young households.

This paper is related to work on uncertain longevity, accidental bequests, and fiscal policy. Abel (1989) is particularly close on the fiscal dimension, studying lump-sum taxes, insurance arrangements, and debt neutrality in an overlapping-generations economy with uncertain longevity. Instead, we ask how public debt affects the effect of longevity on the long-run real interest rate. Zhang, Zhang, and Lee (2003) are close on the bequest mechanism: lower adult mortality raises life-cycle saving but reduces accidental bequests to the young; they do not study public debt. Heijdra, Mierau, and Reijnders (2014) are also related in analyzing longevity insurance and the general-equilibrium effects of redistributing accidental bequests. Relative to these studies, we show that public debt amplifies the bequest channel, generating the U-shaped longevity-interest-rate relation derived below.

[1] When the interest rate is below the growth rate, the government can finance a certain amount of fiscal spending through bond issuance, benefiting from low-cost borrowing.

2 Model

We extend the canonical two–period overlapping–generations framework of Diamond (1965). We assume households face a constant probability of death between youth and old. Following Abel (1985), the wealth of those who die is distributed as accidental bequests to the next generation. We interpret a decline in the mortality rate (a rise in the survival rate) as an increase in longevity.

2.1 Household

At the beginning of period t, a continuum N_t of identical households is born. Each household maximizes the lifetime utility

$$U_t = \log c_t^y + \beta\gamma \log c_{t+1}^o,$$

where c_t^y and c_{t+1}^o denote consumption when young and old, respectively, $\beta > 0$ is the subjective discount factor, and $\gamma \in (0,1)$ is the probability of surviving to old age. The population grows at the constant gross rate $G > 1$, so that $N_t = GN_{t-1}$.

Each young agent supplies one unit of labor inelastically at the real wage w_t and retires when old. Hence, aggregate labor supply equals N_t. The household budget constraints during each period of life are

$$c_t^y + s_t + \tau_t = w_t + \chi_t,$$

and

$$c_{t+1}^o = R_{t+1}s_t,$$

where s_t is the savings of the generation born in period t, τ_t is lump-sum tax, and χ_t is the accidental bequest received from the previous generation.

The per-capita saving s_t of generation t finances both capital for period t and bonds maturing in t.

$$s_t = k_t + b_t. \tag{1}$$

If a household dies during the transition to old age, these savings including the interest income are bequeathed to the next generation. The term χ_t represents accidental bequests from the previous generation and is given by the following expression

$$\chi_t = (1-\gamma)\,\frac{R_t}{G}s_{t-1}. \tag{2}$$

The households' optimality condition can be derived as follows

$$s_t = \frac{\beta\gamma}{1+\beta\gamma}\left(w_t + \chi_t - \tau_t\right). \tag{3}$$

2.2 Firm

A representative competitive firm produces output, Y_t, by using capital K_{t-1} and labor N_t, according to a Cobb-Douglas technology:

$$Y_t = AK_{t-1}^{\alpha}N_t^{1-\alpha}.$$

Dividing by N_t, we obtain the per capita production function $y_t = A\left(\frac{k_{t-1}}{G}\right)^\alpha$, where $y_t \equiv \frac{Y_t}{N_t}$ and $k_t \equiv \frac{K_t}{N_t}$ denote output and capital per worker, respectively. We assume capital is fully depreciated each period.

The firm rents capital at the return R_t and hires labor at wage rate w_t to maximize profits. Profit maximization problem yields the following first order conditions:

$$w_t = (1-\alpha)\, A\left(\frac{k_{t-1}}{G}\right)^\alpha, \tag{4}$$

and

$$R_t = \alpha A\left(\frac{k_{t-1}}{G}\right)^{\alpha-1}. \tag{5}$$

2.3 Government

In each period, the government collects the lump-sum tax T_t, spends interest payments $R_t B_{t-1}$, and issues public bonds B_t. The government's budget constraint is given by

$$B_t + T_t = R_t B_{t-1},$$

where $B_t \equiv N_t b_t$ and $T_t \equiv N_t \tau_t$.

