From Capital to Concrete: Population Aging and Asset Composition*

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Abstract

This paper provides evidence that population aging systematically shifts asset composition, with implications for lower growth and real interest rates. Using an instrumental variable strategy based on cross-country variation in the predetermined component of population aging, I document that aging raises the share of residential housing assets while reducing the share of productive capital in national wealth. These empirical patterns align with an overlapping generations model with a housing market, in which aging reallocates household savings away from productive investment toward housing, amplifying secular stagnation dynamics.

JEL classification: E21, E22, E44, J11

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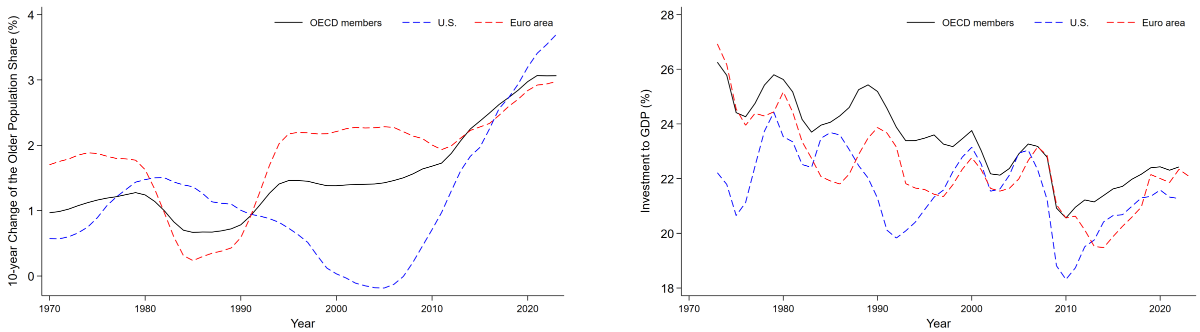
1 Introduction

Aging populations are reshaping the economic landscape across the world. In the decades following the Global Financial Crisis, many advanced economies have experienced persistently low interest rates, weak investment, and sluggish growth. These patterns have rekindled interest in the hypothesis of secular stagnation—originally proposed by Hansen (1939), who emphasized slowing population growth and diminishing investment opportunities, and later revived by Summers (2014), who highlights structural factors like aging, low productivity, or inequality that lead to weak investment demand. Although the COVID-19 shock led to a temporary surge in inflation and real interest rates, many economists argue that the forces underlying secular stagnation remain relevant in the long run.[1]

Figure 1(a) shows the 10-year change in the share of the older population (aged 65 and above) in the OECD, the Euro Area, and the United States since 1970. Although the timing of acceleration and deceleration varies across these regions, since the 2010s, all three have converged toward a similar trend of accelerated aging, which is projected to continue in the coming decades. This demographic shift has coincided with a sustained decline in investment relative to GDP, as shown in Figure 1(b). This reinforces concerns about mismatch between savings and investment in aging societies—a key mechanism underlying the secular stagnation hypothesis.

[1] See, for example, Olivier Blanchard (2023), "Secular stagnation is not over," Peterson Institute for International Economics.



(a) 10-year Change of Older Population Share

(b) Investment-to-GDP Ratio

Figure 1: Demographic and investment trends across OECD, U.S., and Euro area

Note: Data from OECD database. The older population share is defined as the proportion of individuals aged 65 and above in the total population.

While a substantial literature has examined how aging affects labor supply, public spending, and aggregate savings as channels for slowing economic growth (Maestas et al., 2023; Carvalho et al., 2016; Bloom et al., 2010), this paper emphasizes how demographic transitions reshape asset composition and capital allocation in the macroeconomy—jointly contributing to weaker growth. It also connects this analysis to existing studies on capital misallocation and debt-driven demand (e.g., Caggese and Perez-Orive 2017; Glaeser and Gyourko 2018; Mian et al. 2021). By incorporating these demographic-driven shifts into the broader discussion of secular stagnation, this paper offers a new perspective on how aging economies may amplify stagnation dynamics through asset reallocation.

I employ an overlapping generations model with a housing market and inelastic housing supply to illustrate these mechanisms. In this framework, a decline in population growth reduces labor supply, which in turn lowers the marginal product of capital and the return on nonresidential investment. With housing supply fixed and returns on productive capital falling, households reallocate their portfolios toward housing, which serves both as a consumption good and as a store of value. This reallocation raises demand for housing relative to productive capital, driving up housing prices and crowding out nonresidential investment. The resulting shift in asset composition amplifies stagnation dynamics by drawing household savings away from productive uses of capital.

I then test the model's predictions empirically using a shift-share instrumental variable strategy based on historical survival rates. Using cross-country variation in the share of the population aged 60 and over across 31 OECD countries since 1975, I document that increases in the older population share are associated with a rising ratio of net dwelling assets in the household sector to net fixed assets in the non-financial corporate sector. Consistent with these patterns, I find that population aging significantly reduces the ratio of nonresidential investment to GDP while increasing both the value of housing assets and the household-to-corporate debt ratio. Specifically, a one percentage point increase in the older population share is associated with a 0.7 percentage point decline in the nonresidential investment-to-GDP ratio and a 2.2 percentage point rise in the household-to-corporate debt ratio. These findings suggest that aging not only reduces labor input but also shifts asset demand toward residential capital, crowding out productive investment and reshaping the macroeconomic allocation of capital.

This paper contributes to three strands of literature. First, it builds on the growing body of work on secular stagnation, which links persistent low growth and interest rates to structural imbalances in savings and investment. While some studies emphasize demand-side drivers such as inequality (Straub, 2019), household indebtedness (Mian et al., 2021) or safe asset shortages (Caballero and Farhi, 2017), others point to supply-side forces, including slowing productivity growth and demographic headwinds (Gordon, 2015; Eggertsson et al., 2019). In particular, Gordon (2015) argues that population aging reduces labor force growth, compounding productivity stagnation and locking in structurally lower potential output. I complement this view by highlighting a distinct but related mechanism: aging shifts the composition of assets, reallocating savings away from productive capital and crowding out investment, which further contributes to stagnation dynamics.

