

# The Effects of the Financial Crisis on Private Pension Plans<sup>1</sup>

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## *Abstract*

*The financial crisis has reawakened questions concerning just how risky funded private pensions might be. In Germany, the debate has focused in particular on whether the losses induced by the crisis cast doubt on the suitability of a mixed system of funded and unfunded pension plans to meet the challenges posed by demographic change.*

*Using SAVE data from 2008, this study quantifies the level of asset losses and losses in returns on private pension plans resulting from the financial and economic crisis. The average loss in retirement assets is about 2%. This is significantly lower than the loss in financial assets (about 4.3%). If one carries forward these asset losses for birth cohorts from 1940 through 1990 all the way up to retirement age, we find reductions in returns for persons in these cohorts of up to 0.1 percentage points for retirement assets and up to 0.2 percentage points for financial assets.*

*These figures thus provide no grounds to justify a fundamental reorganization of the multi-pillar model of German retirement savings introduced by Walter Riester.*

**JEL:** G01, E27, G11, J26

**Keywords:** private pensions, financial crisis

Note: This paper is an English translation of Börsch-Supan, A., Gasche, M. and M. Ziegelmeier (2010): Auswirkungen der Finanzkrise auf die private Altersvorsorge, forthcoming.

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## 1. Introduction

The financial crisis has reminded us that investments in funded private pension plans are not free from risk, and that large losses in asset value cannot be completely ruled out. In this study, we examine how and to what extent the financial crisis has affected private pension savings and whether these effects are transient or permanent. We also identify the groups of individuals whose retirement savings have been hit particularly hard by the financial crisis.

The strengthening of the funded private pension system has been a demand in Germany for many years, and since 2001 has also been an element of policy for meeting the demographic challenges facing the government pension system. While the unfunded “pay-as-you-go” statutory pension system primarily faces risks related to declining contributions as a result of falling aggregate employee compensation, and is ultimately subject to demographic risks, the specific risks posed to private pensions stem from the volatility of capital markets. This risk became all too apparent in the financial crisis that intensified in Germany in the fall of 2008, resulting in voluble calls for the “restoration” of the unfunded system, even though the risk of reduced contributions to the statutory system as a result of the crisis was just as significant. The long-term demographic risks to the statutory system also remain unchanged. The funded private system is seen as a means to mitigate the demographic risks of the unfunded system, since the birth rate and thus the size relationship between the group of retirees and the group of contributors does not play a direct role in funded private pension systems, and since funded systems allow the demographic burden to be divided differently between generations. The price of reducing demographic risk is to increase capital market risk for the entire pension system.

Against the background of the current crisis, it is now important to ascertain the magnitude of the capital market risk for funded private pension plans in general; how the current crisis has affected returns and risks of funded private pensions; how large the losses precipitated by the crisis have actually been; and whether the crisis now forces a change of perspective about the ability of a mixed system of funded pensions and statutory contributions to best meet the future challenges of demographic change. These are the subjects of our study. It is the “sister study” of a 2009 paper published by Börsch-Supan, Gasche, and Wilke which investigated the effects of the financial crisis upon statutory retirement insurance and upon retirees.

We show that funded private pensions and the unfunded statutory pension system have been affected by the crisis in very similar ways and to a similar degree. Of course, the risks and the underlying mechanisms of the two types of pensions are quite different at first glance. For

private pensions, it is capital market risk that influences returns from invested capital, whereas for the statutory retirement system, the risk is that pension benefits will decline in tandem with reduced aggregate employee compensation, as provided for by the so-called pension adjustment formula. Nevertheless, it turns out that the kind of widespread shock experienced during the recent financial crisis actually affects both types of pensions quite similarly.

First it is important to point out that fundamentally, because of the long-term orientation of private pension investments, the kind of short-term drops in returns seen during the financial crisis have a smaller impact than is generally assumed. In order to demonstrate this, we evaluated direct losses in financial assets in 2008 resulting from the financial crisis by taking the asset positions of German households in 2007 and carrying them forward on the basis of observed returns in 2008 – first using actual 2008 returns and then using hypothetical returns that would have been expected in 2008 had the financial crisis not occurred. We first made this calculation for total financial assets and then separately for private pension investments.

