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Putting Retirement at Risk: Has Financial Risk Exposure Grown More Quickly for Older Households than Younger Ones?

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Abstract

Financial markets have been characterized by boom and bust cycles since the 1980s, while the responsibility for managing retirement wealth has increasingly shifted onto individual households at the same time. Policymakers and experts have expressed concern over rising risk exposure among older households, who appear to be increasingly exposed to the growing financial risks just as they near retirement. We consider household data from the Federal Reserve's Survey of Consumer Finances from 1989 to 2010 to analyze the correlation between age and risk exposure. We test if older households' risk exposure has indeed grown over time, if it has increased more than that of younger households, if changes in the demographic composition of older households have contributed to older households' rising risk exposure and the degree to which increases in risk exposure can be traced to a growing concentration of household assets held in stocks and housing and to rising household indebtedness. Our results indicate that risk exposure has grown more for older household than for younger ones, that demographic changes among older households have contributed to additional increases in older households' risk exposure and that the growth of older households' risk exposure is driven more by rising risky asset concentration and less by greater indebtedness.

I. Introduction

Household wealth, most of which is intended to pay for people's retirement, has become increasingly volatile since the 1990s due to substantial asset price swings and because households have become increasingly exposed to these price swings. Households held larger shares of their savings in risky assets and they became more indebted. Greater risky asset concentration and more indebtedness mean that the greater up and down movements in stock and house prices could do more damage to household wealth than would have been the case with less risky asset concentration and indebtedness. Alternatively, even if markets had not become more volatile households would lose more money than in the past, simply because of greater risk exposure –more money held in risky assets and greater indebtedness.

Several observers have expressed concern about the growing risk exposure of older households during this time period. Some have highlighted that many older households have few assets outside of their homes. Others, including Sen. Herb Kohl (D-Wi), chairman of the U.S. Senate's Special Committee on Aging in 2009, expressed concern about the substantial losses that some older households nearing retirement suffered in the stock market drop of 2008 because they still held large shares of their retirement assets in stocks (United States Special Committee on Aging, 2009). And, several experts worried about the rising indebtedness of older households (Copeland, 2013; McGhee & Draut, 2004).

Risk exposure – risky asset concentration and indebtedness -- has risen for all age groups (Weller, 2013) and summary data show that risk exposure among older households has grown more quickly than among younger ones, as we discuss below, which contradicts previous research on household risk exposure. Older households should have less risk exposure than younger ones to begin with since they have fewer years left before retirement to recover

potential wealth losses (Bodie, Merton, & Samuelson, 1992). Moreover, slower growth of Social Security benefits (Holst, 2005), disappearing defined-benefit pensions (EBSA, 2014), more health-related labor income disruptions (Rosen & Wu, 2004) and rising labor market risks (Rix, 2012) should all have led to less risk tolerance (Malmendier & Nagel, 2011). All of these changes have been more pronounced among older households than among younger ones during the 1990s and 2000s. Social Security's age for full benefit receipt rose for older cohorts, but stayed the same for younger ones, older households tend to be in worse health than younger ones and labor market risks, especially long-term unemployment, is higher and has risen faster among older households than among younger ones (GAO, 2012). Older households could theoretically still have increased their risk exposure due to financial market innovations that facilitate risk management, but this increase should have started from lower levels of risk exposure and should have grown more slowly than was the case for younger households.

There are two possibilities to resolve this apparent contradiction between the data and theoretical predictions. First, the summary trend data could reflect compositional changes in older households – relatively faster growth among households with a greater risk tolerance than among those with lower risk tolerance. Second, the summary trend data could mirror structural factors that put older households at a particular disadvantage in managing their wealth to avoid rising risk exposure. One factor may be household inertia, especially an inattention to the growing concentration of assets in stocks and housing as prices rose rather than reallocating assets to other, safer investments.

Understanding trends in financial risk exposure among older households is of particular policy relevance. First, improving risk management tools such as financial advice may be particularly pressing if risk exposure of older households has risen faster than for younger households.

Second, understanding financial risk exposure by age and other household characteristics give policymakers a better sense of their target audiences to incentivize improved risk management strategies. Third, a detailed analysis of risky asset concentration and indebtedness also helps to identify priorities for policy intervention.

The rest of the paper is organized as follows. Section II discusses the relevant literature, followed by a discussion of the data and the empirical analysis in section III. Section IV concludes.

