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# Impact of Population Aging on Financial Markets in Developed Countries

*By James M. Poterba*

**T**he impact of population aging on asset prices is a topic that has attracted tremendous interest, both in academic research and even more so in the popular press. It is not too hard to understand why.

Chart 1 shows the real level of the Standard & Poor's 500 Index in the United States as well as the fraction of the U.S. population that is between the ages of 40 and 64, arguably the age range during which key wealth accumulation and saving for retirement take place. Needless to say, at least for several decades, there is a very strong correlation. Moreover, if one extrapolates this correlation using what we know about the predictable path of the fraction of the population between 40 and 64 in the future, the curves would turn down. This would imply a substantial fall in the real level of the S&P 500.

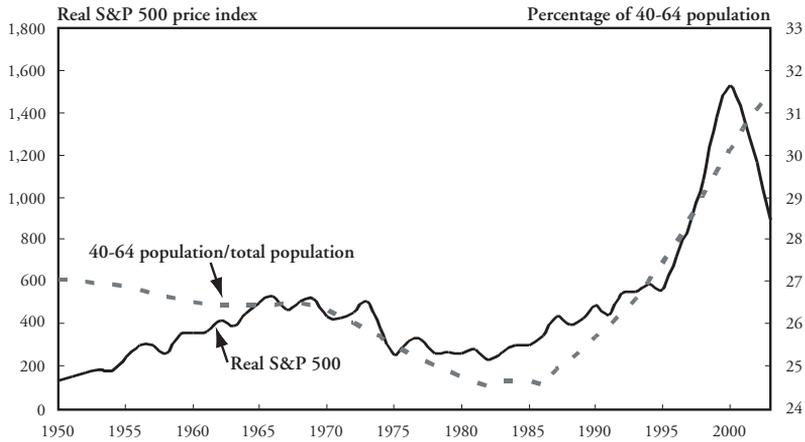
This type of analysis has captivated many people interested in financial markets. Books with titles like *Boomernomics*, *The Roaring 2000s*, and *The Coming Generational Storm* have tried to dissect the demo-

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Chart 1

## REAL S&P 500 PRICE INDEX AND PERCENTAGE OF 40-64 POPULATION AMONG TOTAL POPULATION, 1950-2003



Source: Calculated from U.S. Census Data

graphic evidence and to understand the consequences of demographic change for the private financial markets in the United States and other developed countries.

My analysis addresses three issues related to the links between demography and financial markets. First, I outline a very simple model in which there can be an important linkage between the age structure of the population and the level of financial asset prices. Then, I describe the empirical evidence that is available on this relationship, focusing primarily on the U.S. experience in the 20th century. Finally, I explore how changing age structure in the population will affect the demand for different types of financial products.

### I. A SIMPLE PARABLE LINKING DEMOGRAPHY AND FINANCIAL MARKETS

To understand how demographic changes may affect financial markets, one needs only a few, very simple ingredients. Imagine a world in which people live for two periods. They work in the first period and they accumulate resources, and they retire in the second period. During

the first period they save, during the second period they consume their saving, and at the end of the second period they die. Imagine there is no flexibility in how much they can work. They work one unit when they are working. The price of what they produce is set in the world market, so there is no variation in the marginal revenue product of the labor they supply. Imagine further that there is a fixed saving rate out of labor income.

Now imagine there is a fixed supply of capital that never depreciates and cannot be produced anymore. The way people save for their retirement is by buying the fixed supply of capital. Now think about what happens if a large cohort is born. More people are working. They are generating more labor income. They are generating a larger flow of saving, but they have to buy this fixed stock of capital, which is what they need to live off when they retire. They are going to bid up the price of the capital good. When they retire, they have to sell the capital to the next cohort. If that cohort is a small cohort, it will be willing to pay less for the capital stock than the large cohort paid when they bought it. The investment in the capital good will therefore yield a poor rate of return for those in the large cohort. This will leave them with less resources in retirement than they would have had if their cohort had been smaller and the return on their investment had been greater.

