June 2014 Investment Publications Highlights

The world is paying increasing attention to its aging population. As policymakers figure out how to deal with rising health care and pension payments, business leaders are trying to position themselves to profit from a shifting age structure. For institutional investors, the key question is how an older population will impact asset prices and the macroeconomic environment.

For this month's Investment Publications Highlights*, we have summarized a handful of insightful papers published since the early 2000s about these investor-related demographic issues. While our compendium is far from comprehensive, it offers a glimpse into the diverse range of economic issues—and associated opinions—relevant to investors from a demographic perspective.*

Demographic Structure and Asset Returns

James M. Poterba, *The Review of Economics and Statistics,* vol. 83, no. 4 (November 2001): 565–584

Looking at 75 years of historical evidence, MIT economist James Poterba argues that the impact of the demographic shift in the United States and other developed economies on future asset returns could be insignificant compared to other market-moving forces.

As the baby boom cohort enters retirement age, some investors have grown increasingly concerned about the effect this demographic shift could have on the demand for financial assets. In theory, as this generation begins to draw down a lifetime of accumulated financial assets, the prices of stocks and bonds could come under significant pressure. But when Poterba analyzes historical shifts in demographics within Canada, the United Kingdom, and the United States, he does not find a noticeable relationship between these changes and returns across a variety of asset classes.

Poterba notes that past studies of population growth and asset returns have had several shortcomings. They assume, for example, that there are pronounced age patterns in the ownership of financial assets and that a "decumulation" of these assets will occur as the population ages. This assumption is fragile given that the available data make it difficult to estimate age patterns in asset holdings with precision. Poterba notes that asset "decumulation" appears to occur at a much slower pace than one might expect, seemingly dispelling the possibility of a demographically induced market meltdown in the coming decades. Other challenges to any study of demographics and asset returns include the small sample size of generational shifts in data and the unknown timing

of investor reactions to demographic shifts. Investors are forward-looking, and the fact that a growing share of the US population will enter retirement age in the coming years has been known for decades.

Poterba analyzes the association between population age structure in the United States, particularly the share of the population in the prime saving years (40–64), and the real returns on T-bills, long-term government bonds, and corporate stocks. The results provide, at best, limited support for a link between asset returns and shifting demographics. Poterba notes that the most persuasive result is not related to returns, but valuations; there is a positive correlation between market valuations (as measured by the price-to-dividend ratio) and the proportion of the population in prime saving years. Results from Canada and the United Kingdom about the more general relationship between returns and demographics do not match those for the United States, further weakening the claim that demographics and asset returns exhibit systemic linkages. Ultimately, the results suggest caution in projecting large future changes in asset values on the basis of projected demographic changes.

Poterba notes that even if changes in a population's age structure do affect asset demand, these effects may simply be too small to be detected among the many other factors that influence asset prices. This is especially true within the context of a globalized economy. Any attempt to assess the future link between asset returns and demographic structure must consider the growing integration of global capital markets, as any given country's age profile may bear little relationship to that of the home country of a foreign asset owner.

Demographic Changes, Financial Markets, and the Economy

Robert D. Arnott and Denis B. Chaves, *Financial Analysts Journal* vol. 68, no. 1 (January/February 2014): 23–46

Researchers have been interested in the link between demographics, GDP growth, and capital markets returns since at least the late 1980s, but the analytical challenges in identifying the linkages are substantial. Rob Arnott and Denis Chaves of Research Affiliates use a specific econometric technique to analyze a large, 60-year sample of global data, the results of which project weak economic growth and investment returns in the developed world.

Demographic changes can influence a country's GDP in two important ways. First, different age groups have different levels of productivity. Young workers, for example, enter the labor force with few skills, and contribute less to GDP per capita than more experienced employees—but more than retirees. Second, different age groups also become more or less productive at different *rates*. Young adults contribute more to the rate of GDP growth than older workers as they learn. The theoretical links between demographics and capital market returns are more complex, but most models suggest that workers demand first stocks and then bonds as they build their retirement savings, bidding them up, and then liquidate these assets in the same order in retirement, putting downward pressure on their prices.

