

# HOW WILL MORE RETIREES AFFECT INVESTMENT RETURNS?

BY STEVEN A. SASS\*

## Introduction

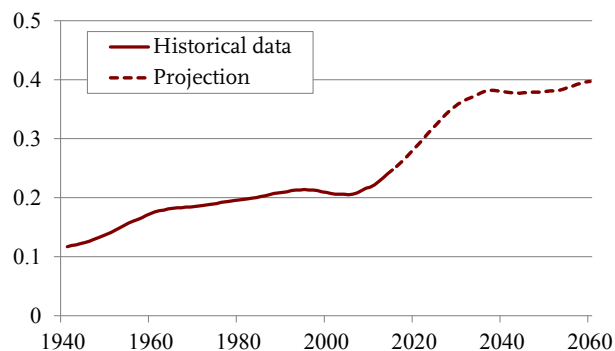
Private savings are an increasingly important source of retirement income. How much income people get depends on their investment returns – the interest, dividends, and profits that the private savings produce. These returns could be affected by the ongoing transition to an older society with a larger share of retirees. This *brief* reviews studies by the Social Security Administration's Retirement Research Consortium and others on the long-term effect of this demographic transition on investment returns, which could moderate, or exacerbate, the nation's retirement income challenge.

The discussion proceeds as follows. The first section provides an overview of the demographic transition and its potential effects on the supply and demand for savings. The second section reviews studies that try to identify relationships in the historical record between changes in the age structure of the population and investment returns. The third section reports on how retirees draw down their savings and the resulting impact on the supply of savings. The fourth section assesses attempts to project future investment returns. The final section concludes that the demographic transition will likely put some downward pressure on investment returns. While it is unclear how strong that pressure will be, the decline in returns will require workers to save more to secure a given amount of income in retirement.

## The Transition and Its Potential Effects

The transition to an older society is primarily driven by the aging of the baby boom generation and the drop in fertility that has resulted in little or no increase in the size of subsequent cohorts. As a result, the ratio of retirees to the working-age population in the United States will grow rapidly through the middle of the century and more slowly thereafter as life expectancy continues to rise (see Figure 1). The

FIGURE 1. OLD-AGE DEPENDENCY RATIO IN THE UNITED STATES, 1941-2060



Note: This measure is the ratio of the population ages 65 and over to the population ages 20-64.

Source: U.S. Social Security Administration (2016).

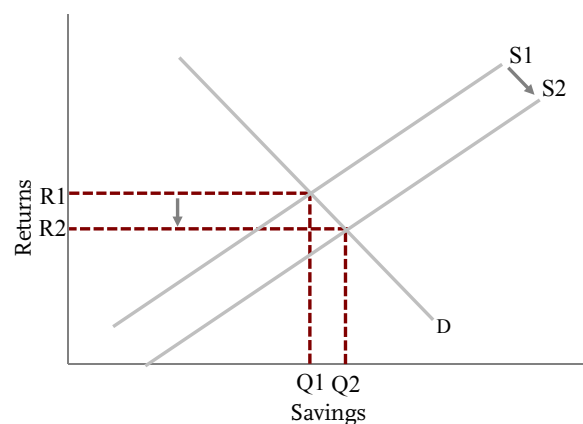
\* Steven A. Sass is a research economist at the Center for Retirement Research at Boston College.

transition is global, beginning sooner in Japan and Western Europe and later in China and most other developing nations. By mid-century, however, the ratio of retirees to workers in these nations is generally projected to be much the same or higher than in the United States.<sup>1</sup>

The long-term effect of this demographic transition on U.S. investment returns depends on how it affects the supply and demand for savings in the “real” economy. This effect includes demographic changes in other nations that result in capital flows to and from the U.S. market.

If the supply of savings rises relative to demand, moving from S1 to S2 in Figure 2, the market-clearing return on savings declines – investors would receive less income from interest, dividends, or profits for each dollar invested. Alternatively, if the supply of savings declines relative to demand, moving from S2 to S1, savings can be invested in opportunities that offer higher returns.

FIGURE 2. EFFECT OF A CHANGE IN THE SUPPLY OF SAVINGS ON INVESTMENT RETURNS



Source: Author's illustration.