II. Literature review

Financial risk exposure creates the chance that households will have lower than expected savings if financial market risks materialize, e.g. during a stock or housing market downturns near retirement. The literature generally shows that the most important reasons households save is to finance retirement and to have liquidity to pay for unexpected events (Bricker et al., 2012). The largest proportion of total household savings in home equity, stocks, bonds and cash are intended for retirement (Browning & Lusardi, 1996; Munnell, Webb, & Golub-Sass, 2012), while emergency savings play a much smaller role and bequests play a negligible role in people's decision to save (Bricker et al., 2012).[1]

Understanding trends in risk exposure has only gained in importance over time as the need for individual savings has grown. People can expect to live longer, older households face more labor market uncertainty (Rix, 2011), the growth of Social Security benefits has slowed due to a rising normal retirement age and fewer workers have access to employer-sponsored

[1] The fact that households frequently leave inheritances does not contradict their ex ante intentions. Inheritances are a byproduct of optimal planning with individual savings, when households do not or cannot annuitize their savings (Fornia & Almeida, 2008). Households will need to plan to spend their individual savings, including their home equity, over the maximum life expectancy to avoid running out of money in retirement, but they will on average only live for the average life expectancy, i.e. a large share of households will pass away before they have spent their money, even with optimal planning.

retirement benefits, especially defined benefit (DB) pensions (Copeland, 2013b)[2] than in the past.

Market and investment risks

Individual savings directly expose households to market risk and investment risks. Market risk exposure follows from large asset price swings, e.g. for stocks and houses (Baker, Krugman, & DeLong 2005; Campbell & Shiller 2001) and because of purchase and sale timing (Campbell et al. 1999; Weller & Wenger 2009). Investment risks exist because the complexity of investment decisions opens the possibility the households make decisions that result in suboptimal outcomes (Bernartzi & Thaler, 2007).

Economists consider stocks and housing to be riskier financial assets compared to bonds and more liquid assets. Households benefit from equity stakes in stocks and housing because of the potential future flows of income the may receive as owners. Income from stocks comes from both the stockowner's claim on corporate income -- dividends less taxes -- and capital gains realized as a result of price appreciation when the stockowner sells the stock for more than the purchase price. Similarly, income from housing comes from saved rents and from home price appreciation if they sell the house for a higher price than what they purchased the house for. Incomes earned on stocks and housing and capital valuations can fluctuate over time, putting household assets at substantial risks.

Stocks and housing entail similar risks that are not found in bonds or other liquid assets. Investing in bonds guarantees, within some limits, the bondholder the future interest payment and the face value when the bond matures. Therefore, if the bond is held until maturity, the owner knows for certain the return she will receive.

[2] This assumes that DB pensions expose households to less market risk than individual savings do since DB pensions can smooth asset market fluctuations over time.

Storing wealth in the form of home equity exposes households to higher liquidity risks than if wealth is stored in other assets. Like other non-cash equivalent assets, in order to use home equity to purchase goods and services, it must be transformed into cash. The ease with which a portion of home equity or the total value of home equity can be liquidated depends on several, often highly correlated, market conditions. First, households may need to sell their home in its entirety in order to move into a residence that is more appropriate for their changing needs. If the need to sell coincides with a market downturn, households may lose a large share of their wealth in the process given that the interaction between housing and labor markets creates pro-cyclical illiquidity in housing assets. House-price swings are often regionally concentrated and regional house-price swings are highly correlated with labor-market conditions (Johnes & Hyclak, 1999; Chan 2001). The pool of potential buyers in the local labor market falls when unemployment goes up and when house prices consequently fall (Dröes & Hassink, 2009). Thus, households may not be able to sell their homes when they need to or they may have to sell at a lower price than anticipated.

Illiquidity of housing assets further exacerbates market risk. Households may need to sell their home in its entirety, e.g. because credit markets are underdeveloped (Meyer & Wieand, 1996; Englund, 2002), rather than in small shares, at an inopportune time to move into a residence that is more appropriate for their changing needs (Dröes & Hassink, 2009). Similarly, homeowners may not be able to diversify their assets when housing prices increase if they face financial constraints (Englund, 2002). And, the interaction between housing and labor markets creates pro-cyclical illiquidity in housing assets. House-price swings are often regionally concentrated and regional house-price swings are correlated with labor-market conditions (Blanchflower & Oswald, 2013). The pool of potential buyers in the local labor market falls when unemployment goes up and when house prices consequently fall (Dröes & Hassink, 2009). The illiquidity of housing assets presents costly obstacles for households

attempting to effectively manage their risk exposure. Houses are hence comparatively risky assets at any point of investment and house prices tend to be more volatile than bonds, while the rate of return earned on housing assets does not fully compensate for the greater risk as compared to bonds.[3]

Both stocks and housing constitute risky assets. This does not mean that renters automatically have less financial market risk exposure than homeowners. Homeowners should have fewer stocks relative to their assets than renters to compensate for their higher housing market risk exposure (Cocco, 2005). A selective risk exposure measure that considers only stocks would undercount the risk exposure of homeowners, for instance, and a selective measure that looks only at housing risk ignores by definition the risk exposure of renters. *Changes in financial risks over time*

Market and investment risks associated with stocks and housing have risen over time. For one, both houses and stocks come with the substantial risk of a fall in value and lower returns than expected (Baker, Krugman, & DeLong 2005; Campbell & Shiller, 1998; Chen, 2001; Dröes & Hassink, 2009; Englund, Hwang, & Quigley, 2002; Meyer & Wieand, 1996). There was a widely acknowledged rise in stock and house price volatility since the 1990s (Campbell & Schiller 1998; Akerloff & Schiller 2010; Baker, Krugman, & DeLong 2005; Weller & Sabatini 2008), increasing the chances of lower than expected sale prices and returns after market run ups.