While this parable is unrealistic in many ways, and while there are many ways to embellish it and to make it more sophisticated, it has a clear germ of truth. The reason that the stories that have been told in the popular press attract a lot of attention is because at root there is an underlying link between the age structure of the population, the demand for assets, and the prices of assets. This lends credibility to claims of a potential asset market meltdown when the baby boomers reach retirement. The critical issue, however, is how quantitatively important these effects are. Do more realistic models suggest that demographic factors are one of the most important drivers of asset price movements? Or are these effects relatively modest and dwarfed by other factors that influence asset prices?

There are several things in my simple parable that do not correspond to the real world. It is important to identify and evaluate them. The first, and probably the most important, is that in practice the supply of capital is not fixed. If the supply of capital can be varied—if

we can produce more of the physical asset which is used to carry assets forward to retirement and we can run down that asset stock when the large cohort decides to sell off assets—then asset price effects will be attenuated. In fact, if capital can be accumulated costlessly, then there would be no asset price changes at all. Capital would always sell for its replacement cost. Thus it is essential to consider how much flexibility there is in accumulating and changing the size of the capital stock.

A second consideration is the open economy, the idea that the capital can be traded and the savings can flow across borders. It is easy, but misleading, to say “Aha, we are a small part of the world economy and therefore demographic changes in the United States should not affect asset prices.” While it is true that demographic changes in the United States are not the only demographic force that affects asset values, that does not imply that United States demographic changes are irrelevant. It is essential to examine the correlation between demographic changes in the United States and in other nations. If the rest of the world is aging in the same way the United States is, then an open capital market is not going to attenuate the effects of United States demographic change, and it might even exacerbate it. Within the OECD, the United States is one of the most slowly aging countries, largely because we have a substantial immigrant flow, and we also have a higher birth rate at this point than many of the other developed nations. Thus the external pressures on asset markets may reinforce the challenges posed by an aging society.

The final thing that is omitted from the analysis I have described is any behavioral response to the financial market changes that are associated with an aging population. Such responses might include a longer working life or a change in the saving rate. It is also possible that changes in the population age structure might affect the aggregate productivity growth rate. This could be a key determinant of the impact of aging on financial markets, since the size of the earnings pool for younger cohorts is a very important determinant of the amount that they will be able to pay to buy capital from retirees.

The parable I have described is helpful for identifying key concepts, but it does not generate numbers that can be used to assess the quantitative importance of population aging. There is a substantial literature that has tried to take the basic analytical inputs of the parable

and to build overlapping generations-type models in which one can try to calibrate the effects of an aging population. The results vary from study to study, but a reasonable consensus analysis would suggest something like a 50-basis-point change in the rate of return available to savers in a cohort like the U.S. baby boom relative to those in a more typical-size cohort.

What does that translate to? Consider a 50-basis-point-change in the TIPS rate for someone who is accumulating for 30 years at 2½ percent. This person will have \$2.10 for every \$1 saved at the beginning of the 30-year period. If instead, this individual accumulates at 2 percent, she will have about \$1.80. The proportional effect of a 50-basis-point decline in the equilibrium return would be smaller if the baseline level of returns was higher, but the absolute effect, in dollars foregone at the end of 30 years, would be larger. These effects are substantial, but they are much smaller than some of the alarmist claims that suggest there will be a “rush to the exits” with many households trying to sell assets when the baby boomers reach retirement.