Changes in the supply and demand for savings also produce transient capital gains and losses in the price of existing assets. Such gains and losses are important components in the return on stocks, bonds, and other financial assets. The focus of this *brief*, however, is the long-term effect of the demographic

transition on investment returns. The focus throughout is thus its effect on the market-clearing return, not on short-term returns that include transient capital gains and losses.

The demographic transition is expected to affect the supply and demand for savings in two ways – by sharply reducing the growth of the working-age population and by changing the overall age composition of the population.

The sharp deceleration in the growth of the working-age population means that the economy needs far less savings to build new offices, factories, roads, and machinery than it had when the labor force was rapidly expanding. This decline in the demand for savings should lower investment returns.

The changing age composition also matters, because the supply and demand for savings is likely age-related. According to the lifecycle hypothesis, in which households borrow, save, and draw down their savings to maximize utility over their lifespan:

- Young workers, ages 20-39, increase the demand for savings as they borrow to purchase and furnish new homes.
- Older workers, ages 40-64, increase the supply of savings as they prepare for retirement by contributing to retirement accounts, reinvesting the investment earnings, and paying down mortgages and other debts.
- Retirees, ages 65+, decrease the supply of savings by drawing down the assets accumulated in their working years over the course of their retirement to provide for their consumption needs.<sup>2</sup>

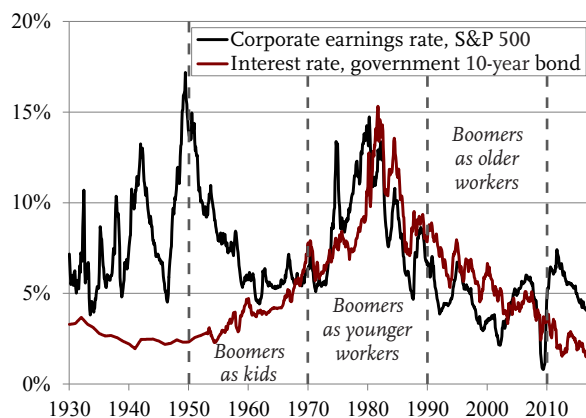
As the working-age population has already essentially stopped growing in the United States, Europe, Japan, and China, that demographically driven reduction in the demand for savings is already in place. Changes in the supply of savings, by contrast, will become more important as the elderly become an increasingly large share of the population.

The following three sections review studies that: 1) test the lifecycle hypothesis by identifying relationships, to date, between the age structure of the population and investment returns; 2) test the hypothesis that the U.S. elderly draw down their savings over the course of their retirement; and 3) develop econometric models that rely on the lifecycle hypothesis to predict what lies ahead.

## The Age Structure and Investment Returns

Various studies have attempted to identify relationships between the age structure of the population and investment returns (see Figure 3). These studies use regression analysis to see if investment returns are associated with the population shares of different age groups in different sets of countries over different time periods.

FIGURE 3. U.S. INTEREST RATE AND CORPORATE EARNINGS RATE, 1927-2016



Notes: The corporate earnings rate for the S&P 500 uses the trailing year's earnings, adjusted for inflation, for each dollar invested in the S&P 500 Index. The time bands loosely capture baby boomer aging, with the transition years associated with leading-edge boomers.

Source: Data archived at Shiller (2017).

The studies find *some* evidence that an increase in the share of young workers (from 1970 to 1990 in the United States) increases the demand for savings and drives up the income generated by a dollar invested in stocks or bonds, consistent with the lifecycle hypothesis. They also find *some* evidence that an increase in the share of older workers (from 1990 to 2010 in the United States) increases the supply of savings and drives down investment returns, also consistent with the lifecycle hypothesis.<sup>3</sup>

Findings on the effect of a growing share of individuals ages 65 and over, however, are mixed. Davis and Li, using U.S. data from 1950 to 1999, find *some* evidence that it tends to increase bond yields and

corporate earnings rates, consistent with the decumulation of assets by pensioners as indicated by the lifecycle hypothesis. In contrast, Poterba, using data from 1926 to 2006, finds *some* evidence of a decrease in U.S. bond yields and corporate earnings rates, consistent with the notion that a growing retiree population *increases* the supply of savings.<sup>4</sup> The results differ because the studies use somewhat different regression models and time periods.<sup>5</sup>

The empirical evidence on the effect of the age structure, and especially on the effect of a rising share of the elderly, is hardly robust. The results are sensitive to the period analyzed, the countries in the sample, and changes in variable definitions and modeling assumptions.<sup>6</sup> This difficulty in validating the expected demographic effects on investment returns is not surprising given the limited number of observations in the historical record, generally stretching back no earlier than the 1920s, and the array of powerful factors, other than demography that affect investment returns. These include wars, business cycles, swings in government tax and spending policies, the rise and transformation of government and employer retirement plans, the oil shock and inflation of the 1970s, the rapid expansion of international trade and financial flows over the last four decades, and “animal spirits” that feed speculative booms and busts.