Second, this paper contributes to the literature on capital misallocation and economic growth slowdown. Caggese and Perez-Orive (2017) show that the increased reliance on intangible capital and persistently low real interest rates interact to discourage firms from borrowing and investing in tangible assets, thereby hindering the efficient allocation of capital. Separately, Glaeser and Gyourko (2018) document how housing market distortions—such as zoning constraints—can inflate housing wealth and trap labor and investment. This paper studies demographic aging as an additional, systematic driver of these wealth reallocations, leading to a higher share of household housing assets and a lower share of productive capital. This demographic channel complements existing theories of misallocation by illustrating how aging-induced shifts in asset composition and asset demand can reinforce stagnation dynamics in the broader economy.

Third, this study contributes to empirical research on the macroeconomic effects of demographic shifts. Prior work has emphasized labor market and productivity consequences (Maestas et al., 2023; Acemoglu and Restrepo, 2018). I complement these findings by showing that aging influences the market value of asset classes—raising housing values while lowering investment—and that these changes are visible in sectoral debt patterns. This perspective highlights a new channel through which aging shapes the macroeconomy, with implications for both growth and financial stability.

The remainder of the paper is organized as follows. Section 2 presents an overlapping generations model with housing to illustrate the mechanisms through which aging affects asset composition. Section 3 describes the data and empirical strategy, including the instrumental variable approach based on historical survival rates. Section 4 presents the main empirical findings: first, the shift in national balance sheets as aging reallocates capital from business capital to residential housing capital; then, the impact on nonresidential investment, housing prices, and sectoral debt composition. Section 5 concludes and discusses implications for macroeconomic policy and secular stagnation.

2 An OLG Model with A Housing Market

To illustrate the mechanisms through which population aging affects asset composition and capital allocation, I employ an overlapping generations (OLG) model that incorporates a housing market with inelastic supply. In this framework, population aging—modeled as a decline in the growth rate of the young population—reduces the marginal product of capital and the return on nonresidential investment. This in turn shifts household savings behavior toward housing assets, raising housing prices and crowding out productive investment.

The economy consists of households and firms. Time is discrete and indexed by t. Each household lives for two periods (young and old), consuming a composite consumption good c and housing services h. The total housing stock H is fixed, and the value of housing assets is determined endogenously by the rental price $R_{H,t}$. Young households earn labor income w_t and allocate their savings between housing and productive capital.

Households derive utility from both consumption goods and housing services across their lifecycle. To formalize this tradeoff, consider a representative young household at time t that maximizes lifetime utility by allocating resources across two periods. The household's problem is written as:

$$\max_{c_{1,t},c_{2,t+1},h_{1,t},h_{2,t+1}} \left((1-\varphi)\ln c_{1,t} + \varphi \ln h_{1,t} + \beta(1-\varphi)\ln c_{2,t+1} + \beta\varphi \ln h_{2,t+1}\right), \tag{1}$$

where φ measures the weight that households place on housing relative to consumption in their overall utility, and β is the intertemporal discount factor.

Households earn income from wages w_t in the first period and allocate it between current consumption, housing services, and savings. Savings enable future consumption and housing services in retirement. The household faces the lifetime budget constraint:

$$c_{1,t} + R_{H,t}h_{1,t} + \frac{1}{1+r_{t+1}}(c_{2,t+1} + R_{H,t+1}h_{2,t+1}) = w_t. \tag{2}$$

This constraint ensures that lifetime income equals lifetime expenditure on consumption, housing services, and savings, where future expenditures are discounted by the real interest rate r_{t+1}.

Firms operate in perfectly competitive markets and produce output using a Cobb-Douglas technology:

$$Y_t = K_t^{\alpha} L_t^{1-\alpha}, \tag{3}$$

where K_t denotes productive capital and $L_t = (1+n)^t$ is the size of the young workforce, growing at rate n. Capital accumulates via:

$$K_{t+1} = Y_t - c_{1,t}L_t - c_{2,t}L_{t-1} + (1-\delta)K_t. \tag{4}$$

This equation reflects that the capital stock in the next period, K_{t+1}, is determined by current output net of the resources consumed by both the young ($c_{1,t}L_t$) and the old ($c_{2,t}L_{t-1}$), plus the undepreciated portion of existing capital $(1-\delta)K_t$.

Assuming a real estate leasing market with free entry and no risk—that is, agents know future rental income, resale prices, and interest rates with certainty—the no-arbitrage condition must hold as an identity. In equilibrium, any trading strategy involving real estate must yield zero economic profit. In particular, the opportunity cost of purchasing one unit of housing at time t must be exactly offset by the sum of rental income and the capital gains from reselling the unit at time $t+1$. This no-arbitrage asset-pricing condition is:

$$p_t = \frac{R_{H,t+1} + p_{t+1}}{1 + r_{t+1}}. \tag{5}$$

Finally, the economy is subject to two market-clearing conditions that ensure consistency between household decisions and aggregate resource constraints. First, the asset market-clearing condition requires that the total value of productive capital and housing assets equals aggregate household savings:

$$K_{t+1} + p_t H = a_t L_t, \tag{6}$$

where p_t is the housing price and a_t denotes household savings per young person. In equilibrium, young agents save a constant fraction of their labor income because they seek to smooth consumption and housing services over time. With two periods of life, they face an intertemporal tradeoff: part of their income must be set aside to support consumption and housing needs in old age. This desire to balance living standards across periods leads households to consistently allocate a fixed share of income to savings, regardless of their absolute income level. It is straightforward to show that this intertemporal optimization under log preferences delivers a constant marginal propensity to save. As a result, the asset market-clearing condition can be expressed as:

$$K_{t+1} + p_t H = \frac{\beta}{1+\beta}(1-\alpha)Y_t. \tag{7}$$

This expression highlights that a fixed share of output is allocated to asset accumulation, with household savings divided between productive investment and housing.

Second, the rental market-clearing condition requires that the total expenditure on housing services, $R_{H,t}H$, is proportionate to aggregate consumption C_t. This relationship emerges because households derive utility from both consumption and housing services and allocate a constant share of their total expenditure to housing at any point in time. Formally, this condition is expressed as:

$$R_{H,t}H = \frac{\varphi}{1-\varphi}C_t, \tag{8}$$

where the coefficient $\frac{\varphi}{1-\varphi}$ reflects the marginal rate of substitution between consumption and housing services in the household's utility function.

I define a competitive equilibrium in this economy as follows.