The data also show accelerating market risk growth after 2000 compared to the 1990s. The period after 2000 saw both stock and housing market booms and busts, while the earlier years experienced only a stock market boom (Baker, Delong & Krugman, 2005). The size of the market swings was thus even more pronounced after 2000 than before.

[3] For a discussion of the relevant literature, see Weller and Sabatini (2008).

Furthermore, households increasingly have had to handle financial risks in their savings on their own, raising the chance of investment risks that could amplify the consequences when market risks materialize. The share of households with a defined-benefit pension has declined since the early 1980s and the share of households with defined-contribution plans has grown (Weller & Wolff, 2005; Wolff, 2011). Defined-benefit pensions typically come with more protection from both market and investment risk than is the case for most defined-contribution plans, since they offer guaranteed income flows throughout retirement and are managed professionally for all participants in the plan (Bodie, Marcus, & Merton, 1988). Households will in theory reduce their risk exposure with defined-contribution plans as compared to defined benefit pensions as long as they believe that defined benefit pensions offer greater risk protections than defined contribution plans.

Household leverage, or the ratio of household debt to income, also accelerated after 2000. The years after 2000 saw an unprecedented household debt boom that vastly accelerated household leverage compared to the 1990s (Barba & Pivetti, 2009). Even with unprecedented deleveraging after the 2007 crisis, households still held larger amounts of debt in 2010 than in any years before 2000 (Cooper, 2012).

Risky asset concentration as risk exposure measure

Households can theoretically protect themselves from financial risks through diversification. They can reduce the risk of substantial losses by putting their assets into different asset classes, so that only a part of their money is invested in risky assets. The share that households should theoretically invest in risky assets depends on their age, education, risk tolerance and total wealth (Merton, 1969; Haliassos & Bertaut, 1995; Guiso, Sapienza, & Zingales, 2008). Younger households, better educated households and households with greater risk tolerance, all else equal, should have larger risky asset shares than their counterparts.

But, where should households put their money to diversify their assets away from risky assets? Basic financial economics suggest that optimal diversification requires the rates of return of different assets to be ideally uncorrelated with each other (Markowitz, 1970). Importantly, asset prices within one asset class – stocks, bonds or real estate – tend to be highly correlated in large part because asset markets tend to follow fads (Campbell & Shiller, 2001; Baker, DeLong & Krugman, 2005). Therefore, diversification requires putting money in different asset classes, not in different assets within the same asset class. Price movements for stocks should be independent of those in savings bonds, for instance. Households consequently should diversify away from stocks and housing to bonds and liquid assets.

Rates of return across asset classes could show some correlation, though. Returns on stocks and bonds can theoretically move in tandem as lower stock prices often reflect a weakening economy, which goes along with lower interest rates. But, empirical evidence shows that this correlation is weak, especially over longer periods of time (Campbell & Shiller, 2001). There is, however, some evidence that rates of return correlate between risky asset classes – stocks and houses. Both house and stock prices often fall when the economy turns sour and rise when the economy improves (Case & Quigley, 2008; Case, Quigley, & Shiller, 2003). The possibility of a correlation between the rates of return across risky asset classes, not just within each risky asset class, only highlights the importance of diversification into safer assets, specifically bonds and liquid assets (Markowitz, 1970).

But, psychological obstacles, e.g. inability to fully process complex information, inability to stick to a financial plan, status quo bias in financial decisions, and herd behavior often lead to systematic mistakes (Benartzi & Thaler, 2007; Campbell, 2006; Bernheim & Rangel, 2005). Households hence may not systematically diversify their assets to meet their preferences and financial needs.

The alternative to systematic diversification is that households do not regularly move out of risky assets nor invest more in risky assets when risky asset prices fall (Mitchell et al., 2006). Considering that risky asset prices rose for most of the period from 1989 to 2010 – the years, for which we have data – risky asset concentration should have risen up until the Great Recession started in 2007 alongside stock and house price increases, if households were inattentive to changes in their risky asset concentration.

