Reconsidering Retirement:
How Losses and Layoffs Affect Older Workers

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ABSTRACT

Recent declines in U.S. stock and housing markets have led to widespread speculation that workers will delay retirement due to shrinking retirement accounts and home equity. Yet the effect of the weak labor market is often overlooked. If older job seekers have difficulty finding work, they may retire earlier than expected. The net effect of the current economic crisis on retirement is thus far from clear. The crisis may also have long-term implications for well-being, if workers who experience asset losses do not delay retirement sufficiently to fully offset the losses or if workers who experience job loss claim Social Security benefits earlier. In this paper, we use 30 years of data from the March Current Population Survey to estimate models relating retirement decisions to fluctuations in equity, housing, and labor markets. We also use the 2000 Census and 2001-2007 American Community Survey to explore the long-term effects of market conditions on retiree income. We find that workers age 62 to 69 retire earlier in response to high unemployment and retire later in response to weak stock markets; less-educated workers are more sensitive to labor market conditions and more-educated workers are more sensitive to stock market conditions. We find no evidence that workers age 55 to 61 respond to these fluctuations or that housing markets affect retirement. On net, we predict that the increase in retirement attributable to the rising unemployment rate will be almost 50 percent larger than the decrease in retirement brought about by the stock market crash. In terms of the long-term effects on well-being, we find that falling stock markets lead to lower investment income for high-income retirees, while weak labor markets result in lower Social Security income for middle- and lower-income retirees.

"Those Golden Years Have Lost Their Glow; With Home Values Down, Costs Up and Their 401(k)s Declining, Some Seniors Have Had To Rethink Retirement." (*Los Angeles Times*, September 21, 2008)

"Will You Retire?; New Economic Realities Keep More Americans In the Workforce Longer." (*Washington Post*, October 15, 2008)

"Economic Crisis Scrambles Retirement Math: The 401(k) Model of Saving is Under Duress as Stocks Slide. Home Equity Losses Don't Help." (*Christian Science Monitor*, March 4, 2009)

I. INTRODUCTION

One casualty of the financial and economic crisis that began in the fall of 2008 may be workers' carefully laid retirement plans. The popular press recognized this from the start of the crisis, as the headlines listed above make clear. Front page stories of lost retirement savings and plunging home values are commonplace. With diminished retirement savings and less home equity to draw on, the story goes, expected retirement income has shrunk, forcing older individuals to stay in the labor force longer. Workers interviewed for these stories wondered when or if they would ever be able to retire.

Amidst these concerns, another news story appeared briefly in spring 2009 indicating that Social Security benefit claims have risen sharply since the crisis began, suggesting an increase in retirements rather than a decrease (Dorning, 2009). A subsequent report (Johnson and Mommaerts, 2010) indicated that new Social Security retirement awards continued to surge through 2009. Although the number of Americans turning age 62, and thereby becoming eligible for Social Security retirement benefits, rose 9 percent between 2008 and 2009, the number of new retirement benefit awards rose 20 percent for men.

But why are more workers retiring now if their expected retirement income is going down? The answer may lie in another aspect of the crisis, the weak labor market. The

unemployment rate has more than doubled and the economy has shed millions of jobs since the crisis began. Some of those workers struggling to stay employed or find new jobs are surely nearing retirement age. For the unfortunate ones who are not able to maintain or find employment, retirement may be the only solution, despite its involuntary nature.

The net effect of the current financial and economic crisis on retirement is thus far from clear, as plunging equity and home values would be expected to lead to a decrease in retirements while a weak labor market would be expected to lead to an increase. Moreover, the crisis may have important long-term implications for retiree well-being. Workers who experience losses in their retirement savings accounts or home equity may choose to work longer, doing additional saving or reducing the length of retirement in order to offset the loss. However, if they do not work long enough, they may experience lower income in retirement. Workers who are laid off and unable to find new work may choose to claim Social Security benefits earlier than they otherwise would have. Doing do provides immediate income support, but at a cost, as benefits will be lower for the rest of the retiree's life.

The purpose of this paper is to examine the effect of economic conditions on retirement and the long-term implications for retiree income. We use 30 years of data from the March Current Population Survey (CPS) to estimate models relating retirement decisions to changes in equity, housing, and labor markets over time and (where possible) across geographic locations. We use our regression estimates to predict the net effect of the current crisis on retirement. We also use the 2000 U.S. Census and the 2001-2007 American Community Surveys to explore the long-term effects of market fluctuations on retirement income.

Our analysis indicates that the retirement decisions of workers between ages 62 and 69 with more education are affected by long-run fluctuations in stock market returns. We also find

that labor market conditions are an important determinant of retirement decisions. When the unemployment rate rises, more workers between ages 62 and 69 retire, particularly those with less education. Workers between ages 55 and 61 are not found to be responsive to either type of market fluctuation. Individuals do not seem to respond to fluctuations in the housing market regardless of their age. On net, we predict that the increase in retirement brought about the recent rise in unemployment will be almost 50 percent larger than the decrease in retirement brought about by the stock market crash.

Turning to our analysis of retiree income, we find that equity and labor market conditions around the time of retirement have effects on economic well-being even after a decade or so. Workers who face a weak labor market around the period of labor force withdrawal receive lower Social Security payments. This effect is concentrated among lower income and middle class retirees. Those who experience below average stock market returns in the years leading up to retirement are less likely to receive any investment income in retirement. Higher income retirees face this problem.

Overall, our findings suggest that the plight of those who are forced to retire early as a result of weak labor market conditions merits greater attention. These results have potentially important distributional implications as well. It is often those on the bottom of the economic ladder who are being hurt by retiring prematurely due to labor market factors and those at the top who may not be able to retire as planned due to equity losses. Our results also have implications beyond the current economic crisis, as they suggest that the past literature on retirement has paid too little attention to the important role of labor market conditions in the retirement decision.

The remainder of our analysis proceeds as follows. In the following section, we document trends in the environment surrounding retirement decisions, including stock returns,

housing prices, and the labor market. Next, we review the relevant literature and discuss the data and methods we use in the remainder of the analysis. We then present our results regarding the impact of changes in equity, housing, and labor markets, respectively, on retirement decisions. and simulate the net effect of recent market events on retirement. Finally, we present the results regarding the impact of market fluctuations on retiree income and conclude by discussing the policy implications of our findings.

II. BACKGROUND

In this section, we present trends in stock, housing, and labor markets to review recent activity and summarize earlier events that may be less well remembered. We also discuss the conditions under which fluctuations in these markets may affect retirement behavior.

A. Trends in the Stock Market

Annual changes in the value of the stock market, as captured by the S&P 500 Index, are shown in Figure 1A. This figure reports real annual changes (adjusted for inflation) based on December monthly average values. The figure illustrates the tremendous year-to-year volatility in aggregate stock prices. The pattern in the 1980s and early 1990s is one of two good years with 10 to 20 percent annual returns followed by a bad year with zero or negative returns. Since then, the market has experienced more prolonged booms and busts, including two five-year rallies in the late 1990s and mid 2000s, as well as a multi-year bear market early in this decade. The market fell by 40 percent in real terms in 2008, the sharpest decline in recent history.

One can see how these dramatic turnarounds in stock markets have captured the public's attention. The question at hand, though, is whether they alter retirement decisions. Given that

there has always been substantial year-to-year variability in stock prices, is it sensible to expect a single year's market performance to drive behavior?

The market return over a longer period of time could potentially play a more important role in retirement decisions. In Figure 1B, we display five-year and ten-year market returns (again calculated using December monthly average values). This figure shows that there is substantial variability in longer-term returns over time. In the 1980s and early 1990s, the five-year real return was consistently about 50 percent. After that real returns rose, hitting almost 200 percent in the year 2000 before collapsing to small or negative values. Ten-year returns are higher, but the patterns are similar.

These statistics suggest that market returns could have a significant impact on retirement behavior. One worker approaching retirement age could have tripled the value of his portfolio over a five year period, while another worker's portfolio remained constant or even shrank. If workers have considerable resources invested in the stock market, a boom or a bust in the period leading up to traditional retirement ages could play a key role in the decision of when to retire. We later explore the level of stock ownership among the population and various subgroups.

B. Trends in the Housing Market

Although the volatility in the housing market is less dramatic, home values also exhibit substantial fluctuations over time. Figure 2 displays annual changes in real house prices from 1987 to 2008 based on the Case-Shiller (CS) Index for 10 large cities across the country and from 1976 to 2008 based on data from the Office of Federal Housing Enterprise Oversight Home Price Index (OFHEO) for the entire country.[1] The figure shows that housing market returns are considerably more serially correlated than stock returns. In the late 1980s and early-to-mid

[1] We discuss these two indices in more detail below. Annual returns in the CS Index are calculated as the change in the December values. Annual returns in the OFHEO Index are calculated as the change in the fourth quarter values.

1990s, home values did not keep pace with inflation. In the decade that followed, however, prices rose continuously, with annual growth rates in the Case-Shiller Index of over 10 percent in some years. House prices have fallen sharply since 2006, dropping almost 20 percent in 2008.

These statistics suggest that home prices could also affect retirement decisions. Depending on their year of birth, individuals may have doubled their home equity or had it cut in half as they approach traditional retirement ages. If workers had substantial home equity to begin with and are willing to draw down this equity during retirement, a substantial increase in home equity could accelerate retirement while a substantial drop could delay it.

C. Trends in the Labor Market

Figure 3 presents the cyclical variation in the labor market, as measured by the monthly unemployment rate for workers age 16 and over. As we describe subsequently, older workers have a lower unemployment rate, but the pattern over time is very similar to that for all workers. The highest unemployment rate in recent times was 10.8 percent in 1982. Subsequent recessions in the early 1990s and the early 2000s were less severe, with the unemployment rate reaching highs of 7.8 percent and 6.3 percent, respectively. In the current crisis, the unemployment rate is climbing rapidly; as of August of 2009, it had reached 9.7 percent. Aside from these recessions, the unemployment rate has been at a low level, around 4.5 percent, for much of the period since the mid-1990s.

As with our earlier discussions of stock and housing markets, labor market conditions around traditional retirement ages may matter. Workers are twice as likely to be unemployed now as they were a few years ago. In times when obtaining a new job is difficult, older individuals who are laid off or unemployed for other reasons may be more likely to retire. This may be especially true for workers age 62 and up, who generally have access to Social Security.

As this discussion has made clear, there are reasons to believe that variations in stock prices, house prices, and the labor market have the potential to alter retirement behavior. It is also clear that there are important conditions for these behavioral responses. Lower stock and housing prices may lead to fewer retirements if individuals nearing retirement have sufficient stock holdings and home equity and plan to consume it during retirement. Higher unemployment rates may lead to more retirements if older individuals are unable to find work and withdraw from the labor force instead. Furthermore, for market fluctuations to affect aggregate retirement rates, the relevant elasticities must be large enough to generate behavioral responses by more than just a handful of older individuals. In the end, the retirement responses to fluctuations in stock, housing, and labor markets are empirical questions. In the remainder of this paper, we attempt to answer these questions.

III. PREVIOUS LITERATURE

Much of the existing retirement literature has focused on Social Security, private pensions, and health. While these factors may be important in explaining long-run trends, such as the steep decline in older men's labor force participation since World War II and the recent reversal of that trend, they are unlikely to explain dramatic changes in retirement behavior in any given year, such as those that might result from the current crisis. In this section, we focus on those parts of the retirement literature that are most directly relevant to our analysis.

A. Financial Shocks

Economic theory suggests that individuals should respond to negative stock market shocks by reducing their consumption of normal goods (including leisure) and delaying

retirement. Articles in the popular press have similarly asserted that this will be the effect of the current crisis. Nevertheless, there is little empirical research to support this hypothesis.

In an earlier paper (Coile and Levine, 2006), we use methods similar to those described below to address this issue. We treat the stock market boom and bust of the late 1990s and early 2000s as a quasi-experiment and explore whether groups with more stock assets were more likely to retire during the boom and less likely to retire during the bust. We find no evidence of this pattern. We also argue that individuals would have to have been implausibly sensitive to market fluctuations for the observed rise in retirement in the year 2000 to have been the result of that year's market crash. Our findings are consistent with those obtained by Hurd, et al. (2009). They are unable to find support for the notion that "households which had large (financial) gains retired earlier than they had anticipated or that they revised their retirement expectations compared with workers in households that had no large gains."[2]

There are two possible explanations for the lack of an effect. The first is that the number of people who experienced large unexpected wealth gains from market fluctuations is relatively small, as Coile and Levine (2006) argue. The second is that the effect of unexpected wealth on labor supply is fairly small. This view is supported by Coronado and Perozek (2003), who find that being a stockholder during the boom of the late 1990s is associated with retiring 6 months earlier than expected, but that each additional $100,000 of unexpected gains is associated with retiring only two weeks earlier than expected. Hurd, et al. (2009) are also sympathetic to this argument, citing evidence from lotteries.

B. The Role of Housing

[2]Sevak (2001) reached a different conclusion, finding that men in defined contribution (DC) pension plans increased their retirement rates by more than men in defined benefit (DB) pensions during the stock market boom of the late 1990s. However, this study is limited by an inability to control for differences in retirement trends between the two groups, a deficiency that is overcome in Coile and Levine (2006) by the use of the boom and bust as a double experiment.

As with stock market shocks, economic theory suggests that unanticipated losses in home equity should lead households to retire later. However, shocks to home equity will only affect retirement behavior if households routinely consume their housing wealth in retirement. In fact, studies suggest that this is not the case. For instance, Venti and Wise (2004) find that most households do not sell their homes until they experience an event such as the death or entry into a nursing home of a spouse. This finding has led some authors to argue that many households treat their home equity as a "buffer stock" of wealth against the risk of shocks late in life. If so, then it seems unlikely that home price fluctuations will affect retirement behavior, although many recent stories in the popular press have asserted that this is the case. The effect of housing wealth on retirement has not been directly addressed in the previous literature. We provide an empirical analysis of this question below.

C. Labor Market Shocks

A small body of literature has established that job loss is relatively common for older workers (Farber, 2008; Munnell, et. al., 2006). For instance, Farber (2008) reports that 10 to 12 percent of private-sector workers between the ages of 50 and 64 experienced permanent and involuntary job losses when labor markets were weak during the 1991 to 1993 and 2001 to 2003 periods, while displacement rates of around 8 percent (over a three year period) were observed during the expansions of the mid-to-late 1990s and the middle 2000s. Previous studies have found that job loss among older workers has long-lasting negative consequences for employment and wages (Chan and Stevens 1999, 2001, and 2004; von Wachter, 2007). Chan and Stevens (1999) estimate that the employment rate of displaced older workers two years after a job loss is 25 percentage points lower than that of similar non-displaced workers and that the median reemployed worker earns 20 percent less than at his old job.

More directly related to the question we seek to address here is our earlier work (Coile and Levine, 2007). Using similar methods and data to that described subsequently, we find that retirement transitions are cyclically sensitive, a result supported by Von Wachter (2007), Hallberg (2008), Friedberg et. al. (2008) and Munnell et. al. (2008). We estimate that changes in rates of retirement between the peak and trough of a business cycle are comparable to those brought about by moderate change in financial incentives to retire or to the threat of a health shock, factors that have traditionally received far more attention in the literature. We also find that Social Security interacts with labor market conditions in affecting retirement transitions, as the effect of the unemployment rate on retirement appears only as workers become eligible for benefits. We expand upon this discussion later in our analysis.

D. Impact of Economic Fluctuations on Retiree Income

There are virtually no past studies that address this question. Nevertheless, there are a number of related literatures that we can use to inform the discussion that follows.

Our analysis of the effect of market conditions on retiree income shares a strong conceptual connection to an existing literature on the impact of economic conditions at the time of labor market entry on subsequent career outcomes. Previous studies find that the disadvantage new entrants experience by entering the labor market during a recession persists long after the economy rebounds due to frictions in the labor market (cf. Beaudry and DiNardo, 1991; Oreopolus, et al., 2006). Similar reasoning can be applied to labor market conditions at the time of retirement. In fact, one could argue that the problem that older workers face may be even greater than that younger workers experience. Younger workers are likely to be more willing to invest in additional human capital or continue looking for work until the labor market strengthens, eventually regaining their earnings capacity. Older workers are less flexible, both

because additional human capital investments would have lower rates of return and their time horizon in the labor market is short enough that they may choose not to wait out the storm. The existing research shows that initial conditions at labor market entry matter. One goal of this paper is to determine whether initial conditions at labor market exit do as well.

A small body of previous literature has established that job loss is relatively common for older workers (c.f., Farber, 2005; Munnell et. al., 2006) and has long-lasting negative consequences for employment and wages (c.f., Chan and Stevens 1999, 2001, and 2004; von Wachter, et al., 2008). Some of these studies compare the outcomes of workers who were laid off to those of workers who were not. One problem with them is the likelihood that layoffs are correlated with other characteristics that affect retirement. Von Wachter, et al. (2008) focuses on the response to mass layoffs, which are more plausibly exogenous to the individual. He similarly finds large, long-lasting negative consequences on the employment and earnings of older workers. The approach we employ here is somewhat broader, considering reduced form models of the impact of aggregate changes in labor market conditions, as measured by the state/year level unemployment rate, as well as examining the long-term effect of stock market conditions.

E. Contribution of this Research

The current analysis of retirement builds on the previous literature, including our own past work, in several ways. First, we update and extend our analyses of the effect of stock market and labor market fluctuations on retirement. Second, we provide a new analysis of the effect of housing market fluctuations on retirement, a question not addressed in the previous literature. Third, we use these various estimates to predict the net effect of the current crisis on retirement. Finally, we discuss the distributional consequences and policy implications of our findings. Our

analysis of the effect of market fluctuations on retiree income explores a question the previous literature has largely overlooked.