The results show that financial asset losses amount to about 3,000 euros per household when compared with simulated assets for 2008 in the absence of the financial crisis. The average relative loss in assets is 4.3%. The households that are particularly affected are those with a high percentage of stock holdings in their portfolios. These generally represent households with higher incomes, greater overall assets, and the elderly. The distribution analysis of the losses shows that some households have been severely battered by the crisis. Thus, 14% of households lost at least 10% of their financial assets and 4.8% of households had to bear extreme losses of at least 25% of their financial assets.

By contrast, the effects of the financial crisis on the overall returns provided by private pension plans over the entire lifetime of an insured individual have been small, especially if the reduction in earning caused by the crisis proves to be only temporary. In such case, the decline in returns will amount to a maximum of 0.2 percentage points when related to all financial assets. This maximum loss amount affects persons already in their retirement years and those nearing retirement. Younger cohorts are affected less or not at all. Increased impacts as measured by losses in returns must generally be seen in combination with the actual magnitude of those returns. Thus, total returns for older cohorts are generally higher than those for younger ones, and older cohorts will still earn higher returns than younger ones, even after consideration of the effects of the crisis.

Overall, there are broad parallels when we look at the effects of the financial crisis upon the statutory pension system.<sup>2</sup> The reduction in the future benefit value of contributions made by employees that occurs in this system can also be interpreted as a loss of assets that permanently affects all age groups who were gainfully employed at the time of the financial crisis. As with private pensions, the persons most severely affected are retirees and persons nearing retirement. The magnitude of losses is also similar in both systems.

Many people may be surprised by this finding, for after all, the worst financial and economic crisis since the Great Depression was characterized above all by a stock market crash. The relatively small impact upon private pensions is the result of two basic characteristics of the private pension system that we will elucidate further in Section 2. For one thing, stocks only constitute a small proportion of private pension investments. For another, due to the fact that pension plans are held over many years and decades, long-term trends smooth over the impacts of short-term shocks.

In Sections 3 through 5, asset losses and declines in returns are calculated for German households based on SAVE data from 2008. First, we describe the portfolio structure of private financial and retirement assets (Section 3). Based upon this structure, we then calculate the crisis-induced asset losses and declines in returns for 2008 (Section 4). In a third step, the long-term declines in returns caused by the financial crisis are estimated for German households (Section 5). Section 6 presents our conclusions.

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<sup>2</sup> See Börsch-Supan, Gasche and Wilke (2009).

## 2. On the Vulnerability of Private Pensions to Financial Market Crises

The financial crisis has led to a depreciation in the value of assets. Asset losses from primary investments (especially stocks, bonds, and derivatives) have been a central concern. Secondary investment vehicles – such as private pension funds, which are assembled from a portfolio of primary investments by large institutional investors like insurance companies and investment funds – were affected by the crisis insofar as primary investments with especially heavy losses were included in the portfolios of institutional investors. Table 1 summarizes returns from primary and secondary investments:<sup>3</sup>

**Table 1: Returns in 2007 and 2008**

	<b>Savings deposits</b>	<b>Building society savings plans</b>	<b>Fixed income securities</b>	<b>Stocks and real estate funds</b>	<b>Other securities</b>
<b>2007</b>	3.26%	2.00%	4.30%	22.29%	4.30%
<b>2008</b>	3.66%	2.00%	4.19%	-40.37%	4.19%
	<b>Endowment life insurance</b>	<b>Company longevity insurance</b>	<b>Other company retirement plans</b>	<b>Riester pensions</b>	<b>Other private retirement plans</b>
<b>2007</b>	4.65%	4.65%	4.65%	7.74%	4.65%
<b>2008</b>	3.55%	3.55%	-8.00%	-4.29%	3.55%

Source: Our own calculations based upon data from the German Bundesbank, German Insurance Association, and the OECD.