The empirical findings also largely reflect changes in the relative prominence of younger and older workers as the baby boom passed through these stages of life. As Poterba notes, the historical record might not be a series of independent observations on the relationship between investment returns and the age structure of the population, as the empirical studies assume, but multiple observations of a single demographic shock.<sup>7</sup> And the final stage of this one-time shock has only now begun.

## How U.S. Retirees Draw Down Their Savings

Data on how retirees draw down their savings offer another way to assess how the coming transition might affect investment returns. The lifecycle hypothesis holds that households manage their finances to maximize utility over their lifespan. Thus, over the course of their retirement, the elderly would draw down essentially all of their savings, with those who die early leaving “accidental” bequests.

Studies using data from the *Health and Retirement Study*, find that retirees draw down their savings at a much slower pace than the lifecycle hypothesis suggests. For example, a study by De Nardi, French, and Jones finds that median net worth in the top three income quintiles of single retirees – for two separate cohorts, a younger cohort aged 74 in 1996 and an older cohort aged 84 in 1996 – generally declined only modestly over a 10-year period (see Figure 4). Specifically, the top two quintiles in the figure (the red and dark gray lines), which hold the lion’s share of the net worth of all elderly households,<sup>8</sup> show either increases or only a modest decline in net worth.<sup>9</sup> This finding suggests that the savings of the elderly will not be significantly drawn down over the course of the demographic transition. The explanations include a desire to hold reserves, primarily against the risks of outliving their savings or incurring high medical or long-term care expenses; a desire to leave bequests; and a general aversion by the elderly to drawing down their savings.

FIGURE 4. MEDIAN NET WORTH OF TOP THREE PERMANENT INCOME QUINTILES, SINGLE RETIREES AGES 74 AND 84 IN 1996, THOUSANDS OF 2016 DOLLARS



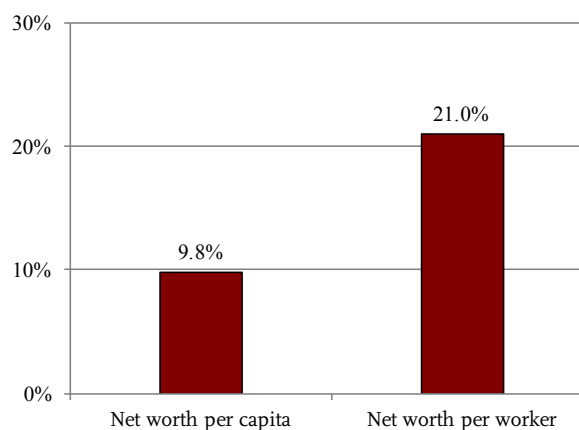
Source: De Nardi, French, and Jones (2010).

Studies using macroeconomic data, such as the National Income and Product Accounts, generally find a more significant drawdown of the savings of the elderly.<sup>10</sup> A key reason is that these data, unlike the household surveys, include the build-up and drawdown of savings in traditional pension plans, correctly identifying pension payments as reduc-

tions in savings. Due to the shift in employer plans from traditional pensions to 401(k)s, the savings of the elderly will increasingly be held in 401(k)/IRA accounts. Since retirees will get much less income from traditional pension benefits, they can be expected to draw down their 401(k)/IRA savings at a quicker pace than indicated in Figure 4.

Even if the growing number of elderly households draw down their savings more quickly, it does not mean the supply of savings will fall. Data from the *Survey of Consumer Finances* (SCF) show that elderly households, on average, have significantly more net worth than working-age households. This reported difference will grow as the savings of the elderly will increasingly be held in 401(k)/IRA accounts, which are included in the SCF data, rather than in traditional employer pension plans, which are not. But even assuming that age-specific asset holdings and values identified in the 2007 SCF remain unchanged between 2010 and 2040, the National Research Council projects the aging of the population will result in a 10-percent increase in per-capita net worth and a 21-percent increase in net worth per worker, as workers make up a smaller share of the population (see Figure 5).<sup>11</sup>

FIGURE 5. PROJECTED CHANGES IN PER-CAPITA AND PER-WORKER NET WORTH, 2010-2040



Note: “Per-worker” net worth uses the number of individuals of working age. The projections assume age-specific asset holdings and values identified in the 2007 SCF remain unchanged.