IV. DATA SOURCES

This section of the paper will describe the sources of data we use for our analyses of retirement and retiree income.

A. Measuring Retirement

Our main source of data for measuring retirements is the Current Population Survey (CPS). The CPS is the leading survey of labor market activity in the United States. The monthly CPS survey asks a sequence of questions about the respondent's involvement in the labor market around the time of survey and also collects demographic data. In March of each year, the "Annual Social and Economic Supplement" (previously called the "Annual Demographic Survey") is administered as a supplement to the regular monthly CPS. Each March CPS provides sample sizes of between 130,000 and 215,000. Although we only are interested in the data for workers around the age of retirement, the large size of each sample coupled with the annual nature of the survey provides us with a tremendous amount of information. For instance, when we pool data from the 1980 through 2008 March surveys for individuals between the ages of 55 and 69, we obtained a sample of nearly 600,000 individuals.

For our purposes, one key attribute of the March CPS is that it enables us to identify retirement transitions.[3] To do so, we make use of information on the labor market activity of

[3] As we describe subsequently, we define retirement as complete labor force withdrawal. However, we recognize that retirement could be defined in other ways, for example, as the initial claim of retirement benefits or as departure from a "career" job. In fact, several studies have found that it is quite common for workers to leave a career job and work for a period of time at a less demanding "bridge" job before completely withdrawing from the labor force; see Cahill, et. al. (2006) for a recent contribution. The data available to us leads us to focus on a definition of complete

respondents in the preceding calendar year, including weeks worked, usual hours worked per week, and weeks spent looking for work. Combining this retrospective information along with that obtained in the regular monthly survey, we can define a retirement to occur when an older worker reports being in the labor force for 13 or more weeks during the preceding year, but is out of the labor force on the March survey date.[4] When we restrict our sample to those in the labor force last year in this way, we are left with a final sample size of over 300,000. Of these workers, we observe that about 9 percent retire in the following year according to our definition.[5] State of residence is available in the March CPS, which we can use to merge in state-level data on unemployment rates and house prices.

B. Measuring Home Prices

We use two sources of home price data. The first is the S&P/Case-Shiller Home Price Index, which is available monthly for 20 metropolitan areas (MSAs) beginning in 1987. The index uses a "repeat sales pricing" methodology, where data on sale prices of individual single-

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labor force withdrawal. However, an analysis of these other types of retirement transitions would be a fruitful area for future research.

[4] A second way that we could use CPS data is by taking advantage of the longitudinal structure of the CPS to create a short panel of information for each respondent. This panel can be created by matching CPS information for some respondents in one March CPS with that from the CPS in the following March. The procedure for doing so is reported in Madrian and Lefgren (1999). These data offer about one-third the sample size as the regular CPS. An advantage of these data, though, is that we can create a definition of retirement for workers who have been more committed to the labor market and out of the labor force for a longer period of time. We have used these data as well and obtained findings qualitatively similar to those reported subsequently. We have chosen not to report them for expediency.

We can also use these matched March CPS data to examine the likelihood of labor market reentry following retirement, as we have defined using the regular March CPS. With the matched data, we use contemporaneous and retrospective labor market activity in the first survey year to define a retirement and contemporaneous labor market activity in the second survey year. Although we do find some reentry, it tends to be lower after a recession. We also find that the more highly educated are the ones who are most likely to reenter and we cannot distinguish differences by educational attainment in terms of the cyclical sensitivity of reentry. We conclude from this that reentry is not uncommon, but that our results are unlikely to be driven by temporary labor force withdrawals.

[5] Using matched March CPS data, described in the preceding footnote, we can also estimate the likelihood that a worker who retires according to our definition regains employment in the following year. Our estimates suggest that 16 percent of those 55 to 69 and 13 percent of those 62 to 69 who retired in the preceding year found employment again in the following year.

family homes is collected from county records and matched to each home's previous sales price, then a weighted aggregate index is created based on the change in sales prices of these homes. We convert the index to real values using the Consumer Price Index (CPI) to calculate real changes in house prices. We calculate the percent change in the index from one March to the next, as our definition of retirement in the CPS is essentially based on changes in labor market activity between one March and the next, and relate retirement decisions in a given year to housing returns over the previous 12 months.

The second data source is the Office of Federal Housing Enterprise Oversight (OFHEO) Home Price Index. This index is available quarterly at the MSA level starting in 1975. The OFHEO index is also based on changes in the value of individual homes over time, but is calculated using Fannie Mae and Freddie Mac data on mortgages originated by these entities during home purchase and refinancing transactions. We use first-quarter data and again relate retirement decisions to home price appreciation in the previous 12 months.

In comparing the two indices, the OFHEO index has the advantage that we are able to merge home price information to the CPS data for half of our sample (essentially all observations with valid MSA data), while the comparable figure for the Case-Shiller data is only 15 percent. However, the Case-Shiller index displays more variation over time, as shown in Figure 2, which can be attributed to several differences in the construction of the two indices, including the fact that the OFHEO index does not include foreclosures. As we report below, results using the two indices are very similar.

C. Measuring Asset Values

The primary source of wealth data in the United States is the Survey of Consumer Finances (SCF). The survey has been conducted every three years since 1983, most recently in

2007, with a sample of roughly 4,500 households per survey. The survey oversamples high net worth households to obtain a more accurate estimate of aggregate wealth holdings. The survey collects detailed data on assets and income, including data on asset allocation within retirement accounts. We use the SCF to generate information on the stock holdings of older households, using sample weights to obtain statistics that are representative of the population.

D. Measuring Retiree Income

Intuition and our past work suggest that any impact of market conditions on retiree income will not be that large in the aggregate. For instance, a major recession would result in, say, an additional five percent of older workers losing their jobs. Only some fraction of those workers will change their retirement behavior as a result. This means that only a small share of the total population is at risk of facing income loss associated with weak market conditions. The losses may be significant for those affected, but in the aggregate it will be hard to identify this effect. This suggests that large amounts of data will be required to do so.

We use microdata from the 2000 United States Census and the 2001 through 2007 ACS in our analysis. The Census provides a very large number of observations; 5 percent of the U.S. population. To obtain time series variation, we augment these data with the ACS data. The ACS is modeled after the Census, with similar variables and coding. The Minnesota Population Center provides unified Census/ACS extracts through their IPUMS USA project; we take advantage of those data.[6] ACS data are available through IPUMS beginning in 2000. The 2000 through 2004 surveys were nationwide demonstrations geared to provide lessons for full implementation of the survey beginning in 2005 (for household units – group quarters were not fully incorporated until 2006). Once fully implemented the ACS contains data for one percent of the population.

[6] For more detail, see Ruggles, et al. (2009). The URL for these data is http://usa.ipums.org/usa/

In the end, we use data from the 2000 Census and seven ACS samples beginning in 2001, providing income data for 1999 through 2006 (since the last currently available ACS at the time of our analysis is from 2007). Over this period, data are available for around 1.68 million respondents between the ages of 71 and 80.[7] Their reported income represents values from the preceding calendar year when the respondents would have been between 70 and 79. All income figures are adjusted to 2007 dollars. In each of these surveys, respondents provide data on a variety of specific components of income. We focus on income from Social Security, pensions, investment income, and total personal income.[8]

We place two other sample restrictions on our data that reduce the final sample size. First, our focus is on income in retirement, so we restrict the sample to those individuals who have already left the labor force. This is not a major constraint given the age composition of the sample. Only 11 percent of respondents are still working; imposing this restriction reduces the sample to around 1.49 million.

We also restrict our attention to the incomes of men. Our decision to do so is largely related to program rules and data availability. For instance, most women in these birth cohorts are likely to receive Social Security payments as a function of their husbands' benefit level, either because their own work history is insufficient to qualify for retired worker benefits or because their dependent spouse benefit is greater than their own retired worker benefit. This means that it may be the market conditions present around the time that the husband retired that

[7] Alexander et. al. (2010) raise concerns about the quality of the age data in the 2000 Census and 2003-2006 ACS, noting "for women and men ages 65 and older, age- and sex-specific population estimates generated from the [Census and ACS] PUMS files differ by as much as 15% from counts in published data tables." We address these concerns below.

[8]The survey itself contains a category labeled "retirement income" that is intended to capture income from pensions. It is unclear, however, whether those who receive distributions from defined contribution pension plans would label this as "retirement income" or investment income. The 2000 Census and the ACS survey forms do not clarify this distinction.

may matter, not those around the time that the wife retired. For those women who have become widowed, we have no data on the age of her husband. Imposing this restriction reduces our sample to 600,211; this is our final sample size.

As we describe in more detail subsequently, one key explanatory variable in our analysis is the unemployment rate in a respondent's state of residence at age 62. Ideally we would know where the respondent lived when they were 62 years old, but in practice, all we know is the current state of residence in all survey years. We therefore assume that no mobility has taken place between age 62 and the survey year, assigning the unemployment rate in the year the respondent was age 62 in the respondent's current state of residence.[9]

We also attach to these data information on the stock market conditions that existed around the time that the respondent was making retirement decisions. We create four additional variables based on the December average values of the Standard & Poors 500 Index, adjusted for inflation. These variables capture the five year growth in the index starting in the year the respondent turned age 50, 55, 60, and 65. Our reasoning for choosing these measures is described subsequently.

V. METHODOLOGY – ANALYSIS OF RETIREMENT

Although the specific methods we use depend on whether we are addressing stock market wealth, housing wealth, or unemployment, the general approach is similar. To avoid repeating

[9] The Census data contains current state of residence along with state of residence five years ago. We use this data to estimate the likelihood that individuals between the ages of 65 and 69 moved across state lines in the past five years, the time when they were between the ages of 60 to 64. Our results indicate that 83 percent of respondents reside in the same state. The main discrepancies occur for those who move to either Arizona or Florida. We found that excluding residents of those states had little impact on our results. Therefore, while we acknowledge the possibility of measurement error in our analysis, we do not believe this is likely to be a particularly serious problem.

ourselves, we first present the basic methodological framework and then provide details regarding the ways in which we modify it for each specific application.

A. Framework

Our goal is to determine whether different types of market conditions alter retirement decisions. Underlying our analysis is a regression model where the dependent variable is an indicator for whether an older worker retired in a particular year as a function of the market conditions he faces along with other explanatory variables, mainly demographic factors like race/ethnicity, gender, level of education, etc.[10] We also include a full set of exact age dummies, which essentially converts our retirement regression into a hazard model with a nonparametric baseline hazard. We use the same CPS data to provide information on retirement behavior as well as the explanatory variables (other than the market conditions).

For each analysis we exploit quasi-experimental variation in the data, which we believe is able to plausibly generate causal conclusions regarding the impact of conditions in each market on retirement behavior. Quasi-experimental variation relies on changes over time in the explanatory variables occurring in some locations or for some groups but not in other places or for other groups. Those individuals who experienced no change act as a quasi-control group for those in a quasi-treatment group who experienced a change. Comparing differences in outcomes over time between the two groups provides a means to identify the effect of the change. Statistically, this approach is referred to as a difference-in-difference method as the change, or

[10] We have also experimented with models that allow the impact of improving market conditions to differ from the negative of the impact of declining market conditions, but we found no evidence of an asymmetric effect. The models that we estimate have binary dependent variables for retirement. We report the results of linear regression models because they are easier to interpret, but we have also estimated probit models, which yielded derivatives that were similar.

difference, within one group is differenced from the change in the other group to estimate the effect.

In practice, this approach is generally implemented using panel data, estimating regression models that include specific market conditions (stock market, housing market, and labor market) along with relevant fixed effects when possible. One set of fixed effects would represent a vector of state of residence dummy variables that can hold constant any longstanding differences in behavior between workers who live in different areas of the country.[11] A second set of fixed effects would represent dummy variables for the time periods included in the analysis. These time fixed effects would hold constant broader social and economic conditions that may be changing over time and that might alter outcomes for all individuals. What remains to be estimated once these fixed effects are included is the difference in outcomes that take place over time between the groups. The coefficient on the market conditions variable, our key explanatory variable, is this estimate. We will apply this general approach in all of our subsequent analyses.

Before providing a discussion of the application of our approach to each specific market, it is appropriate to discuss how we intend to measure market conditions and why we have made those choices. For the stock market, we use the one-, five-, and ten-year percentage change in the S&P 500 Index. For the housing market, we use the one- and five-year percentage changes in the relevant housing price index. For the labor market we use the unemployment rate. Coupling these measures with the retirement rate means that we are mixing flows (retirement) with changes (stock and house prices) and levels (the unemployment rate). We believe that the measures we have chosen do the best job of capturing each type of economic activity for the

[11] If the quasi-treatment and quasi-control groups were identified by a characteristic other than location, for example education, then the dummy variables for each education group would serve to hold constant any longstanding differences in behavior between workers in different education groups, as the state dummies do in this discussion.

purpose at hand. First, we use transitions into retirement rather than the number of retirees at a given point in time because the former captures behavior that is occurring now, while the latter includes those who retired some time ago and thus is unlikely to be responsive to current market conditions. Second, we use the change in stock and house prices because it seems likely that retirement will be more responsive to the price changes than levels. If prices are high but stagnant, the earlier run-up in the market should have already been captured in retirement expectations; changes in behavior are more likely to be generated by changes in prices. Finally, we use the unemployment rate rather than the change in the rate because the former seems more likely to be relevant for retirement decisions. If the unemployment rate rises from 6 to 8 percent and then stays there, jobs are not secure, and older workers may continue to get laid off, even if the unemployment rate is unchanged.

B. Application to Changes in Financial Wealth

Not everyone holds financial wealth. As we document later, some segments of society have little financial wealth. Because changes in stock market conditions should have little or no direct bearing on retirement decisions for those who do not own stocks, these individuals can be thought of as a quasi-control group. We can compare the effect of stock market fluctuations on retirement for those without financial wealth to the effect for those with significant financial wealth to estimate the impact of the market on retirement.

In practice, the CPS data we use to measure retirement do not include data on financial wealth. Instead, we first divide individuals by educational attainment. As we report later, individuals with no more than a high school degree typically have very limited stock holdings and can act as a quasi-control group for college graduates, whose holdings are more extensive. If

the more educated are estimated to retire at a differentially higher rate in response to higher stock market prices, this would support the hypothesis that market conditions matter.

In these specifications, we are unable to include a complete vector of year fixed effects because the stock market variables available to us vary only over time and not across locations. Instead, we capture broader movements in retirement behavior over time by including quadratic time trends in our regression model, allowing the trends to differ by group. This model enables us to identify the impact of stock market changes by estimating whether retirement behavior deviates from a quadratic trend in years in which market returns are higher. To support a causal effect, estimates would need to be greater for the more highly educated.

B. Application to Changes in Housing Wealth

Our use of quasi-experimental variation and difference-in-difference methods is somewhat different when we analyze changes in housing wealth. We first consider the variation available to us as a result of differences in house price changes by location. In the extreme, we could think about individuals who live in locations where housing prices have remained flat (in real terms).[12] They would represent a control group to compare to those in locations where prices rose or fell. Dividing individuals in this way is a bit unrealistic, however, since housing prices tend to fluctuate everywhere at least some of the time.

Nevertheless, we can use the same methods and somewhat modify our interpretation. In reality, what we have are groups who were more affected than others in the sense that housing prices change by more in some locations at some points in time than others. Implementing the difference-in-difference method with location and time fixed effects enables us to estimate

[12] In reality, since we are interested in unanticipated housing gains or losses, what should matter for retirement is not so much the total amount of the gain but the amount that was unexpected, so the ideal control group would be one where housing prices rose no more or less than expected. While it is plausible that expectations about house price appreciation may vary by location, we have no data to guide us on this point, so we must treat all gains or losses in all locations as (equally) unanticipated.

whether there are greater changes in retirement behavior in areas with greater changes in home prices. This method still holds constant longstanding differences in retirement behavior across locations and trends in retirement behavior over time that affect the population as a whole. The experimental analogy does not work quite as well here, but the general approach is the same and yields results that plausibly can be interpreted as causal.

We can further expand upon this approach by incorporated a "third difference" as well. As with financial wealth, home equity varies across individuals. While we are not able to identify the exact amount of home equity held by each individual, we can identify home ownership status in the CPS, allowing us to use those with no equity as a true quasi-control group. If we find that homeowners increase retirement by more than renters in response to an equivalent increase in housing prices, this would be consistent with the hypothesis that home equity affects retirement and provide further support for a causal interpretation of our findings.

C. Application to Changes in Labor Market Conditions

The methods available to evaluate the impact of changes in labor market conditions, as measured by the unemployment rate, are similar to those for housing wealth. The unemployment rate changes in some places at some points in time more than others and we rely on that variation just like we described with changes in housing prices.[13] We can also estimate difference-in-difference models separately for different demographic groups, including by educational attainment. Less-skilled workers tend to be more sensitive to labor market conditions (Hoynes, 2000), so we would expect any impact of an economic downturn on retirements to be larger for

[13] The use of state level unemployment rates introduces some measurement error because those data come from surveys that contain sampling variability. The BLS states "The average magnitude of the over-the-year change in an annual average state unemployment rate that is required in order to be statistically significant at the 90-percent confidence level is about 0.5 percentage point." In a linear probability model with classical measurement error, this should introduce some attenuation bias. To gauge the sensitivity to this problem, we also estimated models using the national unemployment rate rather than the state unemployment rate, including a trend and trend squared rather than year fixed effects. The results of this analysis were quite similar to those reported subsequently, suggesting the attenuation bias described earlier is unlikely to be a major issue.

this group. Following the previous literature, we use less-educated as a proxy for less-skilled workers. Therefore, we can use the differential responsive in retirement to labor market conditions across educational attainment categories as a further test of a causal effect.