Growing risky asset concentration over the decades leading up to the Great Recession reflects not widespread financial savvy that allowed households to time the boom market, but rather an inability of households to avoid excessive risk exposure. There is little evidence that even sophisticated money managers can anticipate long-term market movements. Large institutional investors such as pension funds and mutual funds often failed to anticipate, or at least to properly protect against the massive losses associated with the housing market boom and bust of the 2000s (Manconi, Massa, & Yasuda, 2012). And, households investing rationally should have expected a growing chance of a market downturn after years of stock and house price increases as these markets are mean reverting (Fama & French, 1988; Poterba & Summers, 1988; Baker, Delong & Krugman, 2005), suggesting that rational investors should have regularly rebalanced their assets during years of stock price increases, which did not happen (Mitchell et al., 2007). Furthermore, financial innovation and growing access to credit has expanded the variety of financial investments available to individual investors, which should have made it easier over time for households to quickly diversify away from risky assets. This is especially true for the possibility of households shifting their assets away from housing, e.g. by taking out a home equity loan to invest in safer assets during the housing boom. A household, for example, that has $200,000 in total assets, no debt, $50,000 in home equity and takes out a home equity line of $25,000 to invest in bonds would end up with $225,000 in total assets, but its net wealth would remain unchanged at $200,000. Renters

could instead take out a margin loan from a broker to diversify out of stocks with the same result of unchanged wealth and less risk exposure if they did not want to sell their stocks. This discussion suggests that a growing risky asset concentration during the 1990s and 2000s likely reflected behavioral obstacles and not savvy market timing.

Leverage as second risk exposure measure

Household risk exposure also depends on their leverage – typically the ratio of debt to assets. Leverage translates into risk exposure because gains and losses of assets are magnified (Debelle, 2004). The more highly leveraged a household is the greater the risk is of losing substantial shares of wealth from comparatively much smaller risky asset price drops or from smaller-than-expected interest rates on bonds (Case & Quigley, 2008; Case, Quigley, & Shiller, 2003).

These points are best explained with numerical examples. First, consider a household that has $100,000 in assets, all of which is held in stocks, and $50,000 in debt. Stocks now fall by 10% and the household loses $10,000. This is equivalent to a drop in 20% of household net wealth since its total net wealth was originally equal to $50,000 (total assets minus total debt). Second, consider the same household with $100,000 in assets all invested in variable interest rate bonds, e.g. through a mutual fund. Assume that the household initially earns 4% on its bonds, or $4,000. Now, assume that the household also owes $50,000 in a fixed interest rate loan such as a mortgage at an interest rate of 6%, requiring interest payments equal to $3,000, leaving the household with net interest earnings of $1,000. A drop in the bond interest rate from 4% to 2.5%, holding the investment amount constant at $100,000,[4] would mean that households would lose $500 – or 50 percent of total interest earnings -- following a drop of 37.5% in its interest earnings on its bonds. Households lose from leverage with stock

[4] This can be the case with bond mutual funds over time and guaranteed income contracts.

and bond investments because leverage magnifies total earnings decline when the stock prices and interest rates decline.

There are two larger lessons for using leverage as a risk exposure measure that follow from this discussion. First, leverage is an added risk exposure to risky asset concentration. Second, leverage exposes households to greater financial risks independent of the assets that a household invests in.

Risk exposure differences by age

Older households nearing retirement should theoretically have less risk exposure than younger ones in large part due to life-cycle induced risk aversion (Bakshi & Chen, 1994; Riley & Chow, 1992). As households age and near retirement, they have fewer years to recover from potential financial losses than was the case when they were younger. Thus, their financial risk tolerance declines as their investment horizons shorten (Yao, Sharpe & Wang, 2011) which should result in shifting wealth holdings into less risky assets and consequently decreasing overall risk exposure (Bakshi & Chen, 1994; McInish, Ramaswami & Srivastava, 1993; Morin & Suarez, 1983).[5]

A number of empirical studies show that the share of risky assets out of non-housing assets as an indicator of risk exposure rises with age and then falls as households approach their mid-sixties, as expected (Bertaut & Starr-McCluer,2001; Bodie & Crane, 1997; Heaton & Lucas, 2000; VanDerhei et al., 1999). But, risky asset concentration unexpectedly rises with age at younger ages, giving household risk exposure a hump shape relative to age (Alan, 2006). A

[5] Some studies examining the trends between risk tolerance and age rely on self-reported risk tolerance measures (Grable & Lytton, 1998; Sung & Hanna, 1996; Yao, Gutter & Hanna, 2005; Yao, Sharpe & Wang, 2011). We also include a self-reported measure of risk tolerance in our model, but we are primarily interested in the relationship between age and risk exposure. We thus focus on risky asset concentration and leverage as ndicators of total risk tolerance. See Riley and Chow (1992) for further discussion on the merits of using self-reported risk tolerance and risky asset concentration as household risk exposure measures.

typical explanation for the rising share of stocks out of non-housing assets with age is that younger households face higher transaction costs than older households since younger households have fewer assets (Alan, 2006).

Including housing as a risky asset in addition to stocks makes these group differences more pronounced between older households and younger households. Just as with stocks, there are some initial transaction costs and financial constraints involved, such that young households initially have on average very few housing assets (Chiuri & Japelli, 2003). Homeownership then rises with age as financial constraints fall (Chiuri & Japelli, 2003). Housing assets eventually start to fall with age, largely because older households have had more time than younger households to build up savings outside of their house (Flavin & Yamashita, 2011).

Adding leverage as risk exposure measure should show less risk exposure for older households than for younger ones. Older households have had more time to pay off debt than younger households did and older households have had more time to build up assets than is the case for younger households. The result is that the debt to asset ratio should fall with age (Dynan & Kohn, 2007).