The government follows the fiscal rule:

$$\tilde{b} = \frac{B_t}{K_t} = \frac{N_t b_t}{N_t k_t} = \frac{b_t}{k_t}, \tag{6}$$

setting the debt-to-capital ratio constant. As in Reis (2021) and Abel and Panageas (2025), this paper uses $\tilde{b}$ as a measure of the size of government debt. Then, equation (6) can be rewritten as:

$$\tilde{\tau}_t \equiv \frac{\tau_t}{k_t} = \left(\frac{R_t}{G} - 1\right)\tilde{b}. \tag{7}$$

2.4 Market Clearing

Competitive equilibrium is defined in a standard way; all agents optimize given prices, and the market clearing condition is satisfied for final goods

$$y_t = c_{y,t} + \gamma G^{-1} c_{o,t} + k_t,$$

for all t.

3 Fiscal Demographic Interactions

3.1 Fiscal Demographic Reversal

We explore how rising longevity affects the long-run real interest rate. When equations (1), (2), and (3) are combined, saving can be written as

$$s_t = \frac{\beta\gamma}{1+\beta\gamma}\left[w_t + (1-\gamma)\,\frac{R_t}{G}\,(k_{t-1} + b_{t-1}) - \tau_t\right]. \tag{8}$$

In this expression, the coefficient $\frac{\beta\gamma}{1+\beta\gamma}$ captures the life-cycle saving effect: as longevity rises, younger households save more for retirement. By contrast, the term $(1-\gamma)\frac{R_t}{G}(k_{t-1}+b_{t-1})$ captures the accidental dissaving effect: as more households survive into old age, accidental bequests to the young decline. We examine how these two effects shape the equilibrium interest rate.

By substituting equations (1), (2), and (4) into the household's optimality condition (3), we obtain the following expression:

$$k_t + b_t = \frac{\beta\gamma}{1+\beta\gamma}\left[(1-\alpha)A\left(\frac{k_{t-1}}{G}\right)^{\alpha} + (1-\gamma)\frac{R_t}{G}(k_{t-1}+b_{t-1}) - \tau_t\right].$$

Substituting equations (5), (6), and (7) then yields

$$\left(1+\tilde{b}\right)k_t = \frac{\beta\gamma}{1+\beta\gamma}\left\{\left[\frac{1-\alpha}{\alpha}\frac{R_t}{G} + (1-\gamma)\frac{R_t}{G}\left(1+\tilde{b}\right)\right]k_{t-1} - \left(\frac{R_t}{G}-1\right)\tilde{b}k_t\right\}.$$

In steady state, we obtain

$$R = \Psi G, \text{ where } \Psi \equiv \frac{\beta\gamma + \left(1+\tilde{b}\right)}{\beta\gamma\left[\frac{1}{\alpha} - \gamma\left(1+\tilde{b}\right)\right]}. \tag{9}$$

Differentiating Ψ with respect to γ,

$$\frac{d\Psi}{d\gamma} = \frac{\left(1+\tilde{b}\right)\Phi(\gamma)}{\beta\gamma^2\left[\frac{1}{\alpha} - \left(1+\tilde{b}\right)\gamma\right]^2},$$

where $\Phi(\gamma) \equiv \beta\gamma^2 + 2\left(1+\tilde{b}\right)\gamma - \frac{1}{\alpha}$. Since $\Phi(0) = -\frac{1}{\alpha} < 0$ and $\Phi(\gamma)$ is convex and increasing over the relevant range, if $\Phi(1) = \beta + 2\left(1+\tilde{b}\right) - \frac{1}{\alpha} > 0$, then there exists $\gamma \in [0,1]$ such that $\Phi(\gamma) = 0$. Hence, when

$$\tilde{b} > \frac{1}{2}\left(\frac{1}{\alpha} - \beta\right) - 1 \equiv \tilde{b}^r, \tag{10}$$

longevity generates a demographic reversal in which the interest rate shifts from a declining phase to a rising phase.

When government debt is large, households receive substantial gross interest income from government bonds. As longevity rises, a larger share of this income is consumed by retirees rather than transmitted to younger generations through accidental bequests. This strengthens the dissaving pressure on aggregate saving and raises the interest rate. We refer to this reversal arising from the interaction between longevity and public debt as a *fiscal demographic reversal*.

3.2 Fiscal Demographic Dividend

Since Blanchard (2019), considerable attention has been devoted to fiscal policy when the interest rate R falls below the growth rate G.[2] From the government budget constraint in

[2] See Reis (2022).