D. Why Three Separate Analyses?

A final important conceptual issue relates to our use of three separate models for the three markets rather than one regression model that would include all three measures of market conditions. While in principle we could use the latter approach, in reality there are important differences across the three analyses that make running separate analyses preferable, in our view. First, as just discussed, we are unable to use year fixed effects in the stock market analysis; running one joint model would prohibit us from using them in the analyses of the other markets as well. Second, data on housing prices is only available for about half of the CPS sample (those with non-missing MSA information), so estimating a single model would reduce the power of our estimates in the other analyses as well. Finally, testing our hypotheses involves comparing coefficients across different groups in the different analyses (e.g., by homeowner status in the housing regressions vs. by educational attainment in the stock and labor market analyses). Thus we believe that conducting three separate analyses provides us with the best opportunity to analyze the effects of each market on retirement. We do, however, conduct some specification checks, discussed further below, to verify that our key results are robust to the inclusion of the other market variables.

VI. METHODOLOGY – ANALYSIS OF RETIREE INCOME

The main question we seek to address in this analysis is the long-term impact of market conditions around the time of retirement on retirement income. The first issue that is raised by

this question is what we mean by "around the time of retirement." In theory, if we could observe every individual's complete work history, we could think about alternative definitions of retirement (departure from "career job," complete labor force withdrawal, etc.), choose an appropriate one for our purposes, and assign that retirement date to each record in the data. We could then attach the unemployment rate at that time and the stock market return in the preceding five or ten years to each worker's record. In practice, of course, surveys that are of sufficient size to be useful for this analysis do not contain that level of information on respondents' work histories.

Even if we had this information, it is not clear whether we would want to use it in this way, as the timing of retirement would be endogenous. Those who are willing to live on less and who receive greater disutility from work may retire earlier. If those preferences have any time series and/or regional variation, they may be correlated with changes in market conditions. We would rather assign market conditions to workers around the time of their retirement using alternative, exogenous measures that still may capture the market constraints workers face when they consider retirement.

To capture labor market conditions, we have chosen to use the state unemployment rate in the year that an individual is 62 years old as our preferred measure. This value has the advantage of being exogenous to individual decision-making and occurs at a time at which previous research has shown that there is a spike in retirement rates anyway, coincident with the initial eligibility of Social Security retirement benefits. Our own past work (Coile and Levine, 2007) and the results reported below shows that the impact of labor market conditions on retirement decisions does not begin until age 62, further supporting this decision.[14]

[14] We have also explored a number of alternative specifications as well, including the unemployment rate at different ages individually and collectively. When we included different single age unemployment rates between ages 58 and

To capture equity market conditions, we have chosen to use the five-year real rate of return in the S&P 500 starting in the year the respondent turned age 50, 55, 60, and 65 (representing returns between 50 and 55, 55 and 60, 60 and 65, and 65 and 70, respectively). Our results (discussed below) show that retirement decisions are more likely to respond to longer-term changes in market returns, including those at a five-year interval. Our analysis of retirement income focuses on those beginning at age 70, so working backwards from there seems like a reasonable approach.

The value of using multiple five-year intervals is that the impact of market returns at different ages may have differential effects on retirement income. These effects would be determined by the age profile of stock ownership and stock holdings conditional on ownership. As stock ownership rates and levels may change as a worker ages, the potential impact of stock market returns on subsequent retirement income may change as well. The exact pattern we would expect to observe in the response to market conditions by age, however, is difficult to predict a priori without further information regarding age profiles of stock ownership. We present some data on that subsequently to inform this question.

The source of variation in these labor market and stock market variables is somewhat different, but both are based on the differing historical experiences of individuals born into different birth cohorts. In essence, we treat the labor market and stock market conditions around the time of retirement as a draw that is randomly assigned to individuals. If we only observed retirees in one year, this approach would be equivalent to an identification strategy that is solely based on an individual's age in the survey year. The fact that we have multiple surveys enables

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65 we found the greatest impact around age 62 and little impact of unemployment at the younger and older ages. When we included unemployment rates at each age in the same regression, we obtained unstable results, presumably because of the high serial correlation in year-to-year unemployment rates.

us to also control for aging patterns in retirement income with age fixed effects, since we are able to observe individuals at the same age who were born in different birth cohorts. Similarly, we are able to control for contemporaneous patterns in retirement income with survey year fixed effects, which aggregate different ages in each survey year to see if there are collective patterns in retirement income over time.

The one potential weakness of our identification strategy is that we are not able to control for patterns in retirement income across birth cohorts that may have occurred for reasons other than differing market conditions through the use of birth cohort fixed effects. If there are systematic patterns in retirement income by birth cohort that happen to be related to market conditions, this will introduce bias into our analysis. That bias would still need to be linked to socioeconomic status, though, since we estimate these models separately by position in the income distribution and expect different results for different income groups. The fact that we find that pattern, as reported below, suggests this is not a significant problem in our analysis.

Tables 1A and 1B are designed to provide additional detail regarding the variation in market conditions that we use in our identification strategy. Both tables show the survey years we are using (2000 through 2007 surveys, representing income from 1999 through 2006) and respondents' ages in those survey years (71 to 80, representing ages 70 to 79 in the years income is measured). Table 1A presents the real percentage increase in the S&P 500 between ages 55 and 60 that was experienced for each cohort. For instance, those respondents who were 79 years old in 2000 would have been 55 years old in 1976. The S&P 500 fell by 29 percent between 1976 and 1981 in real terms. Similarly, a 74-year-old respondent in that survey year was 55 years old in 1981; the market rose 68 percent in real terms in the following five years. Looking across the table, there is variation in the historical stock market returns that respondents

experienced not only across surveys and across ages (reflected in the different values in a single row or column, respectively), but also across the interaction of surveys and ages. In the context of panel data methods, we are able to include both survey year and age fixed effects and maintain our identification based on the interaction of the two.

Table 1B presents a similar analysis for the unemployment rate respondents experienced at age 62. The national unemployment rate at age 62 varies from a high of 9.7 percent to a low of 4.5 percent for the cohorts used in the analysis. As with stock returns, the unemployment rate differs across surveys and across ages, but the variation in the interaction of the two is the important feature for our analysis. Moreover, and unlike with stock returns, there are further differences across individuals in the unemployment rate they faced at age 62 due to geographic variation. In our analysis, we assign to each individual the state unemployment rate that existed when he was 62 years old. Our identification strategy relies on all of these sources of variation in the data.

This discussion leads us to our formal econometric specification. The models we estimate take the form:

$$\begin{aligned} Income_{i,s,t,a} = \beta_0 + \beta_1 \cdot UR62_{s,t,a} + \beta_2 \cdot SP5055_{t,a} + \beta_3 \cdot SP5560_{t,a} + \beta_4 \cdot SP6065_{t,a} \\ + \beta_5 \cdot SP6570_{t,a} + \beta_6 \cdot X_{i,s,t,a} + \gamma_s + \gamma_t + \gamma_a + \varepsilon_{i,s,t,a} \end{aligned} \quad (1)$$

In this specification, the dependent variable represents alternative measures of income for individual i who resides in state s in survey year t and is age a in the survey year. In some specifications, we will consider an indicator variable for whether an individual has a particular form of income. In those instances, we estimate linear probability models. In other specifications, we consider the amount of income received, conditional upon receipt; we estimate these models using ordinary least squares. In yet another set of models, we consider the

unconditional amount of income received. For specific types of income, we generally estimate Tobit models due to the presence of a substantial number of zero values. For overall total personal income, few zero values are present so we use ordinary least squares. In all models where the dependent variable is the level of some type of income, the dependent variable is measured in 2007 dollars, rather than in logs, because we believe the linear specification aids in our interpretation of the results.[15]

The key explanatory variables are the unemployment rate at age 62 and the five-year real rates of returns in the S&P 500 index between ages 55 and 70, as described earlier. We also include other individual characteristics (X) as covariates, including race, ethnicity, gender, marital status, and educational attainment. In addition to these variables, we include the contemporaneous unemployment rate as well as fixed effects that generically control for differences across survey years, across ages, and across states of residence.[16]

All of these models are estimated for the full sample of respondents as well as by the respondents' position in the income distribution. Respondents are divided into thirds according to their level of total personal income. We conduct these analyses separately by location in the income distribution because the impact of market conditions around the time of retirement may have differential effects by income level. One potential limitation of this analysis is that we are

[15] Using linear specifications enables us to include the relatively small number of negative and zero values of total personal income when we estimate models of that form. Once we estimate this model in levels, it makes sense to estimate the remaining models in levels so that we can compare results across income categories. However, we have also estimated all models with continuous measures of income, conditional upon receipt, using log linear specifications. In all cases, the results are qualitatively similar.

[16] In principle, the variation available to us also enables us to estimate models that also include interactions of state of residence and survey year along with state of residence and age in survey year. In the OLS specifications, we have estimated these models as well, which mainly yielded qualitatively similar results, particularly for the impact of labor market conditions. In the Tobit models, however, the estimation procedure had difficulty converging with such a precise identification strategy. Because these additional fixed effects do not substantially change our findings when we are able to include them, we chose to report all of the results from the more parsimonious specifications that exclude them.

separating our sample according to one of our dependent variables, suggesting it may be endogenous. In this particular instance, however, we do not believe that this presents much of a problem, because the endogeneity problem would only exist to the extent that market conditions around the time of retirement moved individuals between these three broad income categories. Although this is possible, we believe it will occur in only rare instances.[17]

VII. IMPACT OF LOST STOCK MARKET WEALTH ON RETIREMENT

A. Descriptive analysis

Before proceeding with our econometric analysis of retirement, we begin with a descriptive analysis of individual stock holdings using data from the 2007 SCF, the most recent data available. Our goals in this analysis are to determine the level of stock holdings and the differences in holdings across population subgroups and to get a sense of whether the level of stock holdings may be sufficient to influence individuals' retirement behavior if the market rises or falls.

Table 2 presents information on stock holdings for households headed by individuals between the ages of 55 and 64, who are likely to be contemplating retirement in the near future. The results in Table 2 indicate that the typical household's stock holdings are very small. In fact, the median values of directly held stocks, stock-based mutual funds, and retirement accounts (including DC pension plans and Individual Retirement Accounts, or IRAs) that include stocks

[17] We have also attempted to estimate the exact same models distinguishing workers by the education level rather than their location in the income distribution. Educational attainment is certainly correlated with level of income and is almost certainly exogenous to outcomes so late in a worker's career. The results of these models almost uniformly yielded insignificant coefficients. Our interpretation of this is that education does not adequately distinguish the difficulties that individuals face regarding their retirement income. One way to see this is that the dispersion in income levels across education groups is considerably smaller than that presented subsequently regarding income (see Table 2). Intuitively, particularly among these older cohorts, even less educated workers could have reasonably high retirement incomes and face the same sorts of issues regarding retirement income that more educated workers face.

are zero or very close to it. For all stock-based investments combined, the median value of holdings is just $8,000. The 75th percentile of this distribution is just under $100,000. One needs to look very high in the distribution in order to find households with very large levels of stock holdings.

As previewed earlier, stock ownership is strongly correlated with education. The share of households with any stock-based investments is 46 percent for high school graduates vs. 78 percent for college graduates. Furthermore, those with high levels of wealth are heavily concentrated among more highly educated individuals. For example, the 75th percentile of the distribution of all stock-based investments is just $28,500 for high school graduates vs. $271,300 for college graduates.

Despite the relatively low levels of stock holdings for most households in 2007, stock holdings are even lower at the beginning of our sample period. Similar calculations from the 1989 SCF (not reported on Table 2) indicate that the share of households with any stock-based investments rose from 36% in 1989 to 58% in 2007, while the median value conditional on holding any stock-based investments rose from $30,000 to $78,000. Increases for the college-educated group were similar in absolute terms (though smaller relative to the original values), with the share of stock owners rising from 60% to 78% and the median value conditional on holding stock-based assets rising from $70,000 to $125,000.

Table 3 presents a descriptive analysis of the impact that the recent stock market crash will have on future retirement income based on the 2007 stock holdings reported in Table 2. We begin by listing different levels of stock holdings ranging from none to $500,000 in Column 1. In Column 2, we identify the fraction of households headed by an individual between ages 55 and 64 that have stock holdings at that level or lower. About 42 percent have no holdings at all

and 75 percent have $100,000 or less; 8 percent have $500,000 or more. In Column 3, we approximate the loss experienced by households at each the stock threshold, assuming that their portfolios fell by 50 percent. We then make the simplifying assumption that households consume 5 percent of their wealth per year to approximate the lost retirement income resulting from the market crash. This is reported in Column 4; Column 5 divides this figure by 12 to get monthly statistics.

The results of this analysis suggest that if households divide this lost wealth over their remaining retirement years, the change in income would be modest for most of them. Those with $100,000 of stock holdings would lose $2,500 per year or $208 per month as a result of the stock market crash. These are not insignificant values, but the losses are likely to represent a small percentage of retirement income. The losses are, obviously, even smaller for those with less invested in stocks, a group that includes 75 percent of older households in 2007.

Our conclusion from this analysis is that, based on our assumptions, there are relatively few older households that lost enough money in the recent stock market crash that their retirement income will be substantively diminished.[18] Alternative assumptions, however, may lead one to predict a larger retirement response. Individuals could plan to consume a larger share of their savings just after they retire, for example to generate retirement income until Social Security benefits are available. If so, the relatively small amounts of stock holdings that most households have could lead to a substantial shock to retirement income, if just in the short-run. This could generate a larger retirement response. In the end, this is an empirical question that we will address using the regression techniques described earlier.

[18] Gustman, Steinmeier, and Tabatabai (2010) come to a similar conclusion using even more detailed wealth data (including Social Security and DB pension wealth) available in the Health and Retirement Survey. In their analysis, they conclude that the share of wealth associated with stocks tends to be so small that even a dramatic decline in the stock market is unlikely to have retirement implications for many workers.

B. Econometric analysis

In our econometric analysis, we estimate regression models using data from the March CPS, where the dependent variable is an indicator variable for retirement and the key explanatory variable is the change in the S&P 500 Index. As we discussed earlier, we consider the one-year change, the five-year change, and the ten-year change because the time frame over which individuals respond to market fluctuations is not clear. We implement the quasi-experimental approach described earlier where we estimate the response to market changes across groups that differ by their likelihood of holding substantial amounts of stock. For instance, more educated respondents would be predicted to respond more strongly to market fluctuations. We also estimate models separately for those 55 to 61 and those 62 to 69, since 62 is the age at which individuals are first eligible for Social Security benefits and that eligibility may alter responses.[19]

The results of this analysis are presented in Table 4. Each cell in this table represents the results of a separate regression for the demographic groups previously identified. Based on the results reported here, there is some evidence supporting the notion that stock market fluctuations alter retirement behavior. This finding is strongest for those with more education who are between 62 and 69 and in response to long-term market fluctuations.[20] For workers in this age group, the coefficients on short-run fluctuations are positively signed, though there is no systematic pattern across educational attainment groups and coefficients are small in magnitude relative to the mean retirement rate. For example, a one-standard deviation (or 16 percentage

[19] We have also estimated regression models in which the effect of stock market fluctuations is allowed to vary over time, to allow for the possibility that the response has strengthened as the number of workers with stock market assets and the value of those assets has risen. We fail to find consistent evidence in support of this hypothesis.

[20] Even among the college-educated, heterogeneity exists in the level of stock holdings, which means that the results reported here reflect the impact for the average college graduate. Clearly, some college graduates have very high levels of stock holdings and the impact may be even larger for them.

point) increase in the one-year return increases the retirement rate of college graduates by 0.4 points, or 3.2 percent relative to the mean retirement rate of 11.7 percent. For the ten-year return, however, the pattern across educational groups is consistent with what we would predict and the magnitude of the coefficients is greater.[21] A one-standard deviation (or 77 percentage point) increase in the ten-year return increases the retirement rate of college graduates by 1.5 points, or 12.9 percent relative to the mean. Despite the relatively small sample sizes, we find that the effect for college graduates is statistically different (at the 10% level) from that for high school dropouts or high school graduates, though not different from the effect for those with some college, and also statistically different than the effect for all non-college graduates collectively.

For those workers age 55 to 61, few coefficients are statistically significantly different from zero and there is no systematic pattern in coefficients across education groups.[22] There is a positive and significant effect of 5- and 10-year returns for households with some college, but the fact that households headed by a college graduate have substantially greater stock holdings yet do not respond to these return measures makes us doubt that this results for the former group reflect a causal effect of stock returns. Point estimates on short-run (one-year) fluctuations are mainly wrong-signed.

[21] We have also estimated similar regression models distinguishing workers by whether or not they are covered by a private pension. The type of pension held (DB versus DC) or the dollar amount of their holdings is not reported, but those with pensions are likely to have greater stock market wealth than those without, forming another type of quasi-experiment. Results by pension status are not shown in the interest of space, but are consistent with the results by education group, in that they are more in line with our expectations for older workers than for younger workers and for long-term fluctuations than for short-run fluctuations. These results are available from the authors on request.

[22] The standard errors in these models, as well as those for the housing and labor markets, are clustered by state. We have experimented with clustering by year and using unclustered (robust) standard errors in the stock market regressions, and the results are quite similar to those reported in Table 4.