Changes in risk exposure by age over time

The risk exposure of all households has increased over time (Weller, 2013). This across-the-board increase follows in part from lower costs such as fewer transaction costs, lower interest rates and less stringent lending standards (Loutskina, 2011). Faster increases of risk exposure among older households than among younger ones may also follow from external factors such as herd behavior, household inertia (Bilias, Georgarakos, & Haliassos, 2010; Campbell, 2006; Hirshleifer & Hong Teoh, 2003). All of these factors can impact households of all ages in the same direction, i.e. household risk exposure should increase as costs go down and as inertia

remains prevalent.

But, only household inertia, not lower costs or social pressures, could explain a faster increase in relative risk exposure among older households than among younger ones. Older households generally face lower costs in financial markets than is the case for younger households (Constantinides, Donaldson, & Mehra, 2002; Campbell, 2006), i.e. older households' costs could fall less than for younger households. External factors, especially social influences or herd behavior, could contribute to rising risky asset concentration and housing and larger indebtedness (Masnick, Xiao, & Belsky, 2006). But, there is no a priori reason to believe why social influences should have been more pronounced among older households than among younger ones, i.e. relative risk exposure increases should be similar over time for older and younger households.

That leaves household inertia as possible explanation for faster relative risk exposure increases among older households. Older households in the 2000s had started to invest in the 1980s and early 1990s, when stock and house prices were comparatively low. Inertia would suggest that households did not change their risky assets for less risky ones as they aged and stock and house prices increased relatively fast (Bilias, Georgarakos, & Haliassos, 2010; Brunnermeier & Nagel, 2008). Younger households in the 2000s, in comparison, would have started to invest later than their older counterparts, thus buying stocks and houses typically at higher prices and consequently leaving less room for upward price movements (Alan, 2006). A faster rise in the share of stocks and houses out of total assets among older households than among younger households would imply widespread household inertia.

Changing older household characteristics and risk exposure differences over time

Household risk exposure should vary with household characteristics. Specifically, risk exposure varies with marital status, such that single women and single men generally have fewer stock investments than married couples, and with race and ethnicity such that African-Americans and Hispanics have fewer stock investments than whites (Bernasek & Schwiff, 2001; Cobb-Clark & Hildebrand, 2006; Even & MacPherson, 2003, 2004; Gutter & Fontes, 2006; Holden & Fontes, 2009; Lyons & Yilmazer, 2004; Orel, Ford & Brock, 2004; Yilmazer & Lyons, 2010). And, risk exposure should vary with household risk preferences (Breuer, Riesener, & Salzman, 2012; Xiao 1996). Further, risk exposure should increase with educational attainment and income (Campbell, 2006). Households with more education should have also more financial sophistication and may be able to take a longer-term investment horizon, just like households with more income. Longer planning horizons should translate into greater risk tolerance and risk exposure (Cole & Shastry, 2008). Finally, household with DB pensions should have more risk exposure in individual savings than households with DB pensions (Browning & Lusardi, 1996).

These differences have two implications. First, single women, African-Americans and Latinos hold fewer stocks out of non-housing financial assets than single men and whites do, even after controlling for risk tolerance. But, adding housing assets shows that single women, African-Americans and Latinos seem to have greater risk exposure than their counterparts because they hold larger shares of their total assets in housing (Weller, 2013). Considering only stocks or only housing as risky asset indicators could thus understate the actual risk exposure for key household groups. Second, groups that typically have greater risk exposure than their counterparts may have also grown faster than others, showing up as faster risk exposure among older households than among younger ones in the raw data.

III. Data, variable definitions and summary

We use the Federal Reserve's triennial Survey of Consumer Finances (SCF) for our analysis of household risk exposure. The SCF is a nationally representative household survey that offers a comprehensive look of household assets and debt. The most recent data year is 2010 and consistent data are available starting from 1989, i.e. we have complete and comparable data for eight survey years available spanning twenty one years. We split the sample into two periods, one lasting from 1989 to 1998 and one from 2001 to 2010, since 2000 marks the start of greater macroeconomic risks – increased stock and housing market volatility and an unprecedented debt growth – for households. Our summary and regression statistics are all based on population weighted observations for these two subperiods.

We include only non-retiree households in our analysis. We exclude households, who self-identify as retired, since their risk profile should change dramatically as they draw down their assets to live on and their inclusion could thus distort our conclusions.

Our analysis focuses on households 55 and older and their risk exposure in comparison to younger households. Older households should include only those, who have a high likelihood of withdrawing soon from the labor force. Splitting the sample at age 55 does that. A lower cut-off age, e.g. 50 or even 45 years, would likely overstate older households' risk exposure because it would include many younger households, who may still substantially change their behavior before retiring. Alternatively, a cut-off age greater than 55 would restrict our sample sizes too much to allow for robust statistical analyses. A cut-off age of 55 years reasonably well ensures that we capture the risk exposure of households, who have a high chance of retiring soon and whose risk exposure will not materially change before they retire.