Definition 1. A competitive equilibrium is a sequence of allocations and prices

$$\{c_{1,t}, c_{2,t+1}, h_{1,t}, h_{2,t+1}, w_t, r_{t+1}, R_{H,t}, p_t, Y_t, K_t\}_{t=0}^{\infty}$$

such that:

(a) Households solve their lifetime utility maximization problem, as defined in equations (1) and (2).

(b) Firms maximize profits, as specified by the production function (3).

(c) The asset market-clearing and rental market-clearing conditions hold, as in equations (7) and (8).

(d) Housing asset prices satisfy the no-arbitrage condition (5).

Building on this equilibrium, I focus on the balanced growth path, where output, consumption, capital, and prices all grow at the population growth rate n.

Having defined the competitive equilibrium, I now characterize how key economic outcomes respond to demographic shifts in the balanced growth path. In particular, I derive a set of propositions that capture the comparative static effects of a decline in the population growth rate on interest rates, investment, and asset composition. Proofs of these comparative steady-state results are provided in Appendix B.

Proposition 1 (Interest Rate Proposition) *A decline in the population growth rate n lowers the steady-state real return on capital $\bar{r}$, i.e., $\frac{\partial \bar{r}}{\partial n} > 0$.*

As population growth slows and the labor force shrinks, the capital-labor ratio rises. This reduces the marginal product of capital and lowers the steady-state real interest rate. The decline in interest rates reflects an imbalance between high savings and limited investment opportunities. This mechanism is central to the secular stagnation hypothesis, where aging lowers the natural rate of interest by reducing underlying investment demand

Proposition 2 (Investment Proposition) *A decline in n reduces the steady-state nonresidential investment-to-output ratio, i.e., $\frac{\partial (\bar{I}/\bar{Y})}{\partial n} > 0$.*

With fewer workers and lower marginal returns, firms face weaker incentives to invest in nonresidential capital. At the same time, slower growth reduces the need to expand capital stock to accommodate a growing labor force. Together, these forces depress the share of output devoted to nonresidential investment. The result is a sustained decline in business investment relative to GDP, a key mechanism through which population aging can slow long-run growth.

Proposition 3 (Housing Share Proposition) *A decline in n raises the housing share of total asset, i.e.,* $\frac{\partial(\bar{p}H/\bar{K})}{\partial n} < 0$.

As the return to productive capital falls, households reallocate a growing share of savings toward housing. Housing serves both as a durable consumption good and as a store of value—especially attractive in a low-rate environment. Because housing supply is inelastic, increased saving demand translates into higher residential housing assets relative to productive capital. This compositional shift implies a growing dominance of residential assets in the economy, despite their limited contribution to productive capacity.

Proposition 4 (Amplification Proposition) *A decline in the population growth rate n leads to a larger drop in output in the presence of housing preferences, i.e.,* $\frac{\partial \bar{Y}}{\partial n} > 0$ *and* $\frac{\partial^2 \bar{Y}}{\partial \varphi \partial n} > 0$.

When population growth slows, it reduces the labor force and directly lowers output. In theory, higher capital-labor ratios could partially offset this effect via capital deepening. When $\varphi = 0$, households allocate all savings to productive capital, allowing the economy to fully benefit from this channel. However, if $\varphi > 0$, a portion of savings is instead diverted toward housing. This limits productive investment and weakens the buffering effect of capital accumulation. Consequently, output becomes more sensitive to demographic shocks when housing preferences are stronger. In the limit, aging economies with high housing demand experience a sharper output decline in response to falling population growth. [2]

Proposition 5 (Growth Proposition) *A decline in the population growth rate n leads to a larger drop in nonresidential investment in high-growth economies, and a greater rise in housing asset value (relative to total assets) in low-growth economies, i.e.,* $\frac{\partial^2(\bar{I}/\bar{Y})}{\partial n \partial g_H} > \frac{\partial^2(\bar{I}/\bar{Y})}{\partial n \partial g_L}$*, and* $\frac{\partial^2(\bar{p}H/\bar{K})}{\partial n \partial g_H} < \frac{\partial^2(\bar{p}H/\bar{K})}{\partial n \partial g_L}$.

In high-growth economies, the return on capital is initially high, so population aging, which reduces the labor force, causes a sharper rise in the capital–labor ratio and a more

[2] The demand for holding housing assets is consistent with micro-level evidence from Nakajima and Telyukova (2013), who find that older households tend to hold substantial housing wealth into retirement, show limited willingness to downsize, and decumulate financial assets instead.

pronounced decline in the marginal product of capital, weakening investment incentives. In contrast, in low-growth economies, where capital returns are already low, falling interest rates reduce the opportunity cost of holding long-lived, moderate-yield assets like housing. Households increasingly shift their savings toward housing, which provides both consumption services and a store of value, raising its relative importance in the portfolio. Thus, aging reallocates household assets differently depending on an economy's growth potential.

Overall, these propositions formalize the mechanisms through which population aging reshapes household saving patterns and the composition of national wealth. A natural corollary of these propositions is that population aging causes the nonresidential capital stock to decline as a share of total assets, potentially manifesting as a faster rise in household debt relative to corporate debt.[3]

In the next sections of the paper, I test these theoretical predictions empirically. Specifically, I examine whether population aging (i) raises the share of housing assets in national wealth, (ii) reduces nonresidential investment, (iii) elevates housing prices, and (iv) leads to a faster increase in household debt relative to corporate debt. Together, these empirical tests assess how demographic aging reshapes asset composition, crowds out productive investment, and amplifies secular stagnation dynamics.

3 Empirical Design

3.1 Data

This analysis draws on a panel dataset that combines demographic, macroeconomic, and financial indicators at an annual frequency across OECD countries. The dataset integrates information from international sources including the OECD, World Bank, BIS, and World Inequality Database. Specifically, the OECD National Accounts and Demographic Statis-

[3]This argument assumes that most household debt is residential mortgages, and that loan-to-value (LTV) ratios and firms' capital structure choices remain unaffected by aging.

tics provide key variables on population structure, housing and nonresidential asset stocks, investment, and housing prices. Measures of financial development—such as stock market capitalization-to-GDP ratios and trading volumes—come from the World Bank's Global Financial Development Database, while household and corporate debt data are sourced from BIS Statistics. Finally, indicators of income and wealth inequality are drawn from the World Inequality Database.