VIII. IMPACT OF LOST HOUSING WEALTH ON RETIREMENT

Next, we turn to our econometric analysis of the effect of housing market fluctuations on retirement. As discussed above, this analysis is largely similar to the stock market analysis, except that we now have a true quasi-control group, renters. We thus compare results by home ownership status rather than education level. As before, we examine the effect of the market return over different time periods, one and five years. As discussed earlier, we use two price indices to measure the variation in home prices, the Case-Shiller Index and the OFHEO index, and identify the effects of home prices on retirement based on geographic differences in home price changes over time.

The results of this exercise are presented in Table 5. When we group all households together, the evidence that home price fluctuations affect retirement is weak.[23] In the models that use the Case-Shiller data, the coefficients are wrong-signed for 62 to 69 year olds (the group that was more responsive to stock market fluctuations) and are insignificant for all age groups and time horizons. In the models using the OFHEO data, the coefficients are larger for the older group and right-signed, but also insignificant. Results from the models that estimate the effect separately by home ownership status are largely similar. Once again, the specifications using the Case-Shiller data are not supportive of the hypothesis that home prices affect retirement, while those using the OFHEO data are more in line with our expectations, in that the coefficients on home price changes are uniformly positive for homeowners and larger for the older group, but statistically insignificant. Overall, we are unable to find support for the hypothesis that

[23] One possible explanation for this finding is that individuals respond to the difference between actual and expected home price appreciation rather than to actual appreciation. As we have no individual-level data on expected home price appreciation, we calculate MSA-specific quadratic trends in real house prices and use these to calculate unexpected appreciation. We fail to find that retirement is responsive to this measure.

retirement is responsive to home price fluctuations. This finding is consistent with the previous literature suggesting that most households do not consume their home equity in retirement. Given our results, we make no attempt to include any changes in retirement resulting from home price fluctuations in the simulations of the effect of current market conditions on retirement presented below.

IX. IMPACT OF LABOR MARKET CONDITIONS ON RETIREMENT

A. Descriptive Analysis

Before reporting our econometric results, we begin by presenting a descriptive analysis designed to gauge the magnitude of the potential retirement response brought about by a weak labor market. Are there enough unemployed older workers and is the likelihood of their labor force withdrawal sufficiently large that we would be able to identify whether a labor market shock would generate an aggregate retirement effect?

To begin to address this issue, we first examine the level of unemployment among older workers and how this varies over the business cycle, using official statistics from the Bureau of Labor Statistics and our own calculations from the CPS. Older workers are less likely than the average worker to be unemployed. Unemployment rates for all workers cycle around a value in the vicinity of 6 percent, while the comparable figure for those 55 to 69 is more like 4 percent. The actual number of older workers who experience some unemployment over a given period (like a year), though, is greater than that. The unemployment rate is a point-in-time measure rather than a longer window available in a retrospective measure. Our calculations indicate that

the number of workers 55 to 69 experiencing some unemployment over the past year is a number more like 8 percent with cyclical swings similar to those in the official unemployment rate.[24]

Earlier in this paper, we argued that we did not expect much of an aggregate retirement response to lost stock market wealth since so few individuals hold much wealth. Yet the number of people affected by labor market shocks is probably not a lot different. We would therefore only observe a bigger effect of labor market fluctuations on retirement if older workers who experience unemployment are quite likely to retire. In fact, this is what the evidence shows.

We first provide some descriptive evidence on this point using data from the Displaced Worker Survey (DWS), another supplement to the CPS. A displaced worker is someone who lost their job because of a plant closing, slack demand, or because their position was abolished. We calculate the rate at which workers displaced within the last three to five years withdrew from the labor force by the survey date. For those workers aged 20 to 54, roughly 10 percent withdrew. For those aged 55 to 69, roughly 30 percent withdrew. These withdrawals of older workers would be defined as a retirement, based on the operational definition of the term used in this analysis. Thus workers are very likely to retire in response to a job displacement.

Using our March CPS data directly, we can also distinguish retirement rates between unemployed older workers and others. Figures 4 and 5 present the results from such an analysis. In Figure 4, we present retirement hazard rates by age over the 1980 to 2007 sample period and in Figure 5 we present retirement hazard rates by year over the 55 to 69 age range.[25] In both figures, solid (dashed) lines represent the retirement rates for workers who experienced no (some) unemployment in the year preceding the survey. At all ages and in all years it is clear

[24] See Levine (1993) for a comparison of retrospective and contemporaneous measures of unemployment.

[25] An older worker who is in the labor force in, say, 2003, and withdraws by the March 2004 survey is said to retire in the year 2003. We define that worker's age according to the March 2004 reported age less one to approximate age in 2003.

that unemployed older workers have higher retirement rates. These results along with those from the DWS are not conclusive in showing that unemployment "causes" increased retirement rates because workers who experience a job displacement or unemployment may be more likely to withdraw from the labor force for other reasons. Nonetheless, we view this evidence as supportive of a relationship between unemployment and retirement among older workers.

Figure 5 provides additional evidence that unemployment may serve as a constraint that forces workers into retirement. For workers who experience no unemployment, there is a noticeable trend towards lower retirement rates over time. Annual retirement rates for these workers are about 10 percent in the beginning of the sample period, but begin to decline in the early 1990s, reaching a level of 6 percent by 2007. This pattern is consistent with the recent trend towards greater labor force participation among older workers. Interestingly, no such pattern exists among workers experiencing some unemployment. For them, retirement rates remain roughly constant (albeit a bit noisy due to smaller sample sizes) at around 16 percent. This suggests that whatever factors are driving many workers to choose to remain in the labor force longer are not influencing the behavior of unemployed older workers.[26] This would lead one to believe that other constraints may be dominating their behavior. Again, this evidence is merely suggestive that unemployment may play an important role in the retirement process for some workers. We move on to discuss the results of our econometric analysis next.

B. Econometric Analysis

The results of our econometric analysis are reported in Table 6. In the left part of the table we show results for the full sample as well as separate estimates for workers ages 55 to 61 and 62 to 69. On the whole, we find evidence that older workers' retirement behavior is

[26] Friedberg and Webb (2003) argue that the shift from DB to DC pensions can explain some of this increase; Gustman and Steinmeier (2008) make a similar argument with respect to changes in Social Security rules.

responsive to changes in labor market conditions. A one percentage point increase in the unemployment rate increases the annual retirement rate by 0.18 percentage points. The average retirement rate is 9 percent per year, so this translates into a two percent increase relative to the mean. In the current crisis, the unemployment rate has risen by around five percentage points so far. Our estimates suggest this would increase retirements by 0.9 percentage points, or ten percent relative to the mean retirement rate.

Breaking up our sample by age, we find that the entire effect is driven by those who are 62 to 69.[27] For 55 to 61 year old workers our results indicate a small and statistically insignificant effect of higher unemployment rates. For workers between the ages of 62 and 69, we find that a one percentage point increase in the unemployment rate would generate a 0.36 percentage point increase in the retirement rate. The five percentage point jump in the unemployment rate experienced recently is predicted to increase the rate of retirement by 1.8 percentage points, or 12 percent relative to the average retirement rate of 15.6 percent.

As in past analyses, we also estimate our models by education group; we report these results in the right part of Table 6. We find that high school graduates' retirement decisions are most responsive to a weak labor market.[28] For them, a five percentage point increase in the

[27] We have also estimated all models for both men and women separately. For the labor market regressions, we find some evidence that the impact of unemployment on retirement may be larger for women than for men. The strength of the evidence, however, is somewhat limited by the power of the analysis. For instance, in the aggregate, we find that women are more likely to retire in response to a cyclical downturn. On the other hand, the impact of a downturn on retirements among high school graduates is statistically significantly different from zero for both men and women, but not significantly different from each other. The same pattern holds true for the older group of workers as well (ages 62-69). Because we are unable to strongly determine differences in responsiveness by gender, we have chosen to group men and women together. For the stock market regressions, there are essentially no statistically significant differences between the stock return coefficients for men and women and no consistent pattern of greater responsiveness by either group. For the housing market regressions, we find some evidence of greater responsiveness by men, but only in the models using the 5-year changes in the Case-Shiller index.

[28] F-tests on the joint significance of the coefficients on the unemployment rate interacted with education level rejects the hypothesis that these coefficients are statistically identical (p-value = .019). When we test whether the unemployment rate coefficient for high school graduates is different than that for the other education groups, we find that the differences in the coefficients are significant against high school dropouts at the 5% level (p-value =

unemployment rate would generate a 1.8 percentage point increase in the retirement rate, a 19 percent increase relative to the mean. More-educated workers do not increase their retirement significantly (in either a statistical or economic sense) in response to rising unemployment rates. Based on this evidence, we conclude that changes in labor market conditions have an important effect on retirement decisions, particularly for high school graduates.[29]

X. OVERALL IMPACT ON RETIREMENT

The results that we have presented suggest that the stock market may cause some workers to delay retirement. In particular, in response to long-term declines in the value of stocks, highly educated workers between the ages of 62 and 69 appear to respond by reducing their likelihood of retirement. We find no support for the idea that declining housing values will have much impact in retirement. A likely explanation for this fact, as past research would suggest, is that few older workers use their housing wealth to finance retirement consumption. The impact of a sharply contracting labor market appears to be a relevant, and apparently overlooked, factor in forecasting coming retirement trends.

Taken together, our results suggest that retirements in the near term are likely to fall because of the long-term decline in stock prices, be largely unaffected by the decline in housing

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.045), significant against those with some college at the 10% level (p-value = .066), and not quite significant at the 10% level (p-value = .115) against college graduates. It is our impression that these results are strong enough to conclude that there likely is a difference in the impact of labor market conditions across educational attainment categories.

[29]One interesting finding is that the retirement rates of high school dropouts do not appear to be affected by labor market conditions despite the fact that their employment is highly cyclically sensitive. The greater cyclical sensitivity in their employment, however, does not necessarily need to translate into a higher likelihood of retirement. It could be the case that the workers whose retirements are most affected are, for instance, manufacturing workers (high school graduates) who lose relatively well paying jobs during a recession, are unable to find jobs of similar quality, and retire as a result. By contrast, those at the very bottom of the distribution may have no alternative other than to keep looking for work because they have so few resources. This point is worthy of further study.

prices, and rise because of the increase in the unemployment rate.[30] The net effect is uncertain because the effect of the long-term decline in stock prices and the rapidly rising unemployment rate tend to offset each other.

To assess the relative magnitudes of the two effects, we conduct a simulation exercise designed to estimate the number of individuals in a birth cohort likely to be affected by the recent changes in the stock market and the labor market. The results of this analysis are reported in Table 7. We begin by using data from the 2005 through 2007 American Community Survey to estimate the size of the labor force by exact age. We find that there are 2.8 million individuals in the labor force at exact age 55, a figure that declines to 1.4 million at age 62, 800,000 at age 65, and 400,000 at age 69. Then we apply to these data age-specific hazard rates that we estimate using the March CPS data to arrive at the number of retirements we would predict over the course of a typical year at each exact age. These statistics represent a baseline of the "typical" number of expected retirements per year. In total, about 2 million workers between the ages of 55 to 69 would be expected to retire per year, on average.

The remainder of the table simulates the impact of the changes in retirement brought about by the weak labor market and the plunging stock market. We use the results presented in Tables 4 and 6 to implement this. In both cases, we use the regression coefficients relating changes in market conditions to changes in retirement rates that were estimated separately for workers ages 55 to 61 and 62 to 69. For the stock market, we focus on the ten-year change in the S&P 500 index and simulate the effect of a 110 point drop in the return, which is equivalent to

[30] As noted above, we have chosen to conduct three separate analyses of the three markets rather than one joint regression. We take several steps to confirm that our key results are not affected by this choice. First, all our models include the unemployment rate as a control variable, and the unemployment coefficient obtained in the models presented on Tables 3 and 4 (though not included on those tables) is quite similar to that reported in Table 5. Second, we have re-estimated the models on Table 3 including housing prices and the models on Table 4 including stock prices, and the pattern of results we obtain from this exercise is very similar to the original results.

moving from the average ten-year return during the past thirty years (62 percent) to the ten-year return experienced in the period ending in 2008 (-48 percent). For the labor market we estimate the impact of a five percentage point increase in the unemployment rate, approximating the actual rise in that rate from the low point of 4.4 percent in March 2007 to 9.4 percent in May 2009. The product of these changes in market conditions and the age-specific coefficient estimates from Tables 4 and 6 yields estimates of the change in hazard rates. We apply these estimates to the baseline hazard rate to obtain "adjusted" hazard rates. The product of the adjusted hazard rates and the actual number of workers in the labor force at each age provides an estimate of the adjusted number of individuals retiring. Taking the difference between these new estimates of the number of annual retirements and the number in the base case provides an estimate of the impact of the changes in market conditions on retirement.

The results presented in Table 7 suggest that 86,000 workers who otherwise would have retired will not do so as a result of the declining stock market that year. As that return converges back to normal rates, the annual number of delayed retirements will decline. As a simple example, suppose that it took five years for the market to revert to normal long-term rates of return at a linear rate. In this case, our simulations suggest that 258,000 workers would delay retirement over the course of the market downturn.

On the other hand, our estimates indicate that 126,000 workers will be forced into retirement this year as a result of the weak labor market. Similarly assuming a linear return to normal labor market conditions over a five-year period, we project that 378,000 workers will be forced to retire early as a result of the recession. Importantly, these results indicate that almost 50 percent more workers will be forced to retire because of the weak labor market than will be

forced to work longer because they cannot afford to retire. On net, we predict that almost 120,000 additional retirements will occur as a result of the economic crisis.

The impact of a weak labor market on older workers' well-being may well be more significant than that of a weak stock market even if the number of older workers affected by each were similar. As we highlighted earlier, those workers forced to stay in the labor force because the falling stock market reduced their retirement nest egg tend to be from wealthier households. The plunging stock market cannot hurt those without large stock holdings in the first place. For these workers, the alternative to retirement may be to work for another two or three years so that they have fewer years of retirement to finance and may replenish some of their lost wealth with additional savings. We do not mean to diminish this cost for those workers. Nevertheless, our results suggest that the weak labor market has its greatest impact on less educated workers who have fewer resources in the first place. Workers who are unable to replace labor earnings lost due to a job displacement by extending their working lives are likely to have lower levels of consumption for the rest of their lives. For instance, they may need to claim Social Security earlier than planned in order to make ends meet. Although the adjustment to Social Security benefits for early claiming is designed to be roughly actuarially fair, the worker's annual flow of income from this source is reduced if he retires earlier, increasing the household's risk of poverty in old age. The cost to these individuals may be greater than that experienced by workers with substantial stock holdings who are forced to work a few extra years to make up for stock losses.

XI. EFFECT OF MARKET CONDITIONS ON RETIREE INCOME

We explore this point more directly in our final analysis, which examines the long-term effect of market conditions on retiree income. Before moving ahead with a formal presentation

of these econometric results, though, we begin with a descriptive analysis of the income data for retirees that are available to us.

A. Descriptive Analysis of Census and ACS Data

Table 8 presents means of income levels by type for all respondents 70 to 79 years old and for respondents distinguished by their location in the income distribution. For all retirees, we see that total personal income averages $34,034. On average, Social Security represents around one-third of this amount at $11,388. Pension and investment income constitute the majority of the remainder, averaging $10,730 and $8,066, respectively. These three sources together represent almost 90 percent of total personal income, emphasizing our focus on these categories.[31]

Average levels of income across the income distribution obviously vary quite a bit, ranging from $9,686 for the bottom third of the distribution to $23,032 for the middle third, and $68,356 for the top third. The interesting feature of this part of the analysis is that the different components of income play such different roles across income categories. For those at the bottom of the income distribution, Social Security represents by far the largest component of their income. For them, 81 percent of their average total personal income ($7,807 of $9,686) comes from Social Security.[32] For those in the top third of the income distribution, the comparable figure is 20 percent. Because Social Security benefit formulas are progressive in

[31] Other sources of income reported in these data include: wage and salary income (a negligible total among those currently retired), business and farm income, welfare income, income from the Supplemental Security Income program, and other income.

[32] To put these numbers in perspective, the official poverty thresholds in 2007 for individuals over age 65 were $9,944 and $12,533 for those in one and two person households, respectively, without any related children under age 18 in the household. Poverty calculations are based on family income, not total personal income, so married respondents would add their spouse's income. Note that a married man receiving $7,807 in Social Security who has a spouse receiving half his benefit would receive $11,711 in total from that source. In both single and married households, this means that Social Security alone puts those even towards the bottom of the income distribution near the poverty threshold.

nature, it is not surprising that benefit levels increase relatively little as income rises. Other sources of income increase by a lot more. Pension and investment income each increase many fold between the bottom and top of the income distribution.

These statistics have important implications for what we might expect in the remainder of our analysis. First, the role that stock market fluctuations play in determining the income of retirees must be rather limited for all but those at the very top of the income distribution. Those are the only ones with enough pension and investment income where market fluctuations could make a meaningful impact on their income.[33] Second, the importance of Social Security to those at the bottom of the income distribution is hard to overstate. If labor market conditions lead workers to retire earlier and accept lower Social Security benefits as a result, this could have an important impact on their economic well-being in retirement.

B. Descriptive Analyses of Other Data Sources

The preceding discussion provides some insight regarding what we might expect to observe in our empirical analysis with respect to the effect of labor market conditions and equity returns on retiree income by income group. To continue to develop our intuition along these lines, we present the results of two additional descriptive analyses that rely on other data sources. In the first of these analyses, we seek to document the level of unemployment risk that workers in different socioeconomic groups face. We anticipate that those groups that are subject to greater unemployment risk should be relatively more affected by labor market conditions around the time of retirement.