Summary statistics show that our older household sample is getting a little younger from the early to the late period, which reflects baby boomers starting to move into the older household group during this time. The average age in the early period was 64.3 years and the

average age in the later period was 62.8 years. The share of non-retiree households 65 years old and older out of the total older non-retiree household group was 39.5% in the early period and 31.5 percent in the late period. That is, our data primarily and increasingly capture the experience of younger households over 54 years of age, but households 65 years old and older still constitute a substantial share of non-retirees.

We use three risk exposure measures as dependent variables. We calculate the share of all risky assets – stocks plus houses[6] – out of total individual assets as risky asset concentration, the ratio of total debt to assets and we create a unified measure – very high risk exposure -- that captures both risky asset concentration and household indebtedness, specifically households having both a ratio of debt to assets greater than 25.0 percent and a risky asset concentration greater than 75.0 percent.[7] The unified measure allows for a concise discussion of total risk exposure, while our conclusions rest both on the unified and individual risk exposure measure.

Figure 1 shows the share of non-retiree households with very high risk exposure by age and time period. Risk exposure first increases with age and then decreases in both periods and risk exposure grows over time. The relative increases in the shares of households with very high risk exposure over time tend to be larger for older households than for younger ones.[8]

[6] Stocks include all directly held stocks and indirectly held stocks, e.g. in 401(k) plans, in Individual Retirement Accounts and in other managed accounts. The data do not allow for a further disaggregation of stocks, but this is of limited concern since diversification between asset classes not within asset classes largely determines risk exposure, as we discussed before. Houses include the self-reported gross value of all residential real estate, i.e. it is not net of mortgages since we measure leverage separately.

[7] This ratio implies relative risk aversion because we define risk exposure relative to total assets rather than absolute dollar amounts (Arrow, 1971; Cass & Stiglitz, 1970; Friend & Blume, 1975). We select these particular cutoff points to ensure reasonably large sample sizes for our analysis. The conclusions of this discussion remain robust with changing cutoff points for very high risk exposure.

[8] Relative changes allow for relevant comparisons across groups. Households 55 years old and older generally have lower risk exposure than younger households do. Asset price increases, for example, should result in comparatively similar relative increases, but much smaller absolute increases for older households than younger ones.

*** INSERT FIGURE 1 ABOUT HERE ***

Notes: Authors' calculations based on Board of Governors. Federal Reserve System. Various years. Survey of Consumer Finances. Washington, DC: BOG. Very high risk is defined as having a ratio of stocks and houses to total assets greater than 75% and a ratio of debt to assets greater than 25%. The share of households with very high risk exposure is calculated only for households with any assets. Only non-retiree households are included in the calculation. All figures are in percent.

Our summary data and regression analyses further consider the correlation between household risk exposure and a range of other household characteristics in both subperiods. These household characteristics include age, race/ethnicity, educational attainment, marital status, income, DB pension coverage and willingness to accept financial risk. Income is captured by indicator variables for the five income quintiles in each survey year. Further, the SCF allows household to indicate their financial risk tolerance as "none", "average", "above average" and "substantial". We combine "above average" and "substantial" since the sample sizes in these two categories are smaller than the other two categories, i.e. this combination creates three risk tolerance categories of about equal size. All variables, including whether the household is retired, refer to the head of household.

Risky asset concentration and household indebtedness over time

Table 1 provides data on the share of households with very high risk exposure, on the average risky asset concentration and on the average debt to asset ratio. The risky asset concentration first rises then falls with age, while leverage declines with age, as expected.

Substantially larger relative increases among some groups than others should then mirror different investment behaviors related to risk preferences and other household characteristics. Similarly, for the debt to asset ratio, comparatively larger relative changes should reflect differences associated with household behavior and characteristics, not just macro trends that impact all households about the same such as lower interest rates. Our regression analyses further below study these potential correlates with household risk exposure in greater detail.

All risk exposure measures also show generally an upward shift from the earlier years (1989 to 1998) to the later years (2001 to 2010).[9] The ratio of debt to assets show relatively larger increases for households 55 years and older than for younger households, but the risky asset concentration shows no clear pattern for the relative increases by age (Table 1). Our earlier conclusion of rising risk exposure particularly among older households seems to reflect rising indebtedness rather than a growing concentration in stocks and housing assets.

*** INSERT TABLE 1 ABOUT HERE ***

Correlation of risk exposure with household characteristics, age and time period

The observed increase in risk exposure among older households coincided with other demographic changes. Table 2 shows the composition of our sample by key household characteristics. The population composition of non-retiree households 55 years old and older with any assets substantially change. Educational attainment increased, the share of single men grew by more than twenty percent, older households became substantially less risk averse and the share of older non-retiree households with a defined benefit pension grew as well from the early to the late period.[10]

*** INSERT TABLE 2 ABOUT HERE ***

We next provide summary data to see if the rise in very high risk exposure correlates with other household characteristics in addition to age and time period (Table 3). Risk exposure generally rises with educational attainment, although only up to a certain levels, tends to be greater for married couples than for single men and single women, and is greater for households with DB pensions than for those without (Table 3). But, risk exposure tends to be

[9] The average ratio of debt to assets for households between the ages of 18 to 24 was slightly lower in the later period than in the earlier one. The median ratio – not shown here -- was, however, higher for this age group in the later period than in the earlier period.