Note: Since the guarantee of nominal value for Riester pensions (a primary form of private pension in Germany) extends over their entire term, the returns for a particular year can take a negative value.

### 2.1 Losses in Primary Investments

The greatest losses in asset value occurred on stock market investments and stock mutual funds. Germany's leading stock market index, the DAX, lost 40% of its value in one year. A household holding a portfolio tied to this stock market index would have suffered a loss of assets on paper of the same magnitude in 2008.

While other forms of investment also suffered losses in value, the magnitude of loss was quite varied. Total losses were relatively uncommon, but they did occur – for example, if an individual had a debt instrument or certificates from Lehman Brothers in their portfolio, or invested in structured products (e.g. asset backed securities), whose loss in value was a key cause of the entire crisis. By contrast, due to the tight liquidity situation faced intermittently by commercial banks in Germany, savings deposits, which are the most common investment

<sup>3</sup> The classification of asset classes in Table 1 is oriented to the categories selected for the SAVE data.

instrument, showed an increase in yields.<sup>4</sup> The running yield on fixed interest securities was also affected only to a minor extent.<sup>5</sup> Finally, Germany experienced nothing like the collapse of real estate prices that occurred in many other countries, since no real estate price bubble took place in Germany.

## 2.2 Losses in Secondary Investments

The most common retirement planning product by investment volume is endowment life insurance. The German life insurance branch was only involved to a very small degree in the trading of asset backed securities and credit linked notes,<sup>6</sup> so that the direct effects of the subprime crisis on insurance companies must be estimated as small. However, as a result of losses on the stock market, life insurance companies also had to endure investment value declines. Yet as the largest stock market losses were witnessed in the fall of 2008, life insurance companies had around 80% of their overall 700 billion euros of capital invested in fixed income securities and less than 10% in stocks. Consequently, insurance companies averted massive capital losses. To the extent that fixed income securities held by life insurance companies took the form of government bonds, one can even assume that the value of their holdings increased, as the rates for government paper rose during the crisis due to strong demand. The flip side of this coin is that more recently issued government securities carry lower interest rates. More potentially problematic, however, might have been the bank debentures held by life insurance companies (representing about 30% of their portfolios). For one thing, the price of these debentures (when the price could be determined at all) fell as risk premiums rose, and, for another, there was a significant risk of default. To the extent that such bank debentures took the form of *Pfandbriefe* (mostly triple-A rated German bank bonds), these were certainly secured through mortgages and government securities, but had the market for these papers come to a standstill, there would have been a risk of liquidity bottlenecks. For insurance companies, generally speaking, short-term liquidity problems only arise if the savings rates of insured individuals are smaller than the company's payments, since the insurance

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<sup>4</sup> The returns from savings investments are based upon data from the German Bundesbank, and provide information on the effective interest rates for deposits from private households with terms up to two years and terms over two years. The Bundesbank also makes data available about the volumes of deposits from private households. These data were used to calculate a weighted return for the entire category of savings investments. For this purpose, the average annual interest rate was weighted by its respective share of total deposits.

<sup>5</sup> For fixed income securities, we used data released by the Bundesbank concerning "yields on debt securities outstanding issued by residents," see [http://www.bundesbank.de/statistik/statistik\\_zinsen.en.php](http://www.bundesbank.de/statistik/statistik_zinsen.en.php)

<sup>6</sup> According to the German Insurance Association, in September 2008 this came to about 1.7% of capital holdings.

company must then liquidate capital in order to cover longevity and death benefits, as well as to pay out surrendered policies.

The overall impact of the financial crisis on endowment life insurance policies as a form of retirement planning was relatively small. The net interest earned on endowment life insurance policies sank from 4.65% in 2007 to 3.55% in 2008.<sup>7</sup> Depending on how long these lower returns persist, and, in turn, on the reductions in surpluses which are credited to beneficiaries, this will lead to lower investment value at maturity. However, this value decline would never be of the same magnitude as losses from assets fully invested in stocks.