The dataset spans 31 countries over the period from 1975 to 2021, capturing substantial variation in aging patterns, sectoral asset and investment allocation, and housing prices across advanced and emerging economies. While the panel is unbalanced due to gaps in data availability, it allows me to document key empirical relationships and test the theoretical predictions developed in this paper.

Details on variable construction, data cleaning, and country coverage are provided in Appendix A.

3.2 Approach

Empirical Specification

To investigate asset composition, I use the following baseline specification:

$$Y_{it} = \beta \Delta A_{it} + \gamma_t + \mu_i + \varepsilon_{it},$$

where Y_{it} is the outcome variable of interest—either the 10-year change in the household housing to corporate capital ratio (Housing share), the nonresidential investment-to-GDP ratio, log housing prices, or the 10-year average household debt-to-corporate debt ratio (defined as $HH\,Debt\,Share_{it} = \frac{household\,debt_{it}}{corporate\,debt_{it}}$). The symbol Δ denotes the 10-year change, and A_{it} is the share of the population aged 60 and over to the population aged 20 and over, calculated as $\Delta A_{it} = \frac{Aged_{i,t+10}}{N_{i,t+10}} - \frac{Aged_{it}}{N_{it}}$. γ_t represents year fixed effects, μ_i denotes country fixed effects, and ε_{it} is the error term.[4]

The goal of the empirical analysis is to identify the causal effects of population aging on asset composition and capital allocation. The central challenge is the potential endogeneity of aging with respect to macroeconomic outcomes—for example, economic conditions may influence migration, fertility, or retirement behavior, which in turn can jointly shape both demographic trends and patterns of capital composition. To address this concern, I employ an instrumental variable (IV) strategy that isolates plausibly exogenous variation in the aging rate. The instrument is constructed using a shift-share Blanchard and Katz (1992) approach based on predetermined age structures and externally estimated survival rates.[5]

Specifically, I divide countries into four groups based on their old-age population shares. Within each group, I take each country's age structure at time $t-10$ and apply common cohort survival ratios—estimated from sub-regional population dynamics rather than national data—to project the size of the older and working-age populations ten years forward. This generates a predicted change in the aging rate that reflects demographic momentum rather than contemporaneous economic shocks.

Formally, the instrument is defined as the projected change in the aging rate between year t and $t+10$:

$$\Delta \widehat{A}_{it} = \left(\frac{\widehat{Aged}_{i,t+10}}{\widehat{N}_{i,t+10}} \right) - \left(\frac{\widehat{Aged}_{i,t}}{\widehat{N}_{i,t}} \right),$$

where the projected older population $\widehat{A}_{i,t}$ and total adult population $\widehat{N}_{i,t}$ are computed by applying sub-regional survival rates to each country's cohort structure at $t-10$:

[4] Because of the long panel nature of the data, I verify that the variables are stationary using the Levin, Lin, and Chu (LLC) unit root test. No further differencing is needed for Y_{it}.

[5] I implement a projected growth-based IV using sub-regionally common survival rates, akin to the Bartik instrument with cohort forecasting. Unlike approaches that rely on contemporaneous age structures and country-specific survival rates, this method has two key advantages. First, using lagged population shares ensures that the instrument is predetermined with respect to current macroeconomic shocks. Second, applying externally estimated sub-regional survival rates helps avoid endogeneity arising from country-specific mortality improvements that may correlate with economic performance. This cohort-forecasting variant isolates mechanical demographic transitions rather than endogenous demographic responses.

$$\widehat{Aged}_{i,t} = \sum_{j \geq 50} N_{ji,t-10} \cdot \left(\frac{N_{j+10,t}}{N_{j,t-10}} \right), \quad \widehat{Aged}_{i,t+10} = \sum_{j \geq 40} N_{ji,t-10} \cdot \left(\frac{N_{j+20,t+10}}{N_{j,t-10}} \right),$$

$$\widehat{N}_{i,t} = \sum_{j \geq 10} N_{ji,t-10} \cdot \left(\frac{N_{j+10,t}}{N_{j,t-10}} \right), \quad \widehat{N}_{i,t+10} = \sum_{j \geq 0} N_{ji,t-10} \cdot \left(\frac{N_{j+20,t+10}}{N_{j,t-10}} \right).$$

This instrument captures long-horizon demographic shifts that are plausibly exogenous to near-term macroeconomic fluctuations, enabling a cleaner identification of the causal effect of population aging.

4 Results

This section presents four sets of results. First, I examine the first-stage regression using the full sample of 31 countries to confirm the strength of the instrument for aging. Second, I present motivation results exploring the relationship between aging and macro-level capital composition. Third, I estimate the causal effects of population aging on housing prices and nonresidential investment. Finally, I test the corollary that population aging leads to a faster increase in household debt relative to corporate debt.

4.1 First Stage: Instrument Relevance

I begin by evaluating the strength of the instrument using a first-stage regression of the observed aging rate on the projected instrument derived from lagged age structures and sub-regional survival rates (Table 1). The results confirm that the instrument strongly predicts the observed aging rate, with an F-statistic well above conventional thresholds for weak instrument concerns.

In column (1), which controls for initial conditions and includes country fixed effects, the estimated coefficient on the projected aging instrument is 0.935 and highly significant.

Table 1: Predicting the ΔA from Survival Rates

	(1)	(2) ΔA	(3)
$\Delta \hat{A}$	0.935***	0.876***	0.870***
	(0.011)	(0.017)	(0.016)
F statistic	5727.69	1418.94	2799.47
Initial conditions	Yes	Yes	
Country FE	Yes	Yes	Yes
Year FE		Yes	Yes
Countries	31	31	31

Note: This table shows the first-stage regression estimates of the observed change in the share of the population aged 60 and over (ΔA) on the projected change based on lagged age structures and sub-regional survival rates ($\Delta \hat{A}$). Columns (1)–(3) display different specifications with country and year fixed effects, and, in columns (1) and (2), controls for initial conditions (including the urban population share 10 years before the beginning of the period). Robust standard errors are reported in parentheses. The instrument's F-statistics in all columns exceed conventional thresholds for weak instrument concerns. The sample includes 31 countries for the period 1975–2021. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Adding year fixed effects in column (2) slightly reduces the coefficient to 0.876, reflecting the absorption of global time trends. Column (3) excludes initial conditions while retaining both country and year fixed effects, yielding a coefficient of 0.870 with an F-statistic of approximately 430—well above standard thresholds for weak instrument concerns. These results indicate that a one percentage point increase in the projected aging rate leads to about a 0.87 percentage point increase in the realized aging rate, providing strong evidence for instrument relevance.