Source: National Research Council (2012).

Such a significant increase in the supply of savings, and especially in the supply of savings per worker, would clearly put downward pressure on investment returns. It is unclear, however, how far returns could fall.

## What Models Predict

Next we turn from studies that use historical data to those that use econometric models to predict the effect of the demographic transition on investment returns and other economic variables. These studies use overlapping generation (OLG) models, the basic elements of which are households and firms:

- Households supply firms with labor and capital and, in return, receive wage and capital income and decide how much of that income to consume and how much to save.
- Firms produce output using capital and labor, with output per worker determined by the amount of capital employed per worker. As the capital-to-labor ratio rises, output per worker and wages rise and the return on capital falls.
- How much households decide to save in any given period, plus demographically driven changes in the size of the labor force, determine the ratio of capital-to-labor in the subsequent period – and thereby output per worker, wages, and the return on capital in the subsequent period.

Demographically driven international capital flows and changes in the Social Security program create further complications. While essentially all nations are experiencing a similar demographic transition, differences in the size and timing of the transition could generate cross-border capital flows that affect the supply of savings in the United States. Social Security faces a long-term financing shortfall so benefits, which are a major source of retirement income, must be cut and/or taxes raised as the ratio of retirees-to-workers rises over the next several decades. How households respond to these Social Security changes could also affect the supply of savings.

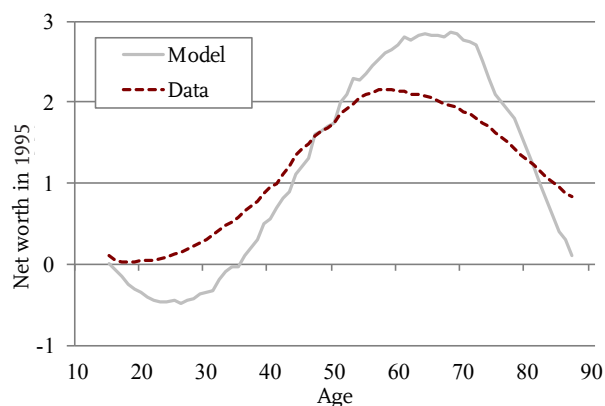
OLG models developed in Ludwig, Krueger, and Börsch-Supan include the effect of changes in Social Security and cross-border capital flows among developed industrial nations.<sup>12</sup> Most significant are the estimated effect of changes in Social Security. Assuming Social Security taxes remain unchanged and benefits are cut, they project a significant increase in

household retirement saving and an 86-basis-point (0.86-percentage-point) decline in U.S. investment returns between 2005 and 2080. If, instead, Social Security payroll taxes are raised so that benefits continue to replace the same share of earnings, the model projects no such increase in saving and just an 18-basis-point decline in U.S. returns.<sup>13</sup>

In contrast, the estimated effect of cross-border capital flows is small. Other industrial nations are aging more rapidly and are projected in the model to export savings to the United States. These capital inflows, however, account for just 7 basis points of the projected 86-basis-point decline should Social Security benefits be cut.<sup>14</sup>

The models that produce these projections are quite complex and by necessity make a host of simplifying assumptions. Especially problematic are assumptions about households' consumption and saving decisions. These models assume that households decide how much to consume and save to maximize lifetime utility – the lifecycle hypothesis. This calculation produces a significantly greater accumulation of wealth prior to retirement than seen in household survey data for the average household (see Figure 6). It also produces a sharp run-up of consumption and complete drawdown of wealth at the end of life, which deviates even more from the data on average household behavior, and is especially at variance with the

FIGURE 6. NORMALIZED NET WORTH PROFILES FROM LIFECYCLE MODEL (ALL HOUSEHOLDS) AND EMPIRICAL DATA (AVERAGE HOUSEHOLD)



Note: Profiles are normalized by their respective means. Net worth data are for 1995 and are from the SCF. Source: Ludwig, Schelkle, and Vogel (2012).

disposition of wealth by the richest households that hold most of the elderly's wealth.<sup>15</sup> These models thus do not project a significant increase in net worth per worker, unlike the National Research Council that projects a 20-percent increase between 2010 and 2040, as the elderly account for an ever greater share of the population.