To explore this, we use data from the 1979 through 2007 March Current Population Surveys and estimate unemployment rates over time for those 55 to 64 (i.e. those nearing

[33] Gustman and Steinmeier (2010) make a similar point using data from the Health and Retirement Survey and the wealth of data on the net worth of individuals at or near retirement age.

retirement). In our subsequent analysis, we divide workers by their level of retirement income, but that is not feasible here. Instead, we use level of education as an alternative proxy for permanent income. Because annual movements in the unemployment rate are rather noisy for small population subgroups, we report three year (backward looking) moving averages. The results are displayed in Figure 6. As expected, those at the bottom of the socioeconomic ladder are the most susceptible to unemployment when recessions strike. Those in the middle are less so, although they still experience significant unemployment risk during an economic downturn, particularly earlier in this sample period. Because the remainder of our analysis focuses on those 70 to 79 in 1999 through 2007, it is this earlier period that is relevant here. Those at the top of the economic ladder are exposed to the lowest level of risk. Therefore, we expect that the impact of unemployment around the time of retirement on retirement income should be greatest for low-income individuals and smallest for high-income individuals.

We also seek to develop our intuition regarding the expected age profile in the response to changing stock market conditions. We will be including in our regression models the market returns to which individuals were exposed at ages 50 to 55, 55 to 60, 60 to 65, and 65 to 70. It is not obvious, a priori, what the age profile of this response should be. It seems sensible, however, that the percentage of individuals that hold stocks by age and the amount that they hold should affect the age profile. Only those who hold stocks should be subject to changing market conditions and those who own more stock should be more at risk.

To examine these age profiles, we use data from the 2007 Survey of Consumer Finances to estimate the percentage of respondents who own stock and the level of those holdings conditional on ownership by age category.[34] The results are displayed in Figures 7 and 8.

[34] The use of cross-sectional data to simulate what is truly a longitudinal behavior pattern has some flaws in this particular application. To the extent that there are cohort effects leading to greater reliance on stocks as an

Figure 7 shows that the likelihood of stock ownership displays an inverted U shape, rising with age into the 50s and then declining. Earlier in life, individuals do not have the resources to purchase stocks and later in life, individuals are moving out of riskier investments. Figure 8 shows that the level of stock holdings among stock holders rises dramatically in the mid 50s, almost doubling between ages 50 to 54 and ages 55 to 59. These patterns lead us to conclude that we should expect to see the responsiveness of retirement income increase in the mid 50s.

C. Econometric Analysis

We now turn to our main analysis, using the Census and ACS data to estimate the model given in equation 1 above. In Tables 9 through 13 we report the estimated impact of labor and stock market conditions on various types of income, first for all retirees and then separately for retirees in each third of the income distribution.

We begin by reporting the impact of market conditions around the time of retirement on Social Security, pension, and investment income for all retirees between the ages of 70 and 79 at the time the income was received. We estimate separate models for the likelihood that any income was received from one of these sources, the conditional amount of income received, and the unconditional amount received. As described above, these specifications are estimated using linear probability models, OLS, and Tobit models, respectively.

Columns 1 through 3 focus on Social Security income. Stock market conditions are not found to have any statistically significant effects on the likelihood of receipt or level of income. Likewise, these results indicate that deteriorating labor market conditions do not have a statistically significant impact on the likelihood of Social Security receipt. This finding is not

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investment vehicle, any age profiles displayed here will be muted from the investment behavior of actual cohorts as they age.

surprising because 91 percent of all retirees are collecting Social Security. Those remaining are likely to be ineligible for benefits, and changing market conditions are unlikely to affect this. Conditional upon receipt, however, we find that a one percentage point increase in the unemployment rate at age 62 reduces subsequent annual Social Security benefits by $21; this finding is statistically significant. The magnitude of this coefficient is an important issue. Taken at face value, it is very small, certainly with respect to the $12,530 average level of benefits received. But it is important to recognize that the $21 figure is the aggregate effect. If the unemployment rate rises by 1 percent, then 99 percent of the workforce is unaffected. For those who lose their jobs, our estimates suggest that Social Security benefits in retirement would drop by $2,084, which represents about a 17 percent reduction in benefits. This figure seems reasonable if one considers the Social Security rules that would apply to workers in this age group. A worker who was forced to move up his Social Security retirement claim from age 65 to age 62 would have experienced a 20 percent reduction in his monthly benefit amount.[35] When we look at the effect of labor market conditions on the unconditional income received, which incorporate the effect on conditional income receipt along with the noisy and statistically insignificant effect on the likelihood of receipt, we find a statistically insignificant result.

The remainder of the table focuses on the receipt and value of pension and investment income. Columns 4 through 6 report our findings for pension income; we find no statistically significant effects here. Our estimates regarding the impact of labor market conditions on investment income are also statistically insignificant.

[35] For workers born in 1937 or earlier, which represents all workers in our data, the Social Security "normal retirement age" was 65. For those workers, commencing benefit receipt at age 62 rather than age 65 would lead to a 20 percent reduction in their benefits. Currently, the normal retirement age is 66 and those who retire at age 62 would face a 25 percent reduction in their monthly benefit.

When we focus on stock market returns instead, we see that retirees who were exposed to higher rates of return in the years leading up to their retirement are more likely to be receiving some investment income. If the market return between ages 55 and 60 increases by 100 percentage points, then the likelihood of receiving investment income between ages 70 and 79 jumps by 2.2 percentage points, according to our estimates. That same 100-point incremental return between ages 60 and 65 generates a 1 percentage point increase in the likelihood of receiving investment income. The impact of market returns between 50 and 55 and between 65 and 70 are not statistically significant. Taken as a whole, these results support the notion of an inverted U-shaped response by age to stock market returns.

Among those retirees who receive investment income, higher returns are estimated to generate higher investment income (at least past age 55), but the impact is not statistically significant. Part of the reason for this may be selection. If investment returns rise and more retirees now have investment income available, the marginal investment income recipient is likely to have less investment income. When we focus on income received from investments unconditional on receipt, our results indicate that investment income in retirement is higher when the stock market performs better in the years leading up to retirement (at least past age 55). Incomes for retirees between the ages of 70 and 79 are estimated to be about $1,750 higher per year if the return in the S&P 500 is 100 percentage points higher in the five-year period when the worker was between ages 55 and 60. The comparable estimate is almost $1,100 for a 100-point increase in the return between ages 60 and 65. These values represent increases in investment income in retirement of 22 percent and 13 percent, respectively.

We get a clearer picture of the impact of market conditions on retirement income when we distinguish individuals by their location in the income distribution. As discussed above, we

divide retirees into those in the bottom third, middle third, and top third of the income distribution and conduct the same analysis just described for each income group separately.

We begin in Table 10 by examining the impact of market conditions on Social Security receipt and income. The top row of the table provides means for each outcome variable by income group. Regarding the likelihood of Social Security receipt, we see that it is high for all three income groups, albeit a bit lower for those in the bottom third of the distribution. Regardless of income level, we are unable to find any impact of market conditions on Social Security receipt.

The middle three columns of this table display the impact of market conditions on Social Security income among those who receive benefits. For these workers, we see that higher unemployment generates a statistically significant drop in the amount of income received from Social Security for recipients in both the lowest and the middle third of the income distribution. We find no significant impact on the top third.[36] In terms of the magnitude of the estimated effect, a one point increase in the unemployment rate reduces Social Security income by $30 and $20 per year for retirees in the bottom and middle third of the income distribution, respectively. For the individual unemployed worker, these figures convert to about a $3,000 and $2,040 drop in conditional annual income, reflecting a 32 percent and 15 percent drop in Social Security income received. Although the point estimate for workers in the bottom third of the distribution is greater than the 20 percent reduction in benefits that we described earlier which would be associated with retiring at 62 rather than 65, it is not statistically significantly different from that

[36] Results like these lead us to believe that the problems described in Alexander, et al. (2010) are not a major problem in our analysis. The potential problem with age reporting in the Census and some ACS surveys would introduce measurement error in our calculation of the unemployment rate at age 62. If this measurement error were random, it would introduce downward bias in our findings. If it were systematic, it would need to be somehow correlated with the unemployment rate at age 62. Either way, it is hard to imagine how it would exist for the less educated, but not the more educated.

value.[37] When we factor in the combination of the estimated impact on income from Social Security, conditional on receipt, and the probability of receipt, we are unable to identify a statistically significant effect on unconditional Social Security income for any income group.

Table 11 reports the results of an analogous exercise focusing on pension income. We are unable to find any impact of labor or stock market conditions on any type of pension income measure for retirees in any of the three income categories. This may be attributable to the fact that among workers in this age group, private pensions are largely defined benefit plans rather than defined contribution plans. If so, stock market conditions would not have that much of an impact. Gustman, et al., (2010) provide evidence supporting this assertion. They find that 52 percent of full-time employees between the ages of 53 and 58 in 2006 covered by a pension have a defined benefit plan. Even those covered by a defined contribution pension have only made contributions for ten years, on average, suggesting that the funds in these accounts are not that large. The relative importance of defined benefit over defined contribution plans would be even more dramatic for those who retired 20 years earlier as in our analysis. Taken as a whole, these findings suggests that it may be years before the increased reliance on defined contribution plans that has taken place over the past two decades filters through to have a large impact on retiree well-being.

Table 12 reports the results of our analysis of the impact of market conditions on investment income by income group. As we have described earlier, only retirees in the top third

[37] Two alternative explanations are also possible that could explain the relatively large magnitude of this effect. First, the basis of our comparison is dependent upon the worker retiring at 62 rather than 65. He could have chosen to retire later than that, which would increase the penalty associated with early retirement. Second, a worker who continues working until age 65 may be able to replace low earnings years with high earnings years in the benefit formula, suggesting that the 20 percent benefit reduction associated with early retirement may be an understatement. The third potential reason is that the key right hand side variable is the aggregate unemployment rate. A one point increase in the aggregate unemployment rate may reflect a larger increase in the unemployment rate of those workers who are at higher risk of unemployment. This would also likely lead to an upward bias in our results for low income workers.

of the income distribution are likely to have enough investment income for market conditions to affect their post-retirement income. This hypothesis is supported by our empirical findings, which shows that retirees in the bottom two-thirds of the income distribution are largely unaffected by changes in both labor and stock market conditions.[38]

Those in the top third of the income distribution, however, are significantly affected by stock market conditions. We find that higher income retirees are more likely to receive investment income in retirement, and they report receiving a higher average level of investment income in response to stronger equity market returns after age 55. An increase of 100 percentage points in the S&P 500 between ages 55 and 60 is estimated to result in an additional 3.3 percent of retirees in the top third of the income distribution receiving investment income. On average, this change is projected to increase the average level of retirement income in the group by nearly $2,300. Run-ups in the market that occur at ages 60 to 65 and ages 65 to 70 also increase the likelihood of investment income in retirement by 2.1 and 0.8 percentage points and increase average investment income by $2,100 and $840, respectively. These findings are consistent with the inverted U-shaped pattern of response by age that we predicted earlier.

Although these effects are large and statistically significant, it is important to place the magnitudes of these estimates in perspective. Investment income increases on the order of $2,000 are clearly substantial, but they add to average investment income of $21,000 and average total personal income of $68,000. As a share of total income, these effects are not that large. By contrast, when we focus on the impact of increased unemployment on Social Security income among those receiving benefits, we see dollar estimates of the impact of unemployment of about the same magnitude for the bottom and middle thirds of the income distribution ($3,000

[38]We do observe some modest effects for the bottom third of the income distribution in response to market conditions at ages 55 to 60. The relative impact on their income, however, is very small in response to large increases in stock market returns.

and $2,100). Their levels of income, though, are considerably lower. They receive $9,300 and $13,000 in Social Security income and $10,000 and $23,000 in total personal income, respectively. Relative to their total income, the losses of Social Security benefits that these groups experience are quite a bit larger than the losses of investment income for those in the top third of the distribution.

Table 13 presents the results of our analysis of the impact of market conditions around the time of retirement on the income of retirees when we combine all sources of personal income. Again, we consider the impact on total personal income for all retirees as well as for each third of the income distribution separately. In this table, the only statistically significant coefficient (at the 5 percent level) is the impact of the unemployment rate at age 62 in total personal income among retirees in the bottom third of the income distribution. For these individuals, a one percentage point increase in the unemployment rate is estimated to reduce total personal income by $25. This means that the incremental individual who becomes unemployed at age 62 will experience a reduction in income of $2,550 a decade or so later. This amounts to about one-quarter of his total personal income. The results we presented earlier suggest that the largest single component of this overall decrease is the reduction in Social Security income that would presumably result from the worker claiming these retirement benefits early.

XII. CONCLUSIONS

This study has focused on the effect of stock, housing, and labor market conditions on retirement and subsequent retiree well-being. We find that workers age 62 to 69 retire earlier in response to high unemployment and retire later in response to weak stock markets; less-educated workers are more sensitive to labor market conditions and more-educated workers are more

sensitive to stock market conditions. We find no evidence that workers age 55 to 61 respond to these fluctuations or that housing markets affect retirement.

Our results suggest that the weakness in the stock and labor markets in the recent economic crisis will have deleterious effects on retirees in the coming years. We find that the income levels of retirees between the ages of 70 and 79 in the bottom and middle thirds of the income distribution are lower if the unemployment rate was higher when they were 62 years old. This effect is driven by a reduction in Social Security benefits; its magnitude is roughly consistent with the benefit reduction rate that is associated with retiring several years earlier than the normal retirement age. We also find that for workers in the top third of the income distribution, long-term declines in stock prices when workers are in their 50s and 60s subsequently lower their incomes when they are retirees in their 70s through a reduction in investment income.

Our findings on retirement and retiree income provide a consistent story. Collectively, they indicate that falling stock prices harm the well-being of more-advantaged older workers by preventing them from retiring when they want and reducing their retirement income. Rising unemployment harms the well-being of less advantaged older workers by leading them to withdraw from the labor market sooner than they want and also reducing their retirement income. We estimate that there are a greater number of less advantaged workers who have changed their retirement behavior as a result of the recent economic crisis than of more advantaged workers who have changed their behavior. We also estimate that the relative impact of experiencing unemployment at age 62 on less advantaged workers' retiree income is much larger than the impact of experiencing poor equity returns on more advantaged workers' retiree income, particularly when the effect it measured as a share of total income. Combining these

findings with virtually any social welfare function suggests that the problems that low-income older workers face when the labor market weaken are of greater concern than the problems that upper-income older workers when equity markets plunge.

Our findings may also have important implications for public policy. One example of this is the debate over raising the Social Security normal and early retirement ages. With individuals living longer and drawing more Social Security benefits over their lifetimes than in the past, one possible reform to help address the financial shortfalls in the Social Security system is to raise the retirement ages. In the past, a common criticism regarding such proposals is that they will harm those individuals who are forced to retire involuntarily because of poor health. A substantial body of evidence exists supporting the notion that poor health is an important prelude to retirement for some older workers (Currie and Madrian, 1999). Our findings indicate that unemployment may be another involuntary mechanism that leads to retirement and reduced economic well-being. The concerns of older workers with weak labor market prospects may need additional consideration in the design of policies for workers nearing retirement age.

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Table 1A: Real Percentage Increase in S&P 500 between Ages 55 and 60, by Year of Survey and Age in Survey Year

Age in Survey Year	Survey Year							
	2000	2001	2002	2003	2004	2005	2006	2007
71	76.6	27.5	38.1	43.2	38.6	9.3	62.7	54.3
72	41.5	76.6	27.5	38.1	43.2	38.6	9.3	62.7
73	48.5	41.5	76.6	27.5	38.1	43.2	38.6	9.3
74	67.8	48.5	41.5	76.6	27.5	38.1	43.2	38.6
75	22.8	67.8	48.5	41.5	76.6	27.5	38.1	43.2
76	12.9	22.8	67.8	48.5	41.5	76.6	27.5	38.1
77	14.9	12.9	22.8	67.8	48.5	41.5	76.6	27.5
78	-5.7	14.9	12.9	22.8	67.8	48.5	41.5	76.6
79	-29.2	-5.7	14.9	12.9	22.8	67.8	48.5	41.5
80	-3.1	-29.2	-5.7	14.9	12.9	22.8	67.8	48.5

Table 1B: National Unemployment Rate at Age 62, by Year of Survey and Age in Survey Year

Age in Survey Year	Survey Year							
	2000	2001	2002	2003	2004	2005	2006	2007
71	6.8	7.5	6.9	6.1	5.6	5.4	4.9	4.5
72	5.6	6.8	7.5	6.9	6.1	5.6	5.4	4.9
73	5.3	5.6	6.8	7.5	6.9	6.1	5.6	5.4
74	5.5	5.3	5.6	6.8	7.5	6.9	6.1	5.6
75	6.2	5.5	5.3	5.6	6.8	7.5	6.9	6.1
76	7	6.2	5.5	5.3	5.6	6.8	7.5	6.9
77	7.2	7	6.2	5.5	5.3	5.6	6.8	7.5
78	7.5	7.2	7	6.2	5.5	5.3	5.6	6.8
79	9.6	7.5	7.2	7	6.2	5.5	5.3	5.6
80	9.7	9.6	7.5	7.2	7	6.2	5.5	5.3

Table 2: Equity Holdings of Households Age 55-64 by Education Group, 2007 SCF

Category	% with Holdings	Median Conditional on Holding	Values among All Households at Percentile: 25th	50th	75th	90th	95th
All							
Directly-Held Stocks	0.213	24,000	0	0	0	25,000	125,000
Stock Mutual Funds (Non-Ret.)	0.140	97,000	0	0	0	45,000	191,000
Stocks in Retirement Accounts	0.500	66,500	0	20	66,500	230,000	447,500
Any Stocks	0.583	78,000	0	8,000	97,500	357,620	752,000
Less than High School							
Directly-Held Stocks	0.054	270	0	0	0	0	50
Stock Mutual Funds (Non-Ret.)	0.019	3,000	0	0	0	0	0
Stocks in Retirement Accounts	0.214	10,000	0	0	0	10,000	70,000
Any Stocks	0.214	10,000	0	0	0	10,000	70,000
High School							
Directly-Held Stocks	0.127	9,000	0	0	0	500	14,000
Stock Mutual Funds (Non-Ret.)	0.069	50,000	0	0	0	0	38,000
Stocks in Retirement Accounts	0.366	33,800	0	0	15,000	88,000	188,800
Any Stocks	0.460	35,000	0	0	28,500	130,000	212,500
Some College							
Directly-Held Stocks	0.156	3,500	0	0	0	2,000	15,000
Stock Mutual Funds (Non-Ret.)	0.060	45,000	0	0	0	0	20,000
Stocks in Retirement Accounts	0.503	60,000	0	20	61,600	160,000	224,000
Any Stocks	0.558	65,000	0	4,000	73,500	197,150	319,500
College Graduate							
Directly-Held Stocks	0.342	60,000	0	0	13,000	154,000	500,000
Stock Mutual Funds (Non-Ret.)	0.260	107,000	0	0	4,700	200,000	385,000
Stocks in Retirement Accounts	0.668	85,000	0	27,000	159,600	480,000	775,800
Any Stocks	0.775	125,000	3,250	65,100	271,300	846,000	1,865,000

Note: data are weighted to be representative of the U.S. population.