4.2 Asset Composition Shifts in National Wealth Accounts

As a preliminary step, I explore the relationship between population aging and shifts in the composition of national wealth. Table 2 presents estimates using the *housing share* variable defined as the ratio of net dwelling assets in the household sector to net fixed assets in the non-financial corporate sector—as a measure for asset composition.

Although data availability is limited both in terms of country coverage and time, the results offer suggestive evidence that aging economies tend to allocate a greater share of wealth toward housing assets. These findings should be interpreted as descriptive, given the restricted sample. Nonetheless, they help motivate the subsequent causal analysis by illustrating how demographic transitions may reshape the structure of national balance sheets.

Table 2: Population Aging and the Housing-to-Corporate Asset Ratio

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
	Housing Share					
ΔA	1.672***	0.784	0.961	1.947***	0.653**	0.854***
	(0.562)	(0.744)	(0.747)	(0.207)	(0.285)	(0.292)
F statistic				1537.93	656.61	1431.99
Initial conditions	Yes	Yes		Yes	Yes	
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes		Yes	Yes
Observations	394	394	398	394	394	398
Countries	21	21	21	21	21	21

Note: This table presents estimates of the relationship between changes in population aging (ΔA) and the housing share of national wealth, measured as the ratio of net dwelling assets in the household sector to net fixed assets in the non-financial corporate sector. Columns (1)–(3) report OLS regressions, and columns (4)–(6) report IV regressions using the projected aging rate instrument based on lagged age structures and sub-regional survival rates. Initial conditions include controls such as the urban population share 10 years prior. Country fixed effects (FE) are included throughout, and year FE are added in columns (2) and (5). Columns (3) and (6) only include country and year fixed effects. Observations vary slightly across specifications due to data availability for the housing share variable. Robust standard errors are shown in parentheses. The sample covers 21 countries; year coverage is limited for this dependent variable, with most observations available after 2000. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.3 Population Aging and Nonresidential Investment

Table 3 reports the estimates for the effect of population aging on nonresidential investment. The dependent variable is the ten-year change in the nonresidential investment-to-GDP ratio. All regressions include country and year fixed effects, without additional controls. The OLS estimates in columns (1)–(3) are generally smaller and statistically weaker than their IV counterparts in columns (4)–(6). This pattern likely reflects attenuation bias from measurement error or omitted variable bias in OLS regressions. By contrast, the shift-share instrument isolates plausibly exogenous variation in population aging, helping to recover the true causal effect. The stronger and more precise IV estimates reinforce the view that population aging causally depresses nonresidential investment, beyond what is captured in simple correlations.

Columns (1) and (4) present the estimates for the full sample. The OLS estimate in column (1) is negative but not statistically significant, while the IV estimate in column (4) is statistically significant at the 1% level. Specifically, the IV result suggests that a one percentage point increase in the older population share reduces the nonresidential investment share by 0.72 percentage points.

A potential concern is that the negative coefficient might not represent a direct causal impact of aging on investment. Rather, it could reflect either omitted variable bias—where persistent economic weakness simultaneously depresses investment and drives demographic shifts—or reverse causality, whereby declining investment opportunities trigger emigration of younger workers and thus accelerate population aging.

To address these possibilities, I split the sample by economic growth performance. Countries above the median post-2020 GDP growth rate are classified as the high-growth group, while those below are the low-growth group. Columns (2) and (5) show the results for the high-growth subsample, and columns (3) and (6) for the low-growth subsample. In the high-growth countries, the IV estimates remain large and significant, indicating that the negative effect of aging on investment is robust and not driven by general economic malaise. In contrast, coefficients for low-growth countries are smaller and statistically insignificant. This pattern suggests that the estimated negative relationship is less likely to reflect reverse causality or omitted variable bias, bolstering the interpretation of aging as a causal driver of lower nonresidential investment.

Table 3: Population Aging and Nonresidential Investment

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Nonresidential Investment / GDP					
ΔA	-0.268	-0.197	-0.0577	-0.716***	-1.150***	-0.378
	(0.371)	(0.958)	(0.398)	(0.208)	(0.245)	(0.296)
F statistic				944.45	835.18	530.16
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Growth Subsample	All	High	Low	All	High	Low
Observations	1102	560	542	1102	560	542
Countries	31	16	15	31	16	15

Note: This table presents estimates of the effect of changes in the population aging share (ΔA) on the ten-year change in the nonresidential investment-to-GDP ratio. Columns (1) and (4) show results for the full sample of 31 countries; columns (2) and (5) for the high-growth subsample; columns (3) and (6) for the low-growth subsample, where growth is defined by whether a country's average GDP growth rate is above or below the median. OLS estimates are reported in columns (1)–(3); IV estimates using a shift-share instrument based on lagged survival rates are in columns (4)–(6). All regressions include country and year fixed effects. First-stage F-statistics for the IV regressions are reported in the table. Robust standard errors are shown in parentheses. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.4 Population Aging and Housing Prices

Table 4 presents the results for the impact of population aging on housing prices. The dependent variable is the ten-year growth in housing prices relative to GDP growth. All specifications include controls for initial urbanization (urban population share) and initial financial development.

For the full sample, columns (1) and (4) yield mixed results. The OLS coefficient is statistically insignificant, while the IV estimates are larger in magnitude and statistically significant. This divergence, similar to the previous subsection, likely reflects the advantages of the shift-share IV strategy in isolating exogenous variation in aging and recovering the causal effect more reliably. These findings support the notion that aging economies may experience an increase in the total value of housing assets. In some emerging markets, however, price effects may be muted as increased demand for housing is met with rapid construction.

To further investigate potential heterogeneity, I split the sample into low-growth and high-growth economies. Columns (3) and (6) focus on the low-growth subsample, which consists mainly of European advanced economies. Here, the IV estimates are both statistically significant and economically substantial: a one percentage point increase in the older population share is associated with an 8.2 percentage point increase in relative housing price growth (column (6)). This magnitude is comparable to anecdotal evidence; for example, in the United Kingdom between 2009 and 2019, the housing price index grew by 19%, while GDP grew by only 3%, coinciding with an aging rate increase of around 2%.