[10] Year-by-year data – not shown here – generally indicate a declining trend of DB pension coverage.

greater among older households unwilling to take risks than among households willing to accept risks (Table 3).

*** INSERT TABLE 3 ABOUT HERE ***

The summary data also indicate that older households' risk exposure has grown faster than for younger households across household characteristics. The share of households with very high risk exposure is always lower for non-retiree households 55 years old and older than for younger households. But, risk exposure typically grew faster among older households than among younger households from the early period to the late period, except for single men, whose share with very high risk exposure grew slower than the respective share among younger single men (Table 3). That is, changes in older household compositions may have contributed to the relative increase in older households' risk exposure. Our summary statistics could hence paint a misleading picture of rising risk exposure of older households, considering changes in household characteristics over time. We thus use multivariate regressions to separate the effect of age on household risk exposure from other determinants of risk exposure.

IV. Multivariate analysis

We use multivariate regressions to test if household risk exposure has grown for all age groups. We estimate the coefficients of the determinants of household risk exposure for earlier and later years. Our sample includes non-retiree households with any assets. And, we eliminate outliers by dropping households with leverage greater than 500 percent, which applies to less than one-half of a percent of non-retiree households with any assets.

Our dependent variables are very high risk exposure, risky asset concentration and indebtedness. This allows us to see how risky asset concentration and indebtedness may contribute to the growth of older households' risk exposure.

The explanatory variables include indicator variables for the household's income quintile, excluding the bottom income quintile; indicator variables for household educational attainment, excluding households with college degrees; indicator variables for family status, excluding single men; indicator variables for household risk preferences, excluding households unwilling to take financial risks; indicator variables for household race and ethnicity, excluding white households; and a dummy variable for DB coverage.

Age is our key explanatory variable in this analysis. We use age in a linear and quadratic specification. We then test if the parameter estimates for age in the later period are greater than the parameter estimates for the earlier period.[11]

The specifications of our dependent variables require different regressions for different dependent variables. We use a probit regression for the probability of having very high risk exposure and we use OLS regressions for the other two risk exposure indicators. Our regression sample includes only households with any assets, such that zero values for diversification and leverage are not truncated values, but legitimate values and OLS is the appropriate methodology rather than a Tobit regression.

The SCF contains five replicates for each unique observation, including imputations for missing observations, to increase the data set's sample size. Estimates must be made for each replicate individually and then combined (often by the arithmetic or geometric average) using rules discussed in detail in Rubin (1987) to analyze the data correctly. All of our regression estimates use this method.

The correlation between age and risk exposure

[11] We separately estimate our regression equation pooling all observations, adding a dummy for later years and interaction terms between the dummy for later years with age and age squared. These results are shown in Table A1 in the appendix. The correlation between age and risk exposure do not change materially in this specification.

Table 4 summarizes our regressions. The probability of having very high risk exposure and the share of stocks and housing out of total assets rise with age in both periods, but the effect of age diminishes gradually since the estimated parameter for age squared is negative. This gives the age-risk profile a slight moderation. Debt, in comparison, falls with age, at least during the later years. The effect of age very gradually slows again for the years from 2001 to 2010. There is no statistically significant relationship between age and debt to assets for the years from 1989 to 1998 (Table 4).

*** INSERT TABLE 4 ABOUT HERE ***

The concentration of stocks and houses out of all assets increases more for older households than for younger ones over time. All parameter estimates for the linear specification for age are statistically different between the two periods, while the estimated parameters for the quadratic age specification are the same for both periods (Table 4). And, the relative gap in the share of stocks and housing out of all assets widens exponentially by age from the early to the later years (Figure 2).[12]

*** INSERT FIGURE 2 ABOUT HERE ***

Notes: All figures in percent. Calculations based on parameter estimates in Table 4.

Our estimates for the ratio of debt to assets show that the effect of age on leverage diminishes over time. The estimates for age in both of their specifications are not statistically significant in the early period (Table 4), but are significant in the later years. The linear specification is negative and the size of this effect tends to overwhelm, in economic terms, the effect of the positive coefficient on the quadratic age term. That is, the ratio of debt to assets falls consistently with age during the later period, while there is no correlation between age and leverage in the early period.

[12] The same is true for absolute differences, not shown here.

The probability of having very high risk exposure combines the effects of the share of stocks and houses out of total assets and of debt to assets. Our estimates show that age is positively correlated with very high risk exposure, although this effect again gradually falls (Table 4).