Table 3: Equity Losses of SCF Households Age 55-64 in 2008 Market Crash

Stock Assets in 2007 SCF (1)	% of Sample w/ assets at/below (2)	Asset Loss (3)	Lost Annual Retirement Income (4)	Lost Monthly Retirement Income (5)
0	0.417	0	0	0
25,000	0.587	12,500	625	52
50,000	0.654	25,000	1,250	104
100,000	0.751	50,000	2,500	208
250,000	0.869	125,000	6,250	521
500,000	0.920	250,000	12,500	1,042

Notes:

1. Assets are assumed to have dropped by 50% in value since 2007 SCF.
2. Lost retirement income is calculated by assuming that household will consume 5% of wealth each year.

Table 4: Effect of Stock Market Fluctuations on Retirement by Age, March CPS

Measures of Stock Market Performance	All	High School Dropout	High School Graduate	Attended Some College	College Graduate
Age 55-61					
Mean of Dependent Variable	0.059	0.075	0.062	0.058	0.044
% change S&P 500 - 12 Mo. (* 100)	-0.0004	0.0140	-0.0026	-0.0041	-0.0035
	(0.0041)	(0.0111)	(0.0056)	(0.0087)	(0.0068)
% change S&P 500 - 5 Year (* 100)	0.0039	0.0001	0.0024	0.0105	0.0014
	(0.0017)	(0.0046)	(0.0024)	(0.0041)	(0.0026)
% change S&P 500 - 10 year (* 100)	0.0022	-0.0021	-0.0013	0.0080	0.0028
	(0.0014)	(0.0044)	(0.0020)	(0.0032)	(0.0027)
Sample Size	210,807	42,020	72,495	43,828	52,464
Age 62-69					
Mean of Dependent Variable	0.159	0.194	0.165	0.146	0.120
% change S&P 500 - 12 Mo. (* 100)	0.0153	0.0043	0.0113	0.0265	0.0206
	(0.0083)	(0.0172)	(0.0157)	(0.0167)	(0.0161)
% change S&P 500 - 5 year (* 100)	0.0013	-0.0062	0.0003	-0.0022	0.0109
	(0.0027)	(0.0071)	(0.0067)	(0.0070)	(0.0066)
% change S&P 500 - 10 year (* 100)	0.0054	-0.0057	-0.0023	0.0120	0.0184
	(0.0040)	(0.0099)	(0.0065)	(0.0065)	(0.0080)
Sample Size	97,408	24,297	33,271	18,019	21,821

Note: Each cell entry represents a separate regression that also includes age dummies, race and ethnicity, gender, marital status, children less than 18, education, unemployment rate, state fixed effects, and a quadratic year trend. Regressions are weighted by sample weights. Standard errors are clustered at the state level. Reported coefficients show the effect of a one hundred percentage point change in the S&P 500 (e.g., a doubling of real stock values).

Table 5: Impact of Real House Price Fluctuations on the Likelihood of "Retiring" in March CPS, by Age
(standard errors in parentheses)

	Case-Shiller Data				OFHEO Data			
	12-Month Change		5-Year Change		12-Month Change		5-Year Change	
	62 to 69	55 to 61	62 to 69	55 to 61	62 to 69	55 to 61	62 to 69	55 to 61
Mean of Dependent Variable	0.134	0.052	0.134	0.052	0.143	0.054	0.143	0.054
% Change in Index (* 100)	-0.0251	0.0039	-0.0107	0.0256	0.0590	0.0025	0.0165	0.0071
	(0.0728)	(0.0410)	(0.0171)	(0.0075)	(0.0567)	(0.0369)	(0.0149)	(0.0099)
% Change Index * Owner (* 100)	-0.0234	0.0150	-0.0097	0.0276	0.0835	0.0156	0.0211	0.0076
	(0.0775)	(0.0417)	(0.0165)	(0.0074)	(0.0567)	(0.0428)	(0.0142)	(0.0108)
% Change Index * Renter (* 100)	-0.0184	-0.0293	-0.0156	0.0196	-0.0434	-0.0555	-0.0038	0.0055
	(0.0636)	(0.0584)	(0.0255)	(0.0113)	(0.1028)	(0.0441)	(0.0266)	(0.0118)
Homeowner	0.0197	-0.0056	0.0226	-0.0083	0.0037	-0.0038	0.0058	-0.0030
	(0.0099)	(0.0049)	(0.0109)	(0.0053)	(0.0057)	(0.0032)	(0.0061)	(0.0034)
Sample Size	14,784	33,126	11,709	27,310	46,993	106,808	45,008	102,436

Notes: Every column and each panel represents the results from a different regression in models where the dependent variable is an indicator for retirement and the key independent variables are those listed. Additional explanatory variables include: age dummies, race and ethnicity, gender, marital status, children less than 18, education, unemployment rate, MSA fixed effects, and year fixed effects. Regressions are weighted by sample weights. Standard errors are clustered at the MSA level. Reported coefficients show the effect of a one hundred percentage point change in the house price index (e.g., a doubling of real house values).

Table 6: Impact of Labor Market Conditions on the Likelihood of "Retiring," by Age and Educational Attainment
(standard errors in parentheses, sample size in brackets)

	Age 55 to 69	Age 62 to 69	Age 55 to 61	HS Dropout	HS Graduate	Some College	College Graduate
Mean of Dependent Variable	0.090	0.156	0.059	0.118	0.094	0.084	0.067
Coefficient on	0.018	0.036	0.010	0.006	0.035	0.001	0.008
Unemployment Rate (*10)	(0.006)	(0.014)	(0.007)	(0.014)	(0.011)	(0.013)	(0.016)
Sample Size	308,215	97,408	210,807	66,317	105,766	61,847	74,285

Notes: Each cell entry represents the coefficient on the unemployment rate in a separate regression that also includes age dummies, race and ethnicity, gender, marital status, children less than 18, education, and state and year fixed effects. Regressions are weighted by sample weights. Standard errors are clustered at the state level. Reported coefficients show the effect of a ten point change in the unemployment rate.

Table 7: Simulated Impact of Economic Crisis on Retirements
(all numbers in thousands)

	Baseline Statistics			Impact of Decline in Long-Term Stock Market Return		Impact of Increased Unemployment	
Age	Number in Labor Force	Hazard Rate	Number Retiring	Adjusted Hazard Rates	Adjusted Number Retiring	Adjusted Hazard Rates	Adjusted Number Retiring
55	2,805	0.045	127	0.043	120	0.046	129
56	2,600	0.049	126	0.046	120	0.049	127
57	2,489	0.054	134	0.051	128	0.054	135
58	2,420	0.054	131	0.052	125	0.055	132
59	2,172	0.060	131	0.058	126	0.061	132
60	1,908	0.079	152	0.077	147	0.08	152
61	1,551	0.086	133	0.083	129	0.086	134
62	1,391	0.162	225	0.154	215	0.180	250
63	1,189	0.138	164	0.131	156	0.156	185
64	1,035	0.130	134	0.123	127	0.148	153
65	794	0.194	154	0.187	149	0.212	169
66	641	0.163	104	0.156	100	0.181	116
67	578	0.158	92	0.151	88	0.176	102
68	515	0.161	83	0.154	79	0.179	92
69	433	0.154	67	0.147	64	0.172	75
total	22,522		1,957		1,871		2,083
Impact on Retirement					-86		126

Notes: The baseline number of workers in the labor force comes from the 2005-2007 American Community Survey. The baseline hazard rates are estimated from the March CPS

Table 8: Mean Incomes of 70 to 79 Year Old Retired Men, by Location in Total Personal Income Distribution

Group	Total Personal Income	Social Security Income	Pension Income	Investment Income	Other Income
All	$34,034	$11,388	$10,730	$8,066	$3,850
Bottom Third	$9,686	$7,807	$701	$306	$872
Middle Third	$23,032	$12,673	$6,429	$2,261	$1,669
Top Third	$68,356	$13,621	$24,644	$21,234	$8,857

Notes: Reported dollar values represent the mean for each income type in each income level and are reported in 2007$.

Table 9: Impact of Labor Market Conditions and Stock Market Returns around the Time of Retirement on Components of Retirement Income for Men in their 70s

	Any Income from Social Security (1)	Income from Social Security (if received) (2)	Income from Social Security (3)	Any Pension Income (4)	Pension Income (if received) (5)	Pension Income (6)	Any Investment Income (7)	Income from Investments (if received) (8)	Income from Investments (9)
Mean	90.9%	$12,530	$11,388	51.9%	$20,679	$10,730	46.5%	$17,377	$8,066
Unemployment	0.043	-20.841	-11.761	-0.073	53.059	12.739	0.037	102.870	79.672
Rate at Age 62	(0.044)	(7.327)	(9.195)	(0.067)	(49.184)	(42.277)	(0.061)	(61.743)	(61.033)
S&P 500 Returns,	-0.006	-0.203	-1.210	0.005	-4.021	--0.941	-0.001	-7.031	-4.369
Age 50 to 55	(0.004)	(0.824)	(0.851)	(0.006)	(3.135)	(3.876)	(0.004)	(5.035)	(4.039)
S&P 500 Returns,	-0.003	-0.247	-0.792	-0.002	0.144	-0.358	0.022	0.516	17.557
Age 55 to 60	(0.003)	(0.652)	(0.826)	(0.006)	(3.666)	(3.724)	(0.005)	(10.040)	(6.116)
S&P 500 Returns,	0.001	-0.371	-0.229	0.003	1.500	2.399	0.010	4.370	10.736
Age 60 to 65	(0.002)	(0.464)	(0.654)	(0.005)	(2.062)	(2.563)	(0.004)	(4.553)	(4.602)
S&P 500 Returns,	0.001	0.041	0.238	0.001	-0.367	0.092	0.003	0.904	3.212
Age 65 to 70	(0.001)	(0.199)	(0.267)	(0.002)	(1.170)	(1.184)	(0.002)	(2.731)	(1.906)
number of obs.	600,211	545,499	600,211	600,211	311,443	600,211	600,211	279,414	600,211

Notes: Estimates in Columns 1, 4, and 7 are from linear probability models. Coefficient estimates and standard errors in those models are multiplied by 100. Estimates in Columns 2, 5, and 8 are from OLS models. Estimates in Columns 3, 6, and 9 are from Tobit models. Each model contains the variables listed along with the contemporaneous state level unemployment rate, demographic factors (marital status, race/ethnicity), educational attainment, and age, survey year, and state of residence fixed effects. Standard errors are clustered at the state level.

Table 10: Impact of Labor Market Conditions and Stock Market Returns around the Time of Retirement on Social Security Income of Men in their 70s, by Income Level

	Any Income from Social Security			Income from Social Security, if Received			Income from Social Security		
Position in Personal Income Distribution:	Bottom Third (1)	Middle Third (2)	Top Third (3)	Bottom Third (4)	Middle Third (5)	Top Third (6)	Bottom Third (7)	Middle Third (8)	Top Third (9)
Mean	83.6%	95.3%	93.7%	$9,343	$13,299	14,533	$7,807	$12,673	$13,621
Unemployment	0.095	0.078	0.007	-30.064	-20.435	0.116	-11.966	-7.815	2.052
Rate at Age 62	(0.099)	(0.040)	(0.042)	(9.641)	(7.607)	(12.472)	(12.246)	(9.771)	(15.576)
S&P 500 Returns,	-0.008	-0.006	-0.005	-0.139	-0.480	-1.091	-1.090	-1.420	-1.859
Age 50 to 55	(0.007)	(0.004)	(0.003)	(0.911)	(1.065)	(1.546)	(1.237)	(1.000)	(1.530)
S&P 500 Returns,	-0.001	-0.002	-0.010	0.019	-0.873	-0.906	-0.182	-1.095	-2.562
Age 55 to 60	(0.007)	(0.003)	(0.005)	(0.733)	(0.952)	(1.111)	(1.100)	(0.953)	(1.453)
S&P 500 Returns,	0.006	-0.002	-0.004	-0.557	-0.149	-0.992	0.169	-0.392	-1.600
Age 60 to 65	(0.004)	(0.003)	(0.004)	(0.574)	(0.570)	(0.984)	(0.827)	(0.724)	(1.396)
S&P 500 Returns,	0.002	0.000	0.001	-0.090	0.212	-0.078	0.221	0.134	0.104
Age 65 to 70	(0.002)	(0.001)	(0.002)	(0.314)	(0.327)	(0.429)	(0.417)	(0.332)	(0.580)
number of observations	198,192	197,969	204,050	165,608	188,647	191,244	198,192	197,969	204,050

Notes: Estimates in Columns 1, 4, and 7 are from linear probability models. Coefficient estimates and standard errors in those models are multiplied by 100. Estimates in Columns 2, 5, and 8 are from OLS models. Estimates in Columns 3, 6, and 9 are from Tobit models. Each model contains the variables listed along with the contemporaneous state level unemployment rate, demographic factors (marital status, race/ethnicity), educational attainment, and age, survey year, and state of residence fixed effects. Standard errors are clustered at the state level.

Table 11: Impact of Labor Market Conditions and Stock Market Returns around the Time of Retirement on Pension Income of Men in their 70s, by Income Level

	Any Pension Income			Pension Income, if Received			Pension Income		
Position in Personal Income Distribution:	Bottom Third (1)	Middle Third (2)	Top Third (3)	Bottom Third (4)	Middle Third (5)	Top Third (6)	Bottom Third (7)	Middle Third (8)	Top Third (9)
Mean	15.9%	64.3%	74.8%	$4,420	$9,998	$32,927	$701	$6,429	$24,644
Unemployment	-0.053	-0.136	0.035	7.684	-8.789	105.448	-9.252	-28.713	119.318
Rate at Age 62	(0.054)	(0.099)	(0.087)	(19.518)	(16.719)	(86.774)	(19.154)	(21.701)	(73.761)
S&P 500 Returns,	-0.002	0.007	0.000	-0.572	0.628	-10.470	-0.773	1.549	-9.232
Age 50 to 55	(0.008)	(0.009)	(0.008)	(1.463)	(1.135)	(4.651)	(2.688)	(1.833)	(6.152)
S&P 500 Returns,	-0.007	-0.008	-0.008	-1.429	0.761	-3.364	-3.112	-1.039	-5.515
Age 55 to 60	(0.010)	(0.008)	(0.010)	(1.423)	(1.692)	(6.036)	(3.206)	(1.867)	(6.095)
S&P 500 Returns,	-0.004	-0.003	0.001	-0.285	-0.670	4.563	-1.336	-1.170	5.210
Age 60 to 65	(0.006)	(0.008)	(0.005)	(0.845)	(0.937)	(4.272)	(1.973)	(1.634)	(5.519)
S&P 500 Returns,	0.000	0.001	0.000	0.538	0.555	-0.704	-0.065	0.487	-0.427
Age 65 to 70	(0.002)	(0.004)	(0.002)	(0.425)	(0.417)	(2.303)	(0.811)	(0.753)	(1.969)
number of observations	198,192	197,969	204,050	31,418	127,304	152,721	198,192	197,969	204,050

Notes: Estimates in Columns 1, 4, and 7 are from linear probability models. Coefficient estimates and standard errors in those models are multiplied by 100. Estimates in Columns 2, 5, and 8 are from OLS models. Estimates in Columns 3, 6, and 9 are from Tobit models. Each model contains the variables listed along with the contemporaneous state level unemployment rate, demographic factors (marital status, race/ethnicity), educational attainment, and age, survey year, and state of residence fixed effects. Standard errors are clustered at the state level.