More realistic assumptions could significantly affect the projections of future investment returns. A much milder drawdown of savings by the elderly would increase projected capital-to-labor ratios and result in larger reductions in investment returns – especially the strikingly mild reduction projected if Social Security benefits remain unchanged.

A much milder build-up of savings prior to retirement would work in the opposite direction. How to model the build-up, however, is far from clear. Rising inequality has also made the build-up and drawdown of savings over the course of the demographic transition increasingly dependent on the wealthy, and modelling the lifecycle saving of the wealthy would seem to need its own specification.

The models nevertheless offer useful results. They find that international capital flows are unlikely to have a large effect on U.S. returns. More significantly, they highlight the fact that workers must save more to maintain living standards in retirement if Social Security benefits are cut. To the extent that workers save more and these savings are not drawn down in retirement, the supply of savings would increase more than projected by the National Research Council, and returns would fall more than projected in current OLG models.

## Conclusion

The research reviewed in this *brief* supports the notion that a population with more retirees relative to workers will reduce the demand for savings and expand the supply, putting some downward pressure on investment returns. It is unclear, however, how strong this downward pressure will be. But it would be less strong if retirees drew down more of their savings, as the lifecycle hypothesis suggests. The downward pressure would also be less strong if Social Security benefits remain at their current level, as workers would not need to accumulate more savings than they currently do to support themselves in retirement.

The demographic transition is largely responsible for Social Security's long-term financing shortfall. If it reduces investment returns, it will also weaken the other component of the nation's retirement income system: private saving. Business cycles, productivity shocks, swings in government tax and spending policies, and other forces will continue to push returns up and down. But to the extent that the demographic transition reduces investment returns, workers would need to save more than they currently do to maintain their standard of living in retirement.

## Endnotes

- 1 United Nations (2015).
- 2 The fear that the demographic transition will result in an “asset meltdown” when the baby boom generation retires is based on the notion that dissaving by the boomers – their sale of assets to support their consumption needs in retirement – will create an asset glut that takes an inordinately long time to clear.
- 3 See Yoo (1994); Brooks (1998); Bergantino (1998); Higgins (1998); Davis and Li (2003); Poterba (2001 and 2004), and Geanakoplos, Magill, and Quinzii (2004). See Arnott and Chaves (2012) for a recent study of the effect of the age structure of the population on stock and bond returns including capital gains and losses; this study does not, however, address the long-term effect on interest rates and corporate earnings rates that is the focus of this *brief*.
- 4 The corporate earnings rate is the ratio of corporate earnings to stock prices, the inverse of corporate price-to-earnings ratios.
- 5 Davis and Li (2003) and Poterba (2001 and 2004).
- 6 Bosworth, Bryant, and Burtless (2004); Poterba (2004).
- 7 Poterba (2004).
- 8 In 2012, the richest 10 percent held over 70 percent of the net worth of all elderly households. Author’s calculations using data from the Federal Reserve’s 2013 *Survey of Consumer Finances*.
- 9 De Nardi, French, and Jones (2010 and 2016). The results shown in Figure 4, based on data drawn from sequential HRS biennial surveys, are for single retired individuals and are not adjusted for mortality bias – the fact that wealthier households are more likely to survive from one wave to the next. Including only households that survive to the final survey increases initial wealth levels and shows steeper declines for median household wealth. The declines, however, are still much milder than predicted by the lifecycle hypothesis. Also see Poterba, Venti, and Wise (2011a, 2011b).
- 10 Bosworth, Bryant, and Burtless (2004).
- 11 National Research Council (2012). Assuming that age-specific asset holdings and values in 2001 identified in the SCF remain unchanged, Poterba (2004) estimates that the elderly will hold nearly half of the value of all stocks and bonds held by U.S. households reported in the SCF, up from just over a third in 2001.
- 12 Ludwig, Krueger, and Börsch-Supan (2009). Also see Börsch-Supan, Ludwig, and Winter (2006) and Krueger and Ludwig (2007).
- 13 An OLG model developed in Bryant (2004) projects a similar dramatic difference in saving, and thus in the return on capital, if Social Security benefits are cut as opposed to taxes raised.
- 14 Different OLG models have different estimates of the effect of capital flows between the United States and developing economies. Developing economies by definition need more capital than developed economies and could offer higher returns, which could induce savings to flow out of the United States and raise U.S. returns. Bryant (2006 and 2007), however, notes that: 1) fast-growing developing economies typically see a rapid rise in saving since consumption rises less quickly than incomes; 2) the ability of developing economies to absorb capital is limited: many fewer households, for example, have access to mortgages or business credit; and 3) the population in developing economies is entering the high-saving years, ages 40-64. OLG models developed in Bryant (2006 and 2007) thus project savings moving out of developing economies and into the United States over the next several decades, depressing U.S. returns. These studies report estimates of the size of the resulting current account deficits, but not the reduction in U.S. returns. The OLG model developed in Vogel, Ludwig, and Börsch-Supan (2011) includes North-South capital flows and projects these flows initially raising, then lowering, returns in the North. While the study does not provide quantitative estimates, it characterizes the rise and decline in returns due to North-South capital flows as “relatively mild.”