Overall, these results highlight the nuanced impact of population aging on housing markets, particularly in advanced, slower-growing economies. They also underscore the empirical challenges of identifying the long-run drivers of housing prices (Mian and Sufi, 2009; Chodorow-Reich et al., 2024). In the next subsection, I turn to complementary evidence from sectoral debt composition, which may reflect underlying shifts in asset allocation associated with aging.

Table 4: Population Aging and Housing Prices

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
	Excess Housing Price Growth					
ΔA	-0.274	-2.065	2.450	1.929**	0.791	4.790***
	(2.151)	(3.736)	(2.634)	(0.966)	(1.468)	(1.249)
F statistic				1777.78	999.32	789.86
Initial conditions	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Growth Subsample	All	High	Low	All	High	Low
Observations	606	238	368	606	238	368
Countries	27	15	12	27	15	12

Note: This table reports the estimated effect of changes in the population aging share (ΔA) on the ten-year growth in housing prices relative to GDP growth, a measure of *excess housing price growth*. Columns (1)–(3) show OLS estimates, while columns (4)–(6) report IV estimates using a shift-share instrument for aging based on lagged survival rates. The sample is split into high- and low-growth groups based on median GDP growth rates. All regressions control for initial conditions (urban population share and financial development index 10 years before), and include country and year fixed effects. First-stage F-statistics for the IV regressions are reported in the table. Robust standard errors are in parentheses. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.5 Population Aging and Debt Composition

Population aging can lower real interest rates and boost the demand for housing assets, increasing their market value relative to productive investment. A natural corollary is that population aging can also change debt composition, increasing household debt faster than corporate debt. This is because households primarily use debt for mortgages (except in Germany), whereas corporate debt finances productive investment. To shed light on this implication, I examine whether population aging raises the household-to-corporate debt ratio.

Table 5 presents the results. The debt composition is measured as the ratio of household debt to corporate debt (the household debt share). In columns (1) and (4), controlling only for initial conditions and country fixed effects, I find a significant positive relationship between aging and the household debt share. A one percentage point increase in the older population share is associated with a 3.6 and 4.4 percentage point increase in the household share for the OLS and IV specifications, respectively. Adding year fixed effects in columns (2), (3), (5), and (6) dampens the coefficients somewhat. However, the IV coefficient in column (6) still suggests that a one percentage point increase in the older population share leads to a 2.2 percentage point increase in household debt share. These results provide additional evidence that aging reshapes asset and credit allocation in the economy.

Table 5: Population Aging and Household-to-Corporate Debt Ratio

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
	Household Debt Share					
ΔA	3.578**	1.900*	2.184**	4.393***	1.865***	2.208***
	(1.502)	(1.096)	(1.046)	(0.244)	(0.371)	(0.371)
F statistic				5727.69	1418.94	2799.47
Initial conditions	Yes	Yes		Yes	Yes	
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes		Yes	Yes
Observations	849	849	879	849	849	879
Countries	31	31	31	31	31	31

Note: This table reports estimates of the effect of changes in the population aging share (ΔA) on the average 10-year household-to-corporate debt ratio (household debt share). Columns (1)–(3) show OLS estimates, while columns (4)–(6) present IV estimates using a shift-share instrument for aging based on historical survival rates. The regressions in columns (1) and (4) include only initial conditions (urban population share 10 years ago) and country fixed effects. Columns (2) and (5) additionally include year fixed effects. Columns (3) and (6) only include country and year fixed effects. First-stage F-statistics for the IV regressions are reported in the table. Robust standard errors are shown in parentheses. The sample covers 31 OECD countries from 1975 to 2021. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Additional robustness checks and alternative explanations are presented in Appendix C.

5 Conclusions

Population aging has been a prevalent demographic trend across the world since the last century, and it has long been considered one of the main drivers of secular stagnation.

While most studies focus on how aging reduces labor supply and aggregate saving, this paper highlights an additional mechanism: aging systematically reshapes the composition of capital and asset allocation, amplifying the stagnation dynamics.

Using an instrumental variable approach, I first provide evidence that aging changes the composition of national wealth, with older populations allocating a larger share of capital toward housing rather than productive assets. Specifically, aging is associated with a significant increase in the household sector's share of national assets—measured by the ratio of net dwelling assets to corporate net fixed assets—highlighting a shift in national balance sheets that favors housing over productive investment.

Next, I document that as the share of the population aged 60 and over rises, nonresidential investment declines significantly, while the value of housing assets grows, particularly in low-growth economies. For example, in advanced European countries, a 1% increase in the older population share accelerates housing price growth by over 8 percentage points per decade relative to GDP. These findings suggest that aging not only lowers labor supply, reducing the marginal product of capital, but also redirects household savings away from productive investment and toward housing assets.

Third, I show that this shift in asset composition is reflected in the composition of debt. Population aging is associated with a faster rise in household debt relative to corporate debt. A 1% increase in the share of the population aged 60 and over leads to a 2.2 percentage point increase in the household-to-corporate debt ratio, suggesting that changes in the real economy's asset mix are mirrored in the structure of liabilities.

Finally, I test whether this shift is driven by rising income inequality, as suggested by the "indebted demand" hypothesis(Mian et al., 2021). However, interaction regressions show that inequality does not play a significant moderating role, reinforcing the argument that aging-induced changes in asset composition—rather than distributional shifts—are the main driver of these debt dynamics.

These empirical findings are consistent with the stylized overlapping generations model presented in Section 2, which shows that aging reduces labor supply, lowers the marginal product of capital, and thereby depresses the interest rate. With inelastic housing supply and stable life-cycle demand for housing, the relative return to housing rises compared to productive capital. This crowds out nonresidential investment, amplifying the stagnation of productive capital formation in the economy.