Arnott and Chaves assemble a 60-year data series to test for the effects of demographic changes on GDP growth and asset returns. To deal with some of the analytical challenges in working with demographic data, they use a single polynomial function to describe the population distribution in each country at a point in time rather than segmenting the distribution into particular age groups. For GDP, they choose to measure real per capita purchasing power parity

(PPP)–adjusted GDP growth. For capital market returns, they use country stock and bond returns in excess of cash. To control for asset valuations, they add dividend yield and long- and short-term interest rates to their regressions.

The results confirm many of the intuitions. Having an additional 1% of the population in the cohort of the youngest workers (early 20s) adds about 0.1% per year to real, PPP-adjusted GDP per capita growth, but subtracts about 0.5% from both annual stock and bond returns—presumably as a result of this cohort's lower savings rate and indebtedness. An additional 1% in the group of workers in their early 50s, on the other hand, has zero effect on growth but contributes about 1% to stock returns and 0.5% to bond returns. Large populations of aging retirees (people age 70 and up) have negative effects on both fronts: they erode economic growth (-0.3%) as well as stock (-1.8%) and bond (-0.3%) performance as older members of society stop working and divest assets.

If past statistical relationships hold up in the future, Arnott and Chaves' analysis has bleak implications for growth and asset returns in the developed world over the next ten years. Depending on the specific model used, low birth rates and high numbers of retirees imply GDP growth "penalties" relative to past averages that range very roughly from -0.5% (Norway, United Kingdom, and United States) to -5% (Japan). Annual average deviations from past stock returns may range from -10% (Japan) to 5% or more (Ireland, Portugal, and Spain), with the United States and United Kingdom near zero. Bond returns, however, are generally affected positively since most of the developed world has a fast-growing cohort of middle-aged potential savers. Arnott and Chaves stress that these projections are to be viewed as cautionary, rather than predictive, as they are based on past relationships between demographic structures and measures of economic growth.

Demographics and Industry Returns

Stefano DellaVigna and Joshua M. Pollet, *American Economic Review* vol. 97, no. 5 (December 2007): 1667–1702

To build upon past work on demographics and aggregate stock returns, Stefano DellaVigna of UC-Berkeley and Joshua M. Pollet of the University of Illinois examine the effect of demographics on cross-sectional returns across industries. The evidence suggests that long-term forecasted demand growth due to demographic factors predicts abnormal stock returns because of inattention to information beyond a horizon of four to eight years.

DellaVigna and Pollet ask whether demographic data—which is slow moving, well known, and highly "forecastable"—can provide insight into future industry profitability and stock returns. To do so, they use econometric techniques to associate all final goods with particular demographic groups. Children's book consumers, for example, have predictably different age patterns as compared to those paying for nursing homes, and these age patterns have generally been stable over time. Armed with demographic data and these age profiles of consumption, the authors are able to create historical forecasts of demand growth for US industries. They use only demographic data that was available to investors at the time of the forecast. In each year from 1939 to 2003, they identify 20 "demographic industries," or those with the highest forecasted standard deviation of consumption growth—in other words, those most likely to be affected by demographic changes.

The authors find that forecasted demand growth due to demographics influences both profitability and stock returns. For the 20 demographic industries, the log accounting return on equity, a measure of industry profitability, increases by 1.5% to 3% for each additional percentage point of contemporaneous demand growth induced

by demographics. Whether this higher profitability is incorporated into stock prices ahead of time, however, is a separate question. DellaVigna and Pollet distinguish between short-term (the next five years) and long-term (five to ten years hence) forecasted demand. They find the long-term demand forecasts, but not short-term ones, predict stock returns. A 1% increase in the annualized long-term demand growth rate due to demographics predicts a 5% to 10% increase in abnormal industry return. Long-term forecasted demand growth has a significant influence on expected returns four to eight years ahead.