OLG models developed in Ludwig, Schelkle, and Vogel (2012), on the other hand, estimate large effects resulting from household investments in skill development that are made in response to rising wages and declining returns over the course of the demographic transition. By slowing the rise in the capital-to-“effective labor” ratio, such investments are projected to significantly dampen the decline in investment returns. Assuming Social Security tax rates remain the same and benefits are cut, U.S. returns without such investments are projected to fall by a full percentage point between 2005 and 2050, but only by 40 basis points in the model that includes such induced investments in skill development.

15 Figure 6 reports the results of the benchmark calibration of the model developed in Ludwig, Schelkle, and Vogel (2012). The model does not include precautionary saving, which slows the drawdown of wealth in retirement and is included in some of the models discussed above. These other models, however, also project a significant drawdown of wealth in retirement. But these studies do not provide similar figures that show the build-up and drawdown of savings in their models and how it compares to the build-up and drawdown of savings reported in household survey data.

## References

- Arnott, Robert D. and Denis B. Chaves. 2012. “Demographic Changes, Financial Markets, and the Economy.” *Financial Analysts Journal* 68(1): 23-46.
- Bergantino, Steven. 1998. “Lifecycle Investment Behavior, Demographics, and Asset Prices.” Doctoral Dissertation. Cambridge, MA: Massachusetts Institute of Technology, Department of Economics.
- Bösch-Supan, Axel, Alexander Ludwig, and Joachim Winter. 2006. “Ageing, Pension Reform and Capital Flows: A Multi-Country Simulation Model.” *Economica* 73: 625-658.
- Bosworth, Barry P., Ralph C. Bryant, and Gary Burtless. 2004. “The Impact of Aging on Financial Markets and the Economy: A Survey.” Working Paper 2004-23. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- Brooks, Robin J. 1998. “Asset Market and Saving Effects of Demographic Transitions.” Doctoral Dissertation. New Haven, CT: Yale University, Department of Economics.
- Bryant, Ralph C. 2004. “Demographic Pressures on Public Pension Systems and Government Budgets in Open Economies.” Washington, DC: Brookings Institution.
- Bryant, Ralph C. 2006. “Asymmetric Demographic Transitions and North-South Capital Flows.” Brookings Discussion Papers in International Economics No. 107. Washington, DC: Brookings Institution.
- Bryant, Ralph C. 2007. “Demographic Influences on Saving-Investment Balances in Developing and Developed Economies.” Working Paper 2007-8. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- Davis, E. Philip and Christine Li. 2003. “Demographics and Financial Asset Prices in the Major Industrial Economies.” Working Paper. West London, UK: Brunel University.
- De Nardi, Mariacristina, Eric French, and John Bailey Jones. 2010. “Why Do the Elderly Save? The Role of Medical Expenses.” *Journal of Political Economy* 118(1): 39-75.