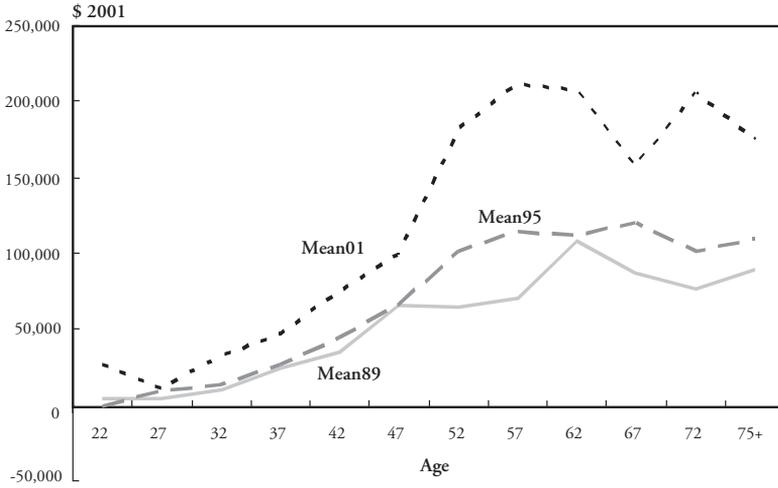
The foregoing parable, and the associated evidence from simulation studies, can be evaluated by investigating what history tells us about the links between population age structure and asset market returns. There are two distinct strands of empirical literature to consider. One is a largely microeconomic literature that focuses on how asset accumulation varies over the lifecycle, because it is very important to measure the age/wealth profile in order to figure out how the demand for financial assets will vary as the baby boom ages. The second strand of empirical literature is concerned with the aggregate relationship between either financial market returns or financial market prices and the population structure of the economy.

## II. ASSET HOLDING OVER THE LIFECYCLE

Let me begin by describing the empirical evidence on the age profile of asset accumulation. Franco Modigliani, my late MIT colleague, spent many years defending against all comers the validity of the lifecycle hypothesis as a way of explaining household-level wealth

Chart 2

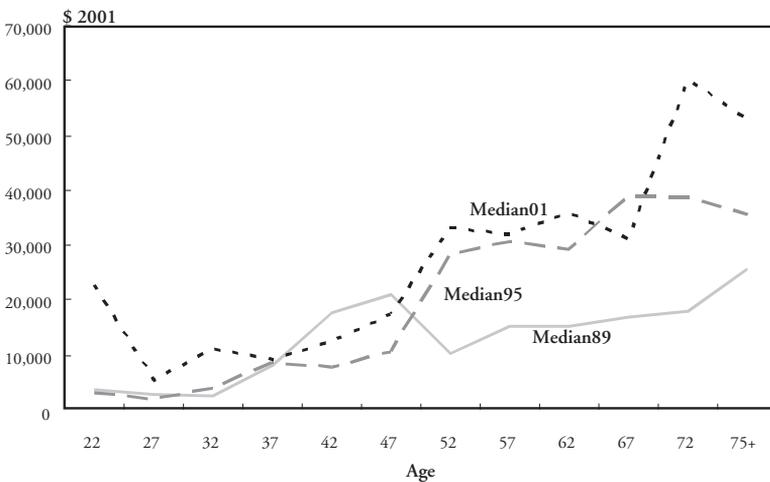
MEAN NET FINANCIAL ASSETS BY AGE OF HOUSEHOLD HEAD, 1989-2001



Source: Survey of Consumer Finances

Chart 3

MEDIAN NET FINANCIAL ASSETS BY AGE OF HOUSEHOLD HEAD, 1989-2001



Source: Survey of Consumer Finances

accumulation and decumulation. This hypothesis predicts smooth decumulation of assets when households retire. Yet the empirical evidence is very mixed, and it is difficult to evaluate.

When we observe an age/wealth profile, it is not possible to determine with certainty how asset holdings will vary as a household ages. The age/wealth profile can vary for three distinct reasons. There can be “age effects,” which means that I may choose to hold a different level of assets at age 50 than at age 40. There can be “time effects.” Almost everybody was richer in 1999 than they were in 1994, so the age wealth profile can be shifted up by favorable asset market returns, and down by unfavorable ones. Finally, there can be “cohort effects.” The cohort that experienced the Great Depression, or that had to fight World War II, may have a lower level of lifetime earnings and consequently lower wealth accumulation at all ages than other cohorts. The difficulty is that we cannot separate age, time, and cohort effects from any data set. We can decide to suppress cohort effects and to identify time effects and age effects, or we can choose any other two effects to estimate, but we cannot recover all three. This is vexing, since on *a priori* grounds we have very good reason to think that all three effects can matter.