Taken together, these results suggest that population aging is not only a driver of secular stagnation through lower labor supply but also an amplifier of stagnation through shifts in asset demand and debt composition. One implication is that housing policy—particularly measures that loosen housing supply constraints—could play a critical role in mitigating these macroeconomic effects. For example, urban economists like Hsieh and Moretti (2019) and Glaeser and Gyourko (2018) have argued that zoning restrictions distort capital allocation by driving up housing prices and crowding out productive uses of land and capital. This paper provides further evidence that these distortions could be exacerbated in aging economies. Finally, the results suggest that monetary policy may be less effective in boosting productive investment in aging societies because low interest rates, in combination with aging, can further shift household savings into housing, potentially reinforcing the stagnation trap. Overall, these insights suggest that further research may be warranted into the potential for coordinated coordinated housing, labor market, and macro-financial policies to offset the stagnation pressures induced by population aging.

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Appendix

A Data

A.1 Data Processing

This appendix provides additional detail on how the core variables were constructed and cleaned. The aging share is calculated as the ratio of the population aged 60 and over to the population aged 20 and over, using annual demographic data from the OECD. The housing share of assets is defined as the ratio of net dwelling assets held by the household sector to net fixed assets held by the non-financial corporate sector, based on the OECD National Accounts.

Nonresidential investment is measured as gross fixed capital formation excluding dwellings, scaled by GDP, with data sourced from the OECD. For debt composition, household and corporate debt-to-GDP ratios are sourced from the BIS Statistics, and the household-to-corporate debt ratio is computed as the ratio of these two sectoral measures. Housing prices are captured by the OECD housing price index, and to assess the relative pace of housing price growth, I compute excess housing price growth as the difference between the housing price index growth rate and the real GDP growth rate.

Financial development is measured using the World Bank's indicators of market capitalization-to-GDP and total traded shares-to-GDP ratios. Measures of income inequality—including the Gini coefficient and the top 1% income share—and wealth inequality (top 1% wealth share) come from the World Inequality Database. Finally, the urban population share, derived from OECD demographic data, reflects the share of the population living in urban areas, capturing urbanization trends that may shape housing demand and asset allocation patterns across countries.

A.2 Summary Statistics

Table A.1: Summary Statistics

Variable	Mean	SD	Min	Max
Aging Share	0.234	0.065	0.087	0.426
Household Debt Share	0.638	0.307	0.062	1.806
Nonresidential Investment / GDP	-0.534	9.891	-44.438	49.085
Change in Housing Prices	0.161	0.311	-0.734	1.071
10-Year Mean GDP Growth	0.022	0.016	-0.026	0.092
Financial Development Index	56.801	46.695	0.023	322.711
Gini Index	0.480	0.101	0.218	0.756
Wealth Inequality	0.262	0.084	0.116	0.585
Urban Population Share	0.726	0.136	0.199	0.980

Note: Summary statistics are based on an unbalanced panel of 31 countries from 1975 to 2021, including Australia, Austria, Belgium, Brazil, Canada, Colombia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Indonesia, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, South Africa, Spain, Sweden, United Kingdom, and United States.

B Proof of Comparative Steady-State Derivatives

Here, I provide the detailed derivation of the steady-state comparative statics with respect to the population growth rate n. These steps extend the summary derivations presented in the main text.

Derivative of $\bar{r}$ with respect to n Using the implicit function defined by the equilibrium condition:

$$1 = \frac{\beta}{1+\beta}(1-\alpha)\frac{1}{\alpha}\frac{d\bar{r}}{dn} - \frac{\varphi}{1-\varphi}\left[\frac{((\bar{r}+\delta)/\alpha - n - \delta)\left(-\frac{d\bar{r}}{dn}+1\right)}{(\bar{r}-n)^2} + \frac{1}{(\bar{r}-n)}\left(\frac{1}{\alpha}\frac{d\bar{r}}{dn} - 1\right)\right],$$

we solve for $\frac{\partial \bar{r}}{\partial n}$:

$$\frac{\partial \bar{r}}{\partial n} = \frac{1 + \frac{B(\bar{r}+\delta)/\alpha - n - \delta}{(\bar{r}-n)^2} - \frac{B}{\bar{r}-n}}{A + B\left[\frac{(\bar{r}+\delta)/\alpha - n - \delta}{(\bar{r}-n)^2}\right] - B\left[\frac{1}{\alpha(\bar{r}-n)}\right]},$$

where

$$A = \frac{\beta}{1+\beta}(1-\alpha)\frac{1}{\alpha}, \quad B = \frac{\varphi}{1-\varphi}.$$

Finally:

$$\frac{\partial \bar{r}}{\partial n} = \frac{1 + \frac{\varphi}{1-\varphi}\left[\frac{(\bar{r}+\delta)/\alpha - n - \delta}{(\bar{r}-n)^2} - \frac{1}{\bar{r}-n}\right]}{\frac{\beta}{1+\beta}(1-\alpha)\frac{1}{\alpha} + \frac{\varphi}{1-\varphi}\left[\frac{(\bar{r}+\delta)/\alpha - n - \delta}{(\bar{r}-n)^2}\right] - \frac{\varphi}{1-\varphi}\left[\frac{1}{\alpha(\bar{r}-n)}\right]}.$$

Given $\bar{r} > n$ and parameter bounds, $\frac{\partial \bar{r}}{\partial n} > 0$.

Other Derivatives

- Output-to-capital ratio:

$$\frac{\partial}{\partial n}\left(\frac{\bar{Y}}{\bar{K}}\right) = \frac{1}{\alpha}\frac{\partial \bar{r}}{\partial n} > 0.$$

- Consumption-to-capital ratio:

$$\frac{\partial}{\partial n}\left(\frac{\bar{C}}{\bar{K}}\right) = \frac{1}{\alpha}\frac{\partial \bar{r}}{\partial n} - 1 > 0.$$

- Housing-to-capital ratio:

$$\frac{\partial}{\partial n}\left(\frac{\bar{p}H}{\bar{K}}\right) = 1 - \frac{\beta}{1+\beta}\frac{(1-\alpha)}{\alpha}\frac{\partial \bar{r}}{\partial n} < 0.$$

- Investment-to-output ratio:

$$\frac{\partial}{\partial n}\left(\frac{\bar{I}}{\bar{Y}}\right) = -\frac{\partial}{\partial n}\left(\frac{\bar{K}}{\bar{Y}}\right) - \frac{\partial}{\partial n}\left(\frac{\bar{C}}{\bar{K}}\frac{\bar{K}}{\bar{Y}}\right) > 0.$$