- De Nardi, Mariacristina, Eric French, and John Bailey Jones. 2016. "Savings After Retirement: A Survey." *Annual Review of Economics* 8: 177-204.
- Geanakoplos, John, Michael Magill, and Martine Quinzii. 2004. "Demography and the Long-Run Predictability of the Stock Market." *Brookings Papers on Economic Activity* 1(2004): 241-325.
- Higgins, Matthew. 1998. "Demography, National Savings, and International Capital Flows." *International Economic Review* 39(2): 343-369.
- Krueger, Dirk and Alexander Ludwig. 2007. "On the Consequences of Demographic Change for Rates of Returns to Capital, and the Distribution of Wealth and Welfare." *Journal of Monetary Economics* 54: 49-87.
- Ludwig, Alexander, Dirk Krueger, and Axel Börsch-Supan. 2009. "Demographic Change, Relative Factor Prices, International Capital Flows, and Their Differential Effects on the Welfare of Generations." In *Social Security Policy in a Changing Environment*, edited by Jeffrey R. Brown, Jeffrey Liebman, and David A. Wise, 414-419. Chicago, IL: University of Chicago Press.
- Ludwig, Alexander, Thomas Schelkle, and Edgar Vogel. 2012. "Demographic Change, Human Capital and Welfare." *Review of Economic Dynamics* 15(1): 94-107.
- National Research Council. 2012. *Aging and the Macroeconomy: Long-term Implications of an Older Population*. Washington, DC: National Academies Press.
- Poterba, James. 2001. "Demographic Structure and Asset Returns." *Review of Economics and Statistics* 83(4): 565-584.
- Poterba, James. 2004. "The Impact of Population Aging on Financial Markets." Working Paper 10851. Cambridge, MA: National Bureau of Economic Research.
- Poterba, James, Steven Venti, and David Wise. 2011a. "The Composition and Drawdown of Wealth in Retirement." *Journal of Economic Perspectives* 25(4): 95-118.
- Poterba, James, Steven Venti, and David Wise. 2011b. "The Drawdown of Personal Retirement Assets." Working Paper 16675. Cambridge, MA: National Bureau of Economic Research.
- Shiller, Robert. 2017. "Historical Data on Corporate Earnings and Interest Rates." Data archived on website maintained by Shiller. Available at: <http://www.econ.yale.edu/~shiller/data.htm>
- United Nations, Department of Economic and Social Affairs and Population Division. 2015. *World Population Prospects: The 2015 Revision, Key Findings and Advance Tables*. Working Paper, No. ESA/P/WP. 241. New York, NY.
- U.S. Board of Governors of the Federal Reserve System. *Survey of Consumer Finances*, various years. Washington, DC.
- U.S. Social Security Administration. 2016. *The Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds*. Washington, DC: U.S. Government Printing Office.
- Vogel, Edgar, Alexander Ludwig, and Axel Börsch-Supan. 2011. "Aging and Pension Reform in a Two-Region World: The Role of Human Capital." Working Paper orrc11-13. Cambridge, MA: National Bureau of Economic Research.
- Yoo, Peter S. 1994. "Age Dependent Portfolio Selection." Working Paper 94-003A. St. Louis, MO: Federal Reserve Bank of St. Louis.

### About the Center

The mission of the Center for Retirement Research at Boston College is to produce first-class research and educational tools and forge a strong link between the academic community and decision-makers in the public and private sectors around an issue of critical importance to the nation's future. To achieve this mission, the Center sponsors a wide variety of research projects, transmits new findings to a broad audience, trains new scholars, and broadens access to valuable data sources. Since its inception in 1998, the Center has established a reputation as an authoritative source of information on all major aspects of the retirement income debate.

### Affiliated Institutions

The Brookings Institution  
Syracuse University  
Urban Institute

### Contact Information

Center for Retirement Research  
Boston College  
Hovey House  
140 Commonwealth Avenue  
Chestnut Hill, MA 02467-3808  
Phone: (617) 552-1762  
Fax: (617) 552-0191  
E-mail: [crr@bc.edu](mailto:crr@bc.edu)  
Website: <http://crr.bc.edu>

---

© 2017, by Trustees of Boston College, Center for Retirement Research. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that the author is identified and full credit, including copyright notice, is given to Trustees of Boston College, Center for Retirement Research.

The research reported herein was performed pursuant to a grant from the U.S. Social Security Administration (SSA) funded as part of the Retirement Research Consortium. The opinions and conclusions expressed are solely those of the author and do not represent the opinions or policy of SSA, any agency of the federal government, Boston College, or the Center for Retirement Research. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of the contents of this report. Reference herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply endorsement, recommendation or favoring by the United States Government or any agency thereof.