DellaVigna and Pollet also construct a long/short investment portfolio to assess the influence of demographic factors on stock returns. The portfolio they create is constructed to be long industries with high absolute and relative long-term forecasted growth and short industries with low absolute and relative long-term forecasted growth. For the 20 demographic industries, the portfolio outperforms various factor models by approximately 6% per year.

The ability to time abnormally high returns due to demographic changes depends largely on the expectations of the marginal investor. The authors' findings match a model in which investors are short-sighted, and neglect or overreact to information beyond a horizon of five years. This seems like a plausible time horizon for such errors to take hold, particularly in light of the fact that it coincides with the horizon of analyst forecasts in I/B/E/S analyst estimates data. While risk-based explanations cannot be ruled out, the authors lean toward a behavioral explanation for the data.

Economic Implications of Demographic Change

Michael Gavin and Tal Shapsa, Barclays, 2014

The large demographic shift beginning around the world will have several important economic implications, according to Michael Gavin and Tal Shapsa of Barclays, but will not be the deciding factor in the balance between inflation and deflation.

Gavin and Shapsa examine the impacts of demographic changes on different economies, focusing on the impact on government budgets, changes in the labor force and investing habits, and potential deflation. Gavin and Shapsa conclude that while an aging population will have economic implications, it will most likely not be the leading factor in balancing inflationary and deflationary forces.

Advanced economies are at the front of the demographic shift, where the total and working age population is expected to decelerate or turn negative. China is also experiencing this shift, but at an earlier stage of its development, due to the one child policy. Aging in China differs from that of more advanced economies like Germany and Japan. First, the speed at which the workforce is shrinking is slower in China than in Germany or Japan. Second, China is a young country and even with this change, the average age will still be in line with global standards. Finally, China's development has followed a qualitatively different path and the demographic shift will likely have a greater global impact given China's significant role in the global economic and financial systems.

In contrast to the negative population growth in developed markets and China, emerging markets, where a majority of the world's population live, are at the early stage of this process. Population growth in Africa, Latin America, India, and much of Asia is slowing, but total and working-

age populations continue to increase. Investors should be aware of this trend and the potential implications for labor force integration from emerging markets into the global workforce.

There are four main impacts these changes could have in the next decade. First, a rise in age-related public spending and decline in tax revenues from a shrinking labor force could pose challenges for balancing the budget. By 2030, total age-related spending in advanced economies will grow by an estimate of more than 4% of GDP (almost equal to the estimated fiscal adjustment needed to stabilize their debt), and 3.2% of GDP in emerging markets. Second, demographic changes will have a key impact on the economic rebalancing needed in China. The decline in the labor force should create pressure to increase real wages, which would help increase spending as a driver of domestic growth; however, aging could also decrease in demand for investment. Third, population growth is projected to turn negative in southern Europe. The resulting deceleration in the labor force growth would slow national income growth and, therefore, the tax base. Finally, the contracting labor force could create a friendlier environment for workers. Since the early 1990s, the rising population and increased profitability of corporations has encouraged employers to focus on increasing return on labor. As the supply of labor shrinks, this trend could reverse.

Gavin and Shapsa note that looking at historical examples such as Japan could lead to the conclusion that this demographic shift is bad for the economy and will lead to deflation. However, they believe several factors could lessen the impact of the decreasing supply of labor and demand for investment such as upward pressure on wages and decreased savings, making the outcome uncertain. In addition, other forces, such as politics, will influence inflation. Most importantly, the demographic shift will occur over time, during which monetary policy can adjust.

Ageing, Property Prices and Money Demand

Kiyohiko G. Nishimura and Elod Takats, Bank of International Settlements, September 2012

Nishimura and Takats argue that demography is the long-run driver of changes in money supply and property prices. Using data from 22 advanced economies over the period 1951–2010, their lifecycle model, in sharp contrast with the quantity theory of money, demonstrates a positive correlation between the working-age population and Marshallian K.[1] Furthermore, the model also suggests that a flexible money supply regime together with inflation targeting is likely to reduce the long-run volatility of real property prices.