Charts 2 and 3 are age/wealth profiles. The data for these charts are drawn from the Survey of Consumer Finances, which is the gold standard for research on household wealth accumulation. Chart 2 shows the mean, and Chart 3 the median, level of financial net worth for households of different ages. The charts show clear evidence of a run-up in asset accumulation between ages 40 and 55, but they show relatively little evidence of decumulation at older ages. That implies there may not be quite as much drawdown of assets when the baby boomers retire as a simple lifecycle model would imply.

It is important to remember, in thinking about wealth accumulation data at the household level, that there is incredible concentration of wealth, at least in the United States. The top 1 percent of equity holders hold nearly half of all the corporate stock in the U.S. economy. So, even though the lifecycle might describe the behavior of many households, the key issue from the standpoint of asset market fluctuations is the behavior of a very small group of top financial asset holders. Those investors may not show the same decumulation profiles that we see elsewhere.

One caution to remember in viewing Charts 2 and 3 involved private pension plans, particularly defined-benefit plans. The data in the charts exclude assets held in corporate defined-benefit pension plans. Assets in these plans are drawn down mechanically as the beneficiaries age, which creates decumulation pressure as retired beneficiaries age.

### III. HISTORICAL LINKS BETWEEN RETURNS AND DEMOGRAPHY

The second key empirical question concerns the historical relationship between returns, the prices of financial assets, and demographic structure. If one studies the historical relationship between returns, either on Treasury bills, or on corporate bonds, or on corporate stocks in the United States or in most other developed countries, and demographic measures such as the fraction of the adult population between 40 to 65 and the fraction of the adult population over 65, there are no very strong or robust correlations.

Even if returns are uncorrelated with demography, however, one might ask about the *level* of asset prices, since the data in Chart 1 suggest a potential relationship. There are several ways to measure the real level of asset prices, including the price/dividend ratio, the price/earnings ratio, and the real level of stock prices. The evidence offers more support for a link between demography and asset prices than for one between demography and returns. In fact, if one estimates regression models relating asset prices to demographic variables for the last eight decades, and then tries to extrapolate and predict future movements in asset prices, the results are almost incredible. They suggest *too large* an effect of demographic change to be explained by any of the foregoing models. My interpretation is that the estimated coefficients in part reflect omitted variable bias, so that the historical relationship cannot be used to form a future prediction.

It is particularly important to remember that even if we have 80 years of very reliable returns data on equity markets in the United States, we do not really have 80 observations on demography and stock returns. We have one big baby boom that has made its way through the

financial markets. So the effective amount of information in this case is much less than standard statistical procedures would suggest. That suggests caution in evaluating the historical evidence.

In general, I place great faith in what we can learn from regression analysis and data investigation. But in studying the link between asset prices and demography, the data limitations are substantial. There is good reason to think hard about what the modeling efforts suggest and to put substantial stock in what simple analytics tell us about the likely effects of aging on financial markets.