Table 12: Impact of Labor Market Conditions and Stock Market Returns around the Time of Retirement on Investment Income of Men in their 70s, by Income Level

	Any Investment Income			Investment Income, if Received			Investment Income		
Position in Personal Income Distribution:	Bottom Third (1)	Middle Third (2)	Top Third (3)	Bottom Third (4)	Middle Third (5)	Top Third (6)	Bottom Third (7)	Middle Third (8)	Top Third (9)
Mean	16.6%	47.4%	74.8%	$2,039	$4,804	$28,418	$306	$2,261	$21,234
Unemployment	0.091	0.061	-0.044	12.528	17.890	164.058	16.451	17.291	83.248
Rate at Age 62	(0.084)	(0.092)	(0.092)	(10.664)	(16.470)	(99.602)	(11.634)	(18.192)	(102.304)
S&P 500 Returns,	0.003	-0.007	-0.003	-0.179	-1.283	-13.113	0.553	-1.480	-12.437
Age 50 to 55	(0.006)	(0.008)	(0.007)	(1.180)	(1.194)	(8.315)	(1.073)	(1.202)	(7.779)
S&P 500 Returns,	0.014	0.010	0.033	0.460	-0.677	-0.008	2.689	1.053	22.659
Age 55 to 60	(0.006)	(0.011)	(0.007)	(1.011)	(1.382)	(16.842)	(1.269)	(1.690)	(11.878)
S&P 500 Returns,	0.000	0.006	0.021	0.126	0.014	8.785	0.321	0.858	21.339
Age 60 to 65	(0.006)	(0.007)	(0.007)	(0.991)	(0.839)	(7.107)	(1.116)	(0.990)	(7.189)
S&P 500 Returns,	-0.003	0.005	0.008	-0.244	-0.329	3.508	-0.453	0.620	8.420
Age 65 to 70	(0.002)	(0.003)	(0.002)	(0.377)	(0.434)	(4.720)	(0.334)	(0.445)	(4.087)
number of observations	198,192	197,969	204,050	32,902	93,885	152,627	198,192	197,969	204,050

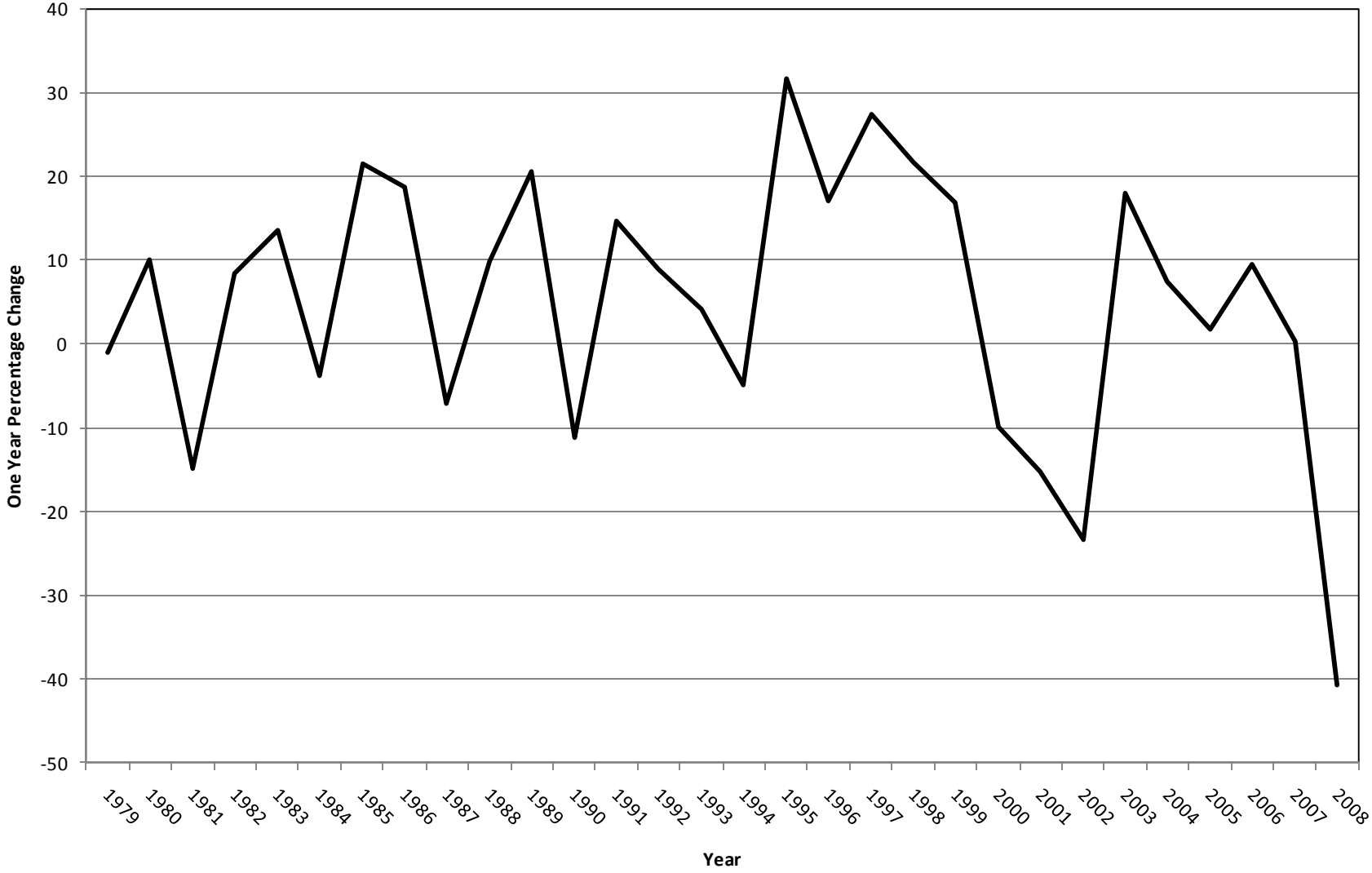
Notes: Estimates in Columns 1, 4, and 7 are from linear probability models. Coefficient estimates and standard errors in those models are multiplied by 100. Estimates in Columns 2, 5, and 8 are from OLS models. Estimates in Columns 3, 6, and 9 are from Tobit models. Each model contains the variables listed along with the contemporaneous state level unemployment rate, demographic factors (marital status, race/ethnicity), educational attainment, and age, survey year, and state of residence fixed effects. Standard errors are clustered at the state level.

Table 13: Impact of Labor Market Conditions and Stock Market Returns around the Time of Retirement on Total Personal Income of Men in their 70s, by Income Level

	All Men (1)	Bottom Third of Income Distribution (2)	Middle Third of Income Distribution (3)	Top Third of Income Distribution (4)
Mean Income	$34,034	$9,686	$23,032	$68,356
Unemployment	8.200	-24.840	-8.204	112.741
Rate at Age 62	(51.049)	(9.767)	(11.128)	(107.305)
S&P 500 Returns,	-4.192	-0.504	-0.440	-16.029
Age 50 to 55	(3.838)	(0.801)	(0.709)	(8.195)
S&P 500 Returns,	-0.179	-0.876	-0.782	-5.001
Age 55 to 60	(5.814)	(0.680)	(1.014)	(12.453)
S&P 500 Returns,	3.431	-0.459	-0.283	11.727
Age 60 to 65	(3.042)	(0.656)	(0.692)	(6.358)
S&P 500 Returns,	0.704	0.204	0.315	4.170
Age 65 to 70	(1.289)	(0.351)	(0.285)	(3.178)
number of obs.	600,211	198,192	197,969	204,050

Notes: Estimates are obtained from OLS regression models that each contain the variables listed along with the contemporaneous state level unemployment rate, demographic factors (marital status, race/ethnicity), educational attainment, and age, survey year, and state of residence fixed effects. Standard errors are clustered at the state level.

Figure 1A: Annual Real Percentage Change in S&P 500

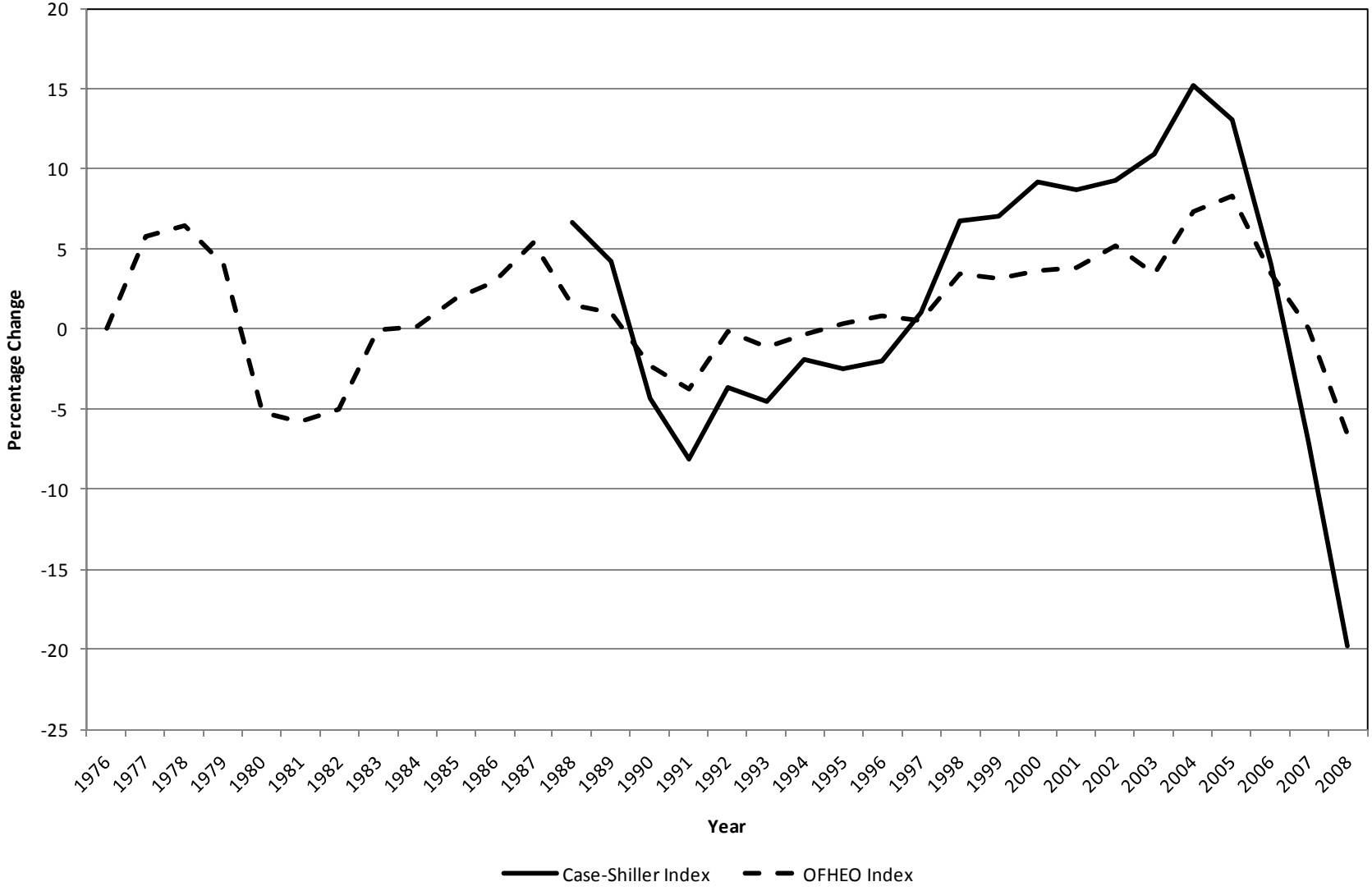


note: annual percentage change is calculated using December to December monthly averages

Figure 1B: Five and Ten Year Real Percentage Change in S&P 500

note: percentage changes are calculated using December to December monthly averages.

Figure 2: Annual Percentage Change in Real House Prices



note: annual percentage change is calculated using December values for Case-Shiller Index and 4th quarter values for OFHEO Index.

Figure 3: U.S. Unemployment Rate

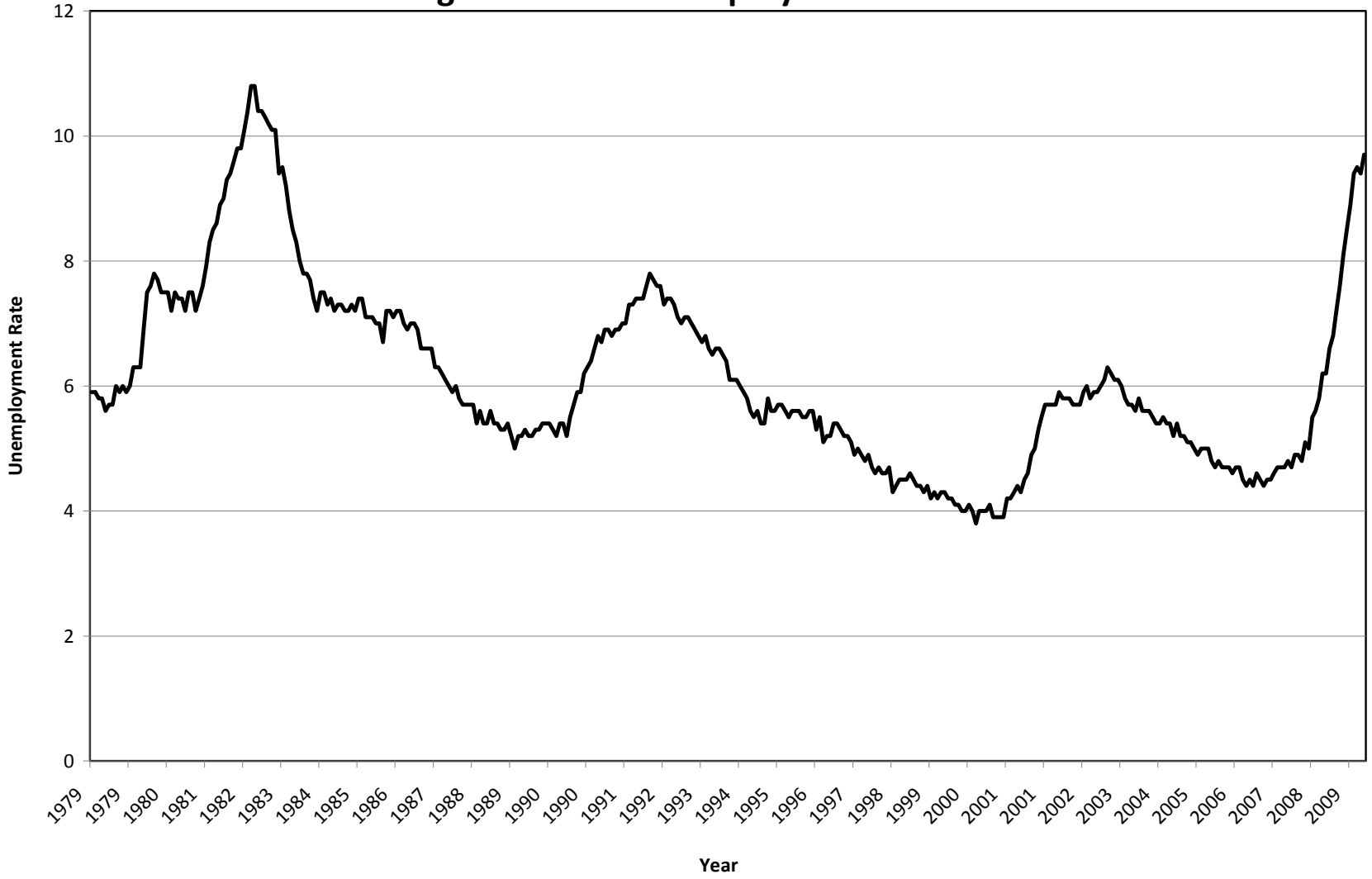
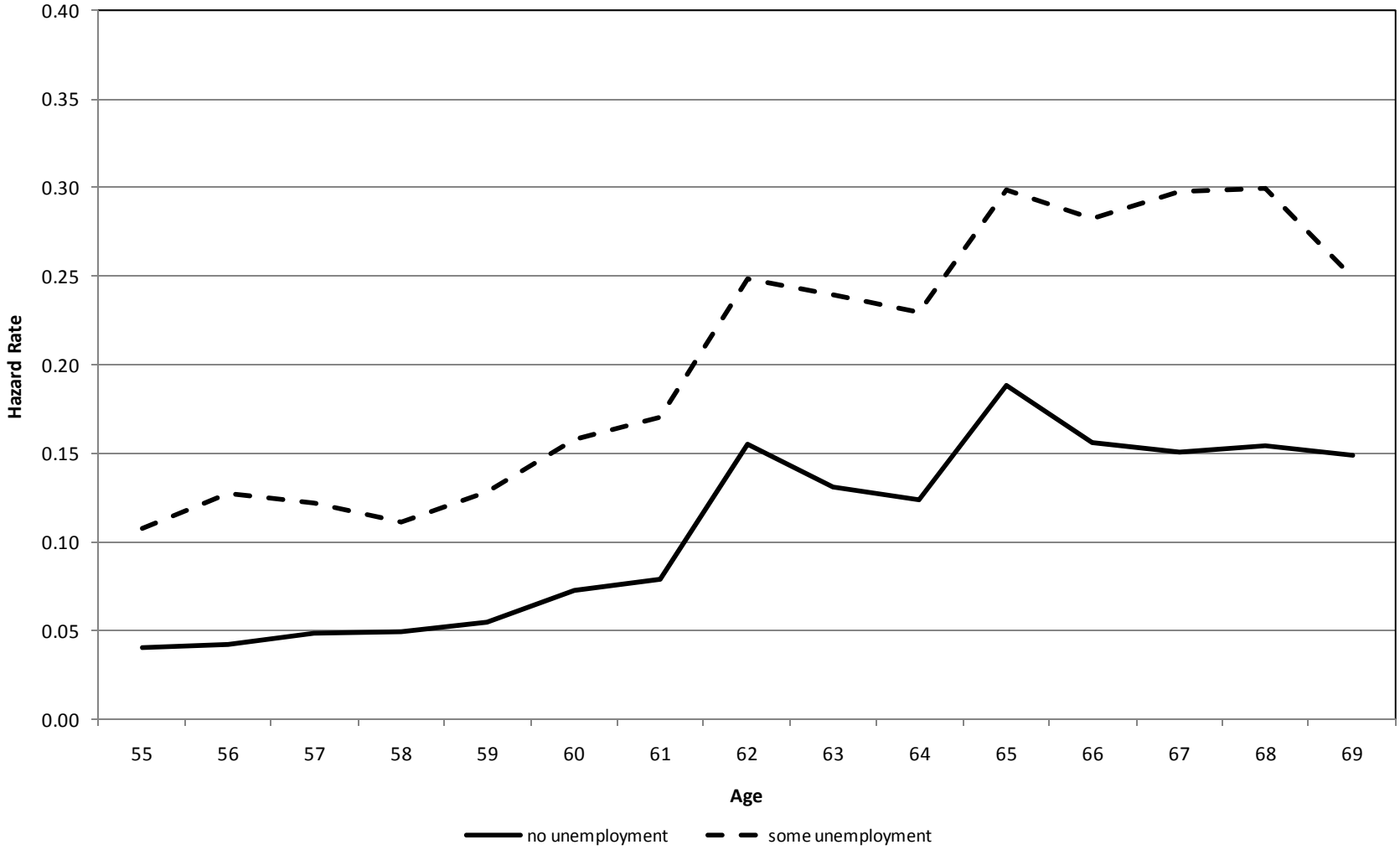
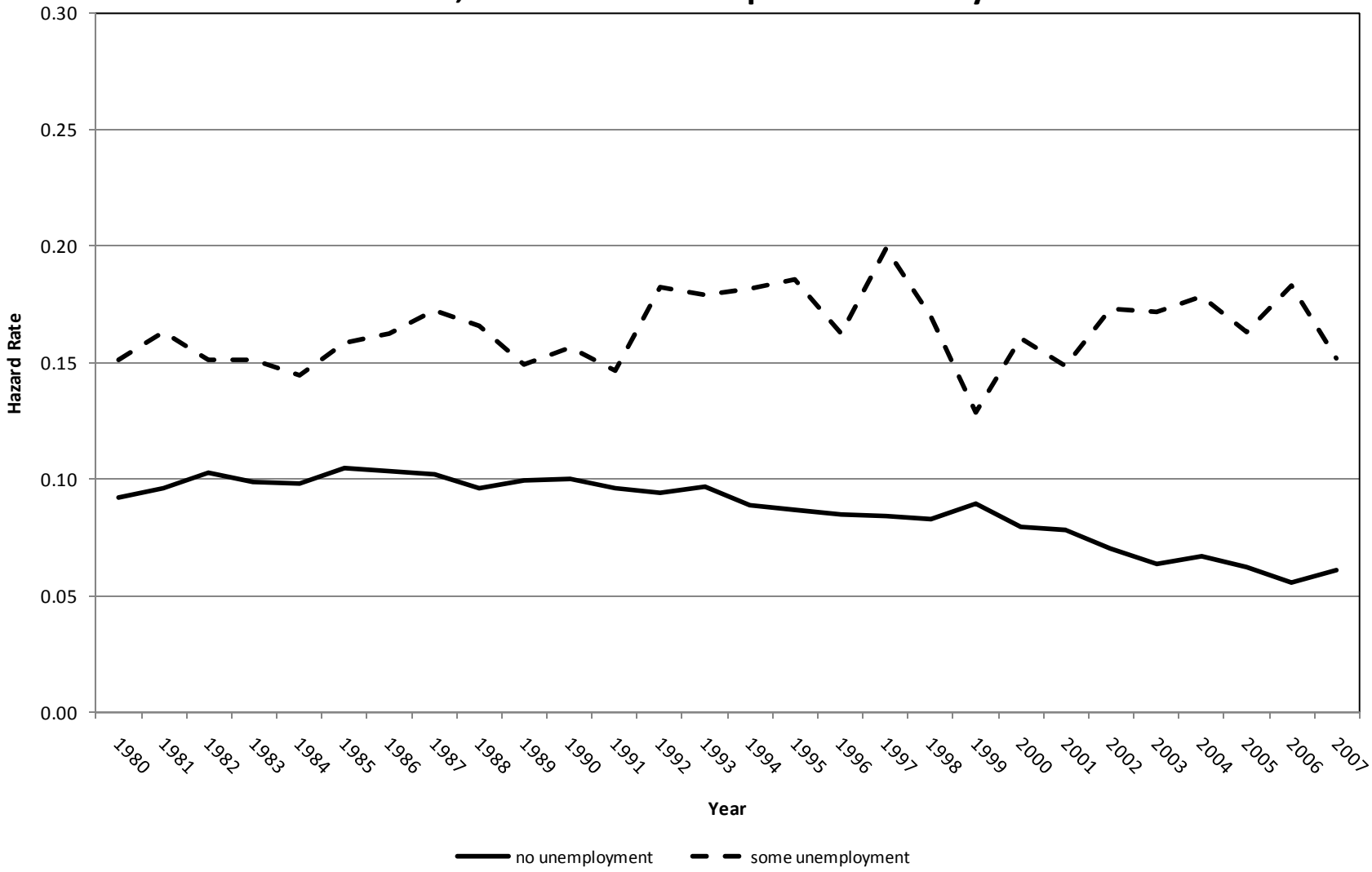