The aftermath of World War II saw the populations of most advanced economies grow rapidly, and gave rise to the baby boomer generation. The baby boomers entering the labor force expanded the working-age population (i.e., the number of people between the ages of 20 and 64). Nishimura and Takats use a stylized overlapping generation model, based on lifecycle theory dating back to Brumberg and Modigliani,[2] to show that people save during their working-age career and dissave as they age. They save for their old age by investing in property and broad money instruments, such as deposits. When there is a demographic transition and a large group like the baby boomers enters the workforce, their savings activity drives up property prices and increases the demand for money. This process will reverse as baby boomers retire. The impact on the fixed supply of property is straightforward: stronger demand from baby boomers drives up real prices

[1] The Marshallian K is the ratio of money supply (M2) to economic output (GDP).

2 Franco Modigliani and Richard H. Brumberg, "Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data," in Kenneth K. Kurihara, ed., *Post-Keynesian Economics*. Rutgers University Press, 1954, pp 388–436.

and vice versa. However, the monetary implications depend on the money supply and Nishimura and Takats examine two extreme cases: a fixed and a fully elastic money supply.

With a fixed money supply, when baby boomers enter the workforce they have a deflationary impact and when they retire they have an inflationary impact. The price of goods expressed in money declines because an increased demand for money increases the price of real money holdings. Since the real value of property and the real value of money depend on both economic and demographic factors, with a fixed money supply, the Marshallian K is unaffected.

In the second scenario, where the financial system supplies money elastically and the central bank targets inflation, the money supply adjusts, not the price level, and increased demand for money translates into higher money holdings without changing the price level. As baby boomers enter the workforce, money demand increases faster than the economy grows. More precisely, the size of the working-age population is positively associated with the Marshallian K. Furthermore, a flexible money supply combined with inflation targeting will reduce the long-run volatility of real property prices to a lower level than would be experienced under a fixed money supply. This is due to the increased money supply providing additional savings vehicles. As baby boomers retire they feel less compelled to sell their property, and in doing so diminish the long-run real volatility of property prices.

Real world conditions are much more complex than those of this stylized model, but for most advanced economies the financial system does create money very elastically to accommodate money demand. In addition, even if central banks don't formally target inflation, many aim to keep inflation in check. Therefore, when connecting the theoretical model to data, it makes sense to focus primarily on the implications of the elastic money supply system. With a model compiling data on 22 advanced economies over the 1951–2010 period, the empirical evidence is consistent with the theoretical implications—the data show a consistently significant and robust relationship between demography and money. Each additional percentage point increase in the share of the working-age population is associated with an equivalent increase in the Marshallian K. From 1951 to 2010 each country's working-age population grew at different rates, and some countries, such as Japan, experienced episodes of decline in their working-age population. These declines are especially relevant to understand the future impact of demographic transitions on money holdings and inflation, given that the UN Population Projections (2011) predict that working-age populations will soon start declining in many advanced economies.

Nishimura and Takats discuss the implications for monetary policy of their findings. First, the oncoming reduction of working-age populations in many advanced economies will create inflationary pressures. The results of the model suggest that central banks might find inflation more difficult to control in the future. Second, monetary stability helps to stabilize real property prices. Central banks focused on inflation targeting must consider that their decisions to stabilize prices might also lend stability to property prices as the working-age population contracts. Third, aging implies a lower demand for money, or a decrease in deposits, which might complicate the deleveraging of high loan-to-deposit ratios. In an aging economy banks looking to deleverage would have to focus more on assets than on the liability side. However, since demographic forces take effect over the long run, short-term effects may be overshadowed by other factors. For example, another economic crisis might cause an increase in precautionary saving demand for safe assets, which could overwhelm demographic dissaving. ■

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