#### **IV. POPULATION AGING AND THE DEMAND FOR PARTICULAR FINANCIAL PRODUCTS**

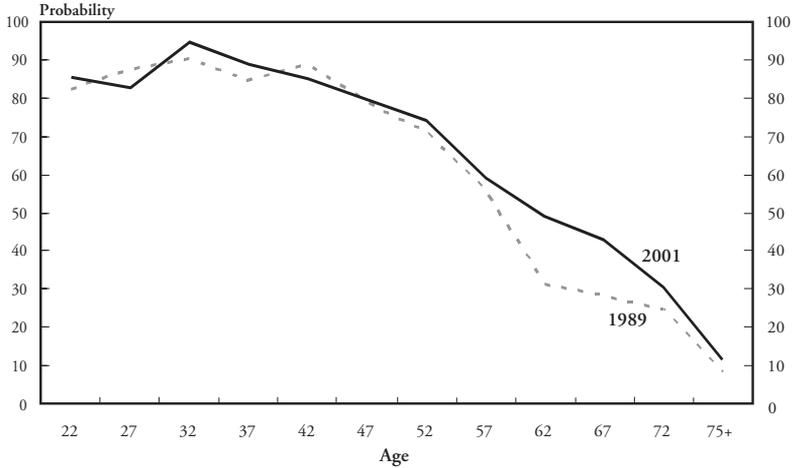
Let me close by considering how the demand for different types of financial assets may be affected by population aging. Some have summarized the effects of population aging on the nature of product demand more generally as a shift from “strollers to walkers and wheelchairs.” The colorful example can be translated to financial markets in a direct fashion. The kinds of products that are currently demanded by older households are likely to see an increase in their demand as the population ages. For example, annuity products, long-term care insurance, and other products that tend to help households preserve and draw down accumulated wealth will be growth segments of the market. The financial products that have traditionally been accumulation vehicles—such as mutual funds and financial products like 529 plans—may face declining demand.

How important are such trends? Today, the fraction of the financial assets that are held by households over the age of 65 is about 31 percent. Running the age structure of the population forward to 2040 using the current age/wealth profile, which is obviously a crude structure, implies that in 2040 the over 65s will hold about 44 percent of all financial assets.

A critical maintained assumption in this analysis is that there will be a stable pattern of age/financial product demand over the next four decades. Yet in fact, the age profile of asset demand can change. Chart 4 illustrates this. It shows mortgage indebtedness for homeowners of different ages in 1989 and 2001, again using data from the Survey of

Chart 4

PROBABILITY OF MORTGAGE INDEBTEDNESS FOR  
HOMEOWNER HOUSEHOLDS OF DIFFERENT AGES,  
1989 AND 2001



Source: Survey of Consumer Finances

Consumer Finances. While the two curves in the chart look very similar at younger ages, at older ages beyond age 57 they begin to diverge. In fact, there is about 15 percent higher probability that a person in their mid-60s today has a mortgage than a similar-aged homeowner in 1989. The results, of course, can be traced to many different factors—deregulation, changes in the mortgage markets, refinancing, and movements in house prices. It is very clear, however, that simply using the 1989 data to extrapolate to 2001 would produce a misleading estimate of the actual effects of population aging.

The demand for financial products like annuities that make it possible to insure against longevity risk is likely to be very dependent on the structure of government programs during the next two to three decades. Social Security and Medicare provide a very important alternative to private-sector retirement and retirement insurance arrangements. If those programs were to be reduced in some way, that would create even greater demand in the financial markets for these types of products.

## V. CONCLUSIONS

My analysis of population age structure and financial markets suggests several conclusions. First, a simple and mechanical analysis that suggests a rapid decline in asset values as the baby boomers hit age 65 is overly alarmist and does not recognize the attenuating factors that more reasoned analyses suggest.

Second, it is important to keep prospective demographic changes in historical perspective. Between 1920 and 1960, the fraction of the population over the age of 65 relative to the population over the age of 20 increased by 7½ percentage points. Between 2000 and 2040, that ratio is projected to increase by ten percentage points. The prospective change is large, but not dramatically larger than what we have experienced in the past.

Finally, it is important to underscore the interaction between what happens in the public sector and the nature of changes in the private sector. Retrenchment in the nature of some government programs that provide retirement income, particularly in some of the developed countries in Europe, is likely to lead to very different patterns of asset decumulation in old age than we have seen historically. The changes in government policy going forward may have very substantial effects on the path of private wealth accumulation and on the demand for financial products.