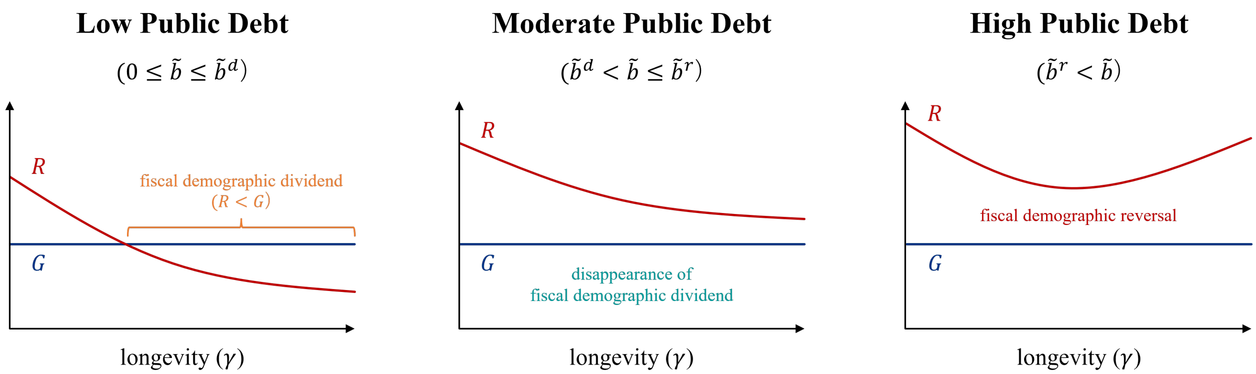

Figure 1: Fiscal Demographic Dividend and Fiscal Demographic Reversal

equation (7), when $R < G$ in steady state we have $\tau < 0$, implying that the government distributes transfers to households. Under $R < G$, public debt bubbles may arise, allowing the government to finance spending through low-cost borrowing (Brunnermeier, Merkel, and Sannikov, 2022; Kocherlakota, 2023).

Longevity initially exerts downward pressure on interest rates. If rising longevity pushes the interest rate below the growth rate and generates public debt bubbles, demographic structure effectively expands fiscal space. We refer to this benefit as a *fiscal demographic dividend*.

From equation (9), since $R < G \Leftrightarrow \Psi < 1$, this dividend arises for levels of longevity satisfying

$$\tilde{b} < \Omega(\gamma) - 1, \text{ where } \Omega(\gamma) \equiv \frac{\beta\gamma(1-\alpha)}{\alpha(1+\beta\gamma^2)}.$$

Because

$$\frac{d\Omega(\gamma)}{d\gamma} = \frac{\beta(1-\alpha)(1-\beta\gamma^2)}{\alpha(1+\beta\gamma^2)^2},$$

$\Omega(\gamma)$ increases monotonically over $\gamma \in [0,1]$. At $\gamma = 1$, the condition becomes

$$\tilde{b} < \frac{\beta(1-\alpha)}{\alpha(1+\beta)} - 1 \equiv \tilde{b}^d. \quad (11)$$

Comparing with $\tilde{b}^r$,

$$\tilde{b}^r - \tilde{b}^d = \frac{(1-\beta)(1+\alpha\beta)}{2\alpha(1+\beta)} > 0.$$

As illustrated in Figure 1, when public debt issuance is small, rising longevity lowers the interest rate and expands the fiscal demographic dividend. As public debt increases, however, the condition $R < G$ eventually fails and the dividend disappears. Further debt accumulation then induces a demographic reversal: continued longevity raises the interest rate and sharply reduces fiscal space in an aging economy. Hence, a fiscal demographic reversal does not arise under persistently low interest rates ($R < G$), but occurs when the stock of public debt is sufficiently large that $R > G$ holds.

While many studies argue that rising government debt may increase interest rates,[3] existing work has not emphasized this bequest-mediated interaction between longevity and government debt.

4 Conclusion

This paper shows that public debt alters the effect of longevity on the long-run real interest rate in an overlapping-generations model with mortality risk and accidental bequests. With low debt, rising longevity lowers the interest rate and can generate $R < G$, creating a fiscal demographic dividend. With intermediate debt, this dividend disappears. With sufficiently high debt, further longevity raises the interest rate, producing a fiscal demographic reversal.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT by OpenAI in order to improve language and readability. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

[3] Auclert et al. (2025a, 2025b) argue that although population aging is likely to continue exerting downward pressure on interest rates, debt expansion could nevertheless raise interest rates and threaten fiscal sustainability.

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