- Output: Output $\bar{Y}$ depends on the capital stock $\bar{K}$ and the population growth rate n through the balanced growth path condition. Specifically, output per capita is given by:

$$\bar{Y} = \bar{K}^{\alpha} L^{1-\alpha}.$$

In the steady state, labor L grows at rate n, so:

$$\frac{\partial \bar{Y}}{\partial n} = (1-\alpha)\bar{Y}\frac{1}{n}.$$

Because $\bar{Y} > 0$ and $n > 0$ in the balanced growth path, this derivative is positive:

$$\frac{\partial \bar{Y}}{\partial n} > 0.$$

- The cross-partial derivative of output with respect to population growth n and housing preference φ is positive:

$$\frac{\partial^2 Y}{\partial \varphi \partial n} > 0.$$

The capital-labor ratio in equilibrium depends on the allocation of household savings:

$$k \propto (\frac{1-\varphi}{n+\delta})^{\frac{1}{1-\alpha}}.$$

Differentiating with respect to n:

$$\frac{\partial k}{\partial n} \propto -\frac{(1-\varphi)}{(n+\delta)^2}.$$

Differentiating again with respect to φ:

$$\frac{\partial^2 k}{\partial \varphi \partial n} \propto \frac{1}{(n+\delta)^2} > 0.$$

This positive cross-partial derivative means that as φ rises, the magnitude of the change in k with respect to n also grows. Consequently, output $Y = k^\alpha L$ becomes more sensitive to n when φ is higher:

$$\frac{\partial^2 Y}{\partial \varphi \partial n} > 0.$$

These derivations confirm that a fall in n reduces the real interest rate and the marginal product of capital, raising housing values relative to nonresidential investment and driving the observed asset composition shift.

C Alternative Explanations and Robustness

C.1 Inequality and Debt Composition

In this section, I explore whether the faster growth of household debt compared to corporate debt could be linked to the rise in income inequality. The *indebted demand* hypothesis (Mian et al., 2021) suggests that higher income inequality reallocates resources from borrowers to savers, lowering interest rates and stimulating household borrowing. This mechanism could potentially contribute to the observed association between population aging and changes in debt composition.

To investigate whether this mechanism plays a role in my setting, I augment the baseline regressions by including interactions between changes in aging and changes in inequality measures. If the indebted demand channel is relevant in this context, the interaction terms should be significant.

Table C.1 presents the results. In this dataset, the interaction coefficients are not statistically significant, and I have a hard time finding clear evidence that inequality meaningfully moderates the relationship between aging and debt composition. This does not contradict the asset valuation mechanism linked to demographic shifts described in the main analysis.

Table C.1: Testing the Moderation Effect of Inequality

	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
	Household Debt Share			
ΔA	2.102*	2.203*	2.001*	2.948***
	(1.135)	(1.235)	(1.122)	(1.085)
$\Delta A \times \Delta$ Gini	-10.95	-11.21		
	(9.542)	(9.091)		
$\Delta A \times \Delta$ Wealth Inequality			9.909	7.922
			(15.38)	(14.31)
F statistic		315.79		189.03
Initial conditions				
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Countries	31	31	31	31

Note: This table examines whether changes in income and wealth inequality moderate the effect of population aging (ΔA) on the 10-year average household-to-corporate debt ratio (household debt share). Columns (1) and (3) present OLS estimates, and columns (2) and (4) present IV estimates using a shift-share instrument for aging based on historical survival rates. Interaction terms $\Delta A \times \Delta$ Gini and $\Delta A \times \Delta$ Wealth Inequality test whether the impact of aging on debt composition depends on changes in inequality. All regressions include country and year fixed effects. The sample covers 31 OECD countries for the period 1975–2021. Robust standard errors are in parentheses. First-stage F-statistics for the IV regressions are reported in the table. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

C.2 Robustness to Financial Development as a Conditioning Variable

The estimated causal effect of aging on debt composition could be biased if unobserved factors—such as technological progress or broader economic development—affect both aging and financial development. In this setting, financial development itself does not directly influence population aging but can shape the corporate sector's access to financing (e.g., making it easier for firms to rely on equity financing and thus dampen the growth of corporate debt). Consequently, financial development may serve as a channel through which unobserved factors influence the relationship between aging and debt composition, potentially creating a back-door path that biases the estimated effect of aging.

To address this concern, I control for the 10-year change in the financial development index. By conditioning on this variable, I aim to block these indirect back-door paths and ensure that the estimated relationship between aging and debt composition captures a cleaner causal effect, net of variation driven by broader financial trends.

Table C.2 reports the results of this robustness check. Across both OLS and IV specifications, the coefficients on the change in the aging rate (ΔA) remain statistically significant and similar in magnitude to the baseline estimates, even after including the financial development index. This stability suggests that the main findings are unlikely to be driven by omitted variable bias related to financial development. Instead, they reinforce the interpretation that population aging can directly shape debt composition through shifts in asset composition.

Table C.2: Robustness to Financial Development Controls

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
	Household Debt Share					
ΔA	4.497**	2.735**	2.658**	4.745***	2.785**	3.094**
	(2.056)	(1.245)	(1.174)	(1.304)	(1.329)	(1.252)
Δ Financial Dev.	0.0261	0.0541	0.0518*	0.0312	0.0503	0.0533*
	(0.0245)	(0.0357)	(0.0302)	(0.0252)	(0.0307)	(0.0295)
F statistic				20.47	35.54	32.18
Initial conditions	Yes	Yes		Yes	Yes	
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes		Yes	Yes
Countries	31	31	31	31	31	31

Note: This table reports the effect of population aging (ΔA) on the household-to-corporate debt ratio (household debt share), controlling for financial development (measured as the 10-year change in the financial development index). Columns (1)–(3) present OLS estimates, and columns (4)–(6) present IV estimates using an instrument based on historical survival rates. Robust standard errors are in parentheses. All regressions include country fixed effects, and columns (2), (3), (5), and (6) also include year fixed effects. The financial development index is measured as the ratio of stock market capitalization to GDP or, alternatively, the total value of traded shares as a percentage of GDP. Coefficients for Δ Financial Dev. are scaled by 100. F-statistics for the IV first stage are reported for the IV columns. The sample includes 31 OECD countries over the period 1975–2021. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.