These correlations with age are larger in the later period (2001 to 2010) than in the earlier period (1989 to 1998). But, the marginal effects, shown in Table A2 in the appendix, show that the overall increase of the effect of age on the probability of having very high risk exposure is very small. The marginal effect at the average age increases by one percentage point (Table A2).

The combination of all of these results indicates that risk exposure among older households has risen over time particularly because of a disproportionate increase in risky asset concentration relative to younger households.

Other effects rising with age and correlation with risk exposure

But, this is just the pure age-related effect. Composition changes among older households over time may have also resulted in faster increases in risk exposure. Table 4 includes control variables for these factors in each regression. We discuss here the correlation between education, family status, risk preferences and DB pension coverage and household risk exposure to see if risk exposure has grown alongside key and substantial demographic changes among older households.

The correlation between education and risk exposure generally decreases from the early to the later period without a clear pattern (Table 4). Households with less than some college have higher chances than those with more education of having very high risk exposure in the early period (Tables 4 and Table A2), but there are smaller or no differences in the later period (Table 4). By and large, this decreasing difference by education follows shrinking differences in risky asset concentration by education (Table 4). More education is correlated

with less risk exposure in the early period, but this effect shrank over time just as older households gained more formal education. This result may lend support to the argument that herd behavior increased risk exposure and thus reduced the value of effect of financial sophistication, for which educational attainment serves as a proxy.

Next, we consider changes by family status. Single women and married couples tend to have a higher chance of having very high risk exposure than single men in both the early and the late period (Tables 4 and A2). This effect diminishes very slightly over time. Both single women and married couples have a larger risky asset concentration than single men in the early period, while single women have the same risky asset concentration and greater indebtedness than single men in the later period (Tables 4 and A2). That is, there is the relatively faster growth of single men among older households may have been associated with a greater risky asset concentration, but less indebtedness, resulting in unchanged very high risk exposure differences by marital status.

Our estimates in Tables 4 and A2 also show that having a willingness to accept above average or substantial risks is not correlated with the chance of having very high risk exposure in either the early or the late period. But, our results further show that being willing to take above average or substantial risks increased the risky asset allocation relative to households unwilling to take risks, but lowered indebtedness. Considering that risk tolerance among older households increased over time, there is some evidence that risky asset concentration, but not indebtedness, simultaneously grew among older households due to higher risk tolerance (Tables 4 and A2).

There is no statistical difference in the chance of having very high risk exposure in the early or the late period by DB coverage (Table 4). But, the difference in risky asset concentration between households with DB benefit pensions and those without it shrunk, while differences

in indebtedness widened. Considering that there is trend albeit not aggregate data evidence that DB pension coverage fell over time, these results further underscore that older households' risk exposure rose faster than that of younger households especially because of a greater risky asset concentration, not because of a faster growth of household debt.

The breakdown of the correlation between key household characteristics and risk exposure tentatively indicates that older households' risky asset concentration may have also grown because of relatively faster growth of population groups that had high and possibly rising risky asset concentrations. Our analyses do not lend support to the notion that indebtedness among older households has risen faster than among younger households.

V. Conclusion

We consider the financial risk exposure of older households – those 55 years old and older – from 1989 to 2010 in this paper. Large stock and house price swings characterized this period alongside increasing individual responsibility to manage households' own savings. We find that older households' overall risk exposure from holding stocks and owning houses has risen faster during this period than younger households' risk exposure.

This faster increase in risk exposure among older households than among younger ones suggests that household inertia in asset allocations may drive household risk exposure. First, household indebtedness, which is less likely to be influenced by household inertia than risky asset allocations, since more indebtedness requires active loan applications, did not rise faster among older households than among younger ones. Second, other possible explanations for the rise in risky asset concentrations such as lower transaction costs and herd behavior would suggest smaller or similar changes for older households than younger ones. That is, household inertia in asset allocation may be the most likely underlying factor for the faster increase in risk exposure among older households than among younger ones. Put differently,

older households on average likely did not adequately manage financial market risk exposure at a time, when the chances of a severe downward market correction generally rose.

It is important, though, to note that inertia is not the only factor that has led to a growing risk exposure among older households. Changes in the composition of older households such as more education, more single men and greater risk tolerance have contributed to relatively faster growth of risky asset allocations among older households than among younger ones. That is, older households may have also invested more in riskier assets because they became more financially sophisticated over time.

Our findings suggest that policymakers need to pay attention to older households' risk exposure, but provide older households with flexibility to manage their own financial affairs. The policy goal would be to lower the presumably adverse effects of inertia on households' risky asset allocation, while giving households the tools to reap the benefits of more sophistication for their wealth. The need to pursue these policy goals has risen over time in an aging population that is increasingly responsible to handle its own finances. Public policy can improve retirement security by helping households better manage the financial risks associated with saving on their own, particularly by helping households better manage their risky asset concentration than has been the case in the past.

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Appendix

*** INSERT TABLE A1 ABOUT HERE ***

*** INSERT TABLE A2 ABOUT HERE ***