Figure 4: Empirical Retirement Hazard Rates by Age and Unemployment Status, 1980 to 2007, March CPS Data



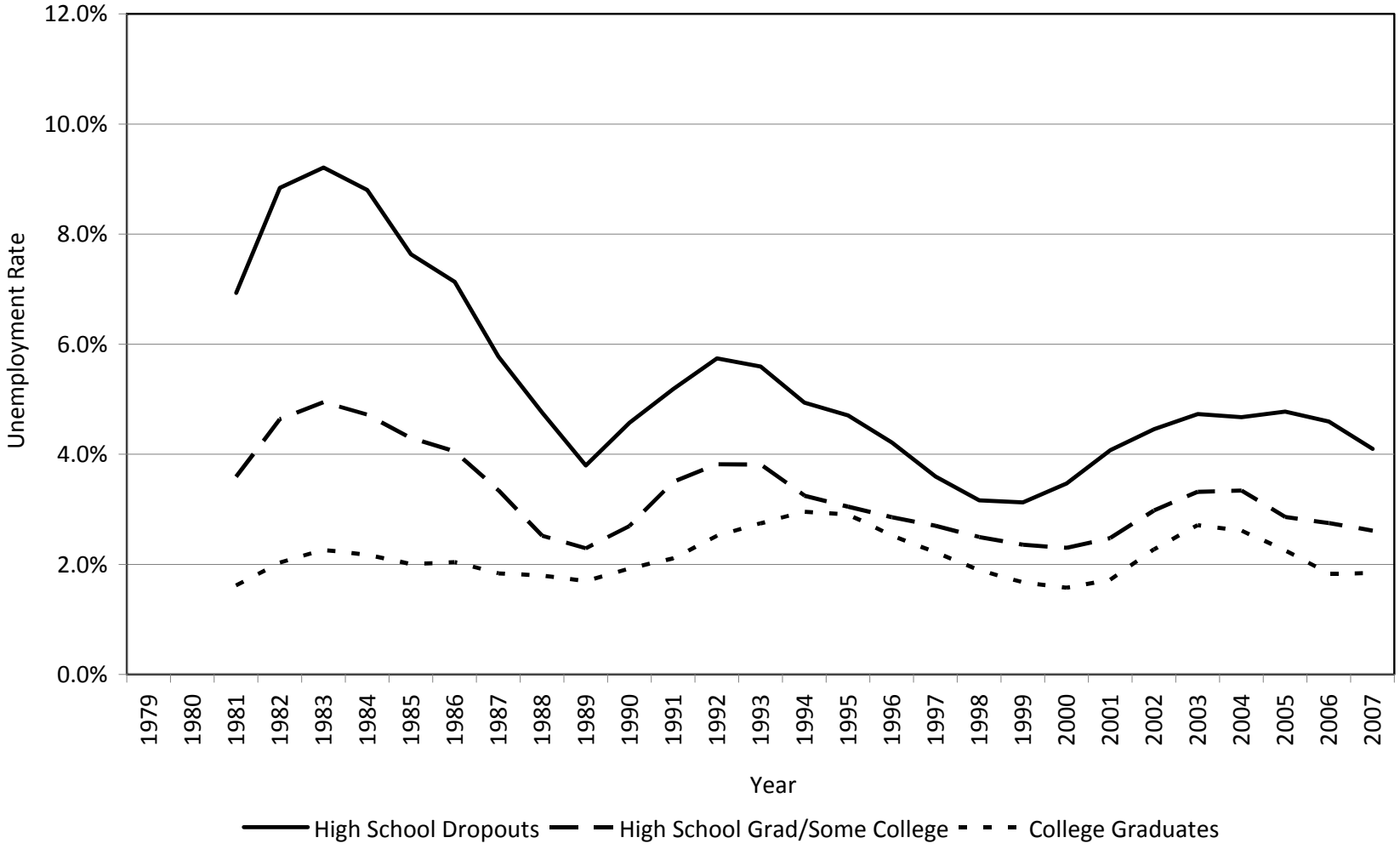
source: authors' calculations from March CPS Data.

Figure 5: Empirical Retirement Hazard Rates over Time, Workers Age 55-69, March Current Population Survey



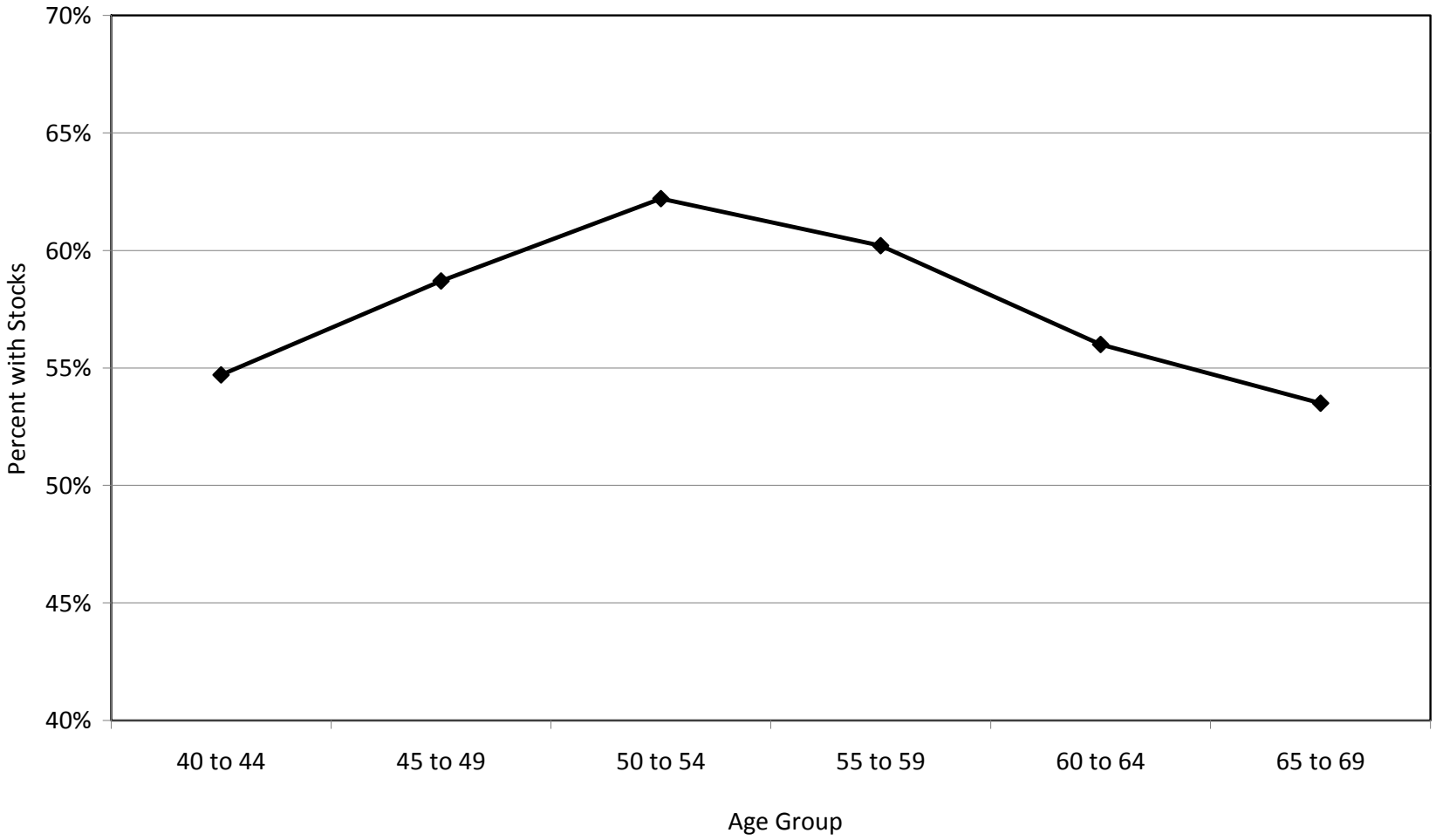
source: authors' calculations from March CPS Data.

Figure 6: Unemployment Rates among Those Age 55 to 64 (3 year moving averages)



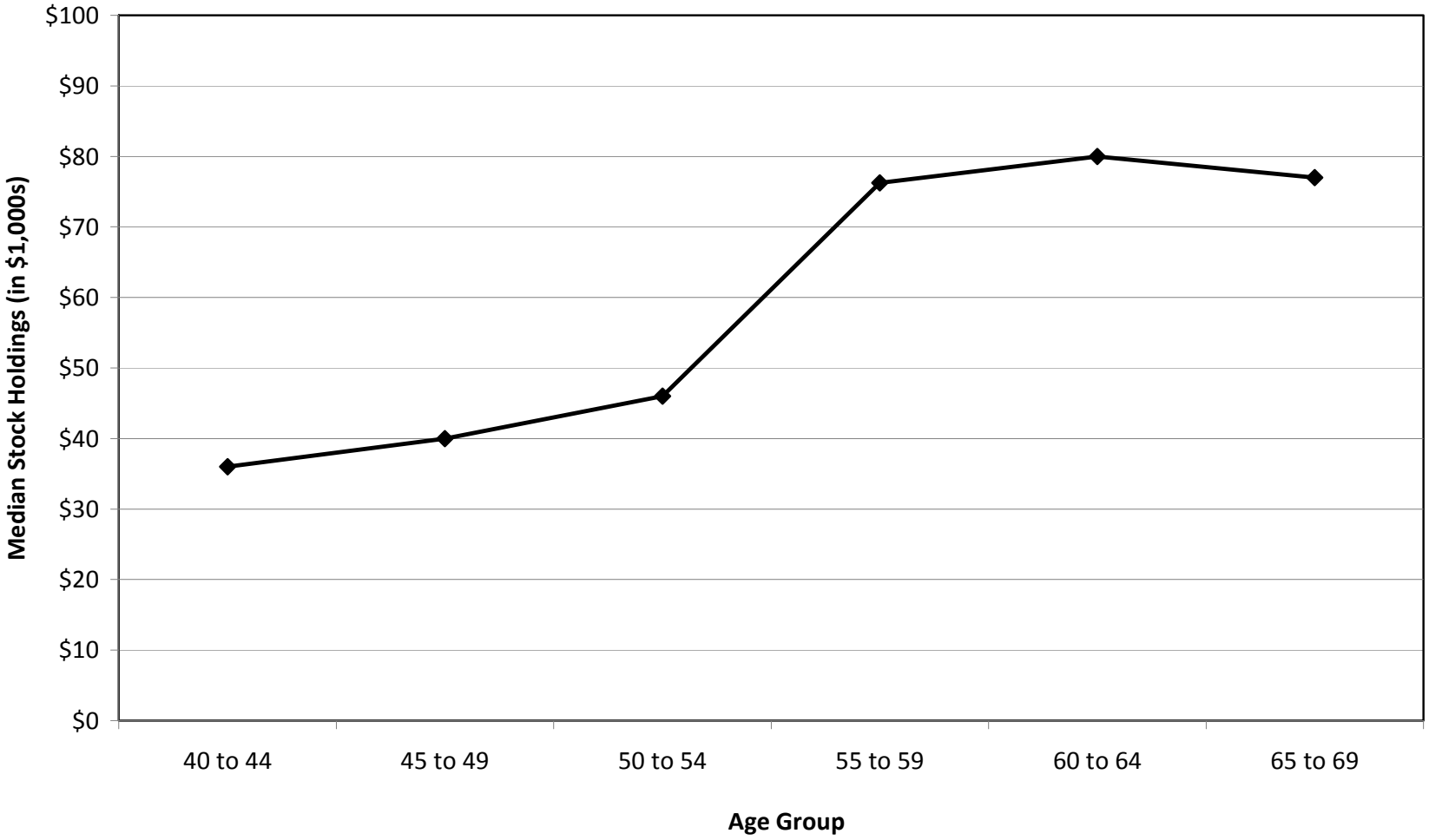
Source: Authors' calculations from the 1979 through 2007 March Current Population Surveys.

Figure 7: Share of Households Holding Stock, by Age



Source: Authors' calculations from the 2007 Survey of Consumer Finances.

Figure 8: Median Stock Holdings among Stockholdersby Age



Source: Authors' calculations from the 2007 Survey of Consumer Finances.