The five implementation options available in Germany for company retirement plans have also been affected in different ways by the financial crisis. The impacts on so-called direct insurance plans (*Direktversicherung*) essentially correspond to that described on endowment life insurance policies. Defined benefit schemes (*Direktzusagen*) have not been directly affected by the financial crisis, but depend upon the overall prosperity of the company, which could be harmed indirectly by the general economic downturn. In the case of staff pension funds (*Pensionkassen*), stock investments may only represent a maximum of 35% of the portfolio. An additional maximum of 5% may be invested in hedge funds. In actuality, 70% to 90% of staff pension fund assets are invested in interest-bearing securities. However, the level of investment in stocks is greater than that of life insurance companies. Another form of company-based retirement plan, the *Pensionsfonds*, has existed in Germany since 2002. The *Pensionsfonds* is not bound to provide a minimum annual return, and is also not limited in its proportion of stock investments. The OECD assumes that German *Pensionsfonds* likely lost 8% of their value during the 2008 financial crisis.<sup>8</sup>

In the case of Riester pensions (a primary form of private pension in Germany that was introduced 2002), the financial crisis had varying effects depending upon whether a contract was set up as a building society savings plan, fund savings plan, or as pension insurance.<sup>9</sup> In prin-

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<sup>7</sup> See German Insurance Association (2009). The net return is based upon gross yield minus expenses (including write-offs) for capital investments as a percentage of the average value of the capital investment portfolio for the year. For calculating the net return from capital investments, all returns and expenses from capital investments are taken into consideration. The calculation thus also includes returns and losses from the outflow of capital investments as well as write-offs for securities and investment shares.

<sup>8</sup> See OECD (2009), p. 33, Figure 1.3. The assumed figure of -8% for other company pensions is seen as potentially over-pessimistic, see German Insurance Association (2009), p. 17.

<sup>9</sup> The returns used for Riester contracts represent a weighted arithmetic mean of returns from the different types of Riester contracts – insurance contracts, funds contracts and building society savings plans. Thus, the returns on Riester insurance contracts mirror insurance contract returns in general; returns from building society savings plans mirror interest paid on savings deposits; and returns on Riester investment fund contracts mirror trends in

principle, full repayment of contributions is guaranteed for Riester contracts – i.e. a nominal rate of return of at least zero is assured. The losses were greatest for Riester pension funds, since these were most affected by market fluctuations. For Riester insurance plans, the earlier comments about life insurance are applicable.

The interest rates on Riester building society savings plans are often tied to the interest rates for German government securities and/or the Euribor (the euro zone interbank lending rate), so a low rate of return on German government bonds can also have an impact on Riester pensions. However, since the Riester pensions use a floating interest rate (over many years), only sustained declines in interest rates can have negative effects. If we assume that (1) Riester insurance contracts had a similar rate of return as endowment life insurance policies; (2) that Riester funds had the same loss in asset value as the DAX; and (3) that Riester building society savings plans must have earned the same rate of return as savings plans in general, then for all types of Riester contracts in 2008, the weighted average return was around -4.3%. The returns from the three Riester categories were weighted according to their respective shares of the total number of contracts.

Overall, we can thus conclude that typical retirement products were far less affected by the financial crisis in their value or their returns than pure stock products. The loss of value in stock products, which amounted to more than -40% in 2008, is not a good barometer for the effects of the crisis on private retirement savings.

### **2.3 Smoothing Over Time**

It is important to recall that retirement plans represent very long-term investments, with investment terms generally extending over 25 years. Over such a long time horizon, short-term fluctuations are smoothed out to a considerable degree. A one-year investment with returns corresponding to the year-over-year change in the DAX would achieve an average return of almost 7% between 1970 and 2010. However, the return fluctuations are very large from year to year; the standard deviation in annual returns from such an investment over this time period is more than 24%. For DAX-indexed investments with five-year terms, the average return would be the same, but the standard deviation is less, at approximately 9%. In the case of a typical retirement investment with a time horizon of 30 years, the standard deviation is only 1.2%.

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stock and real estate investment funds. The weighting was performed according to the share each type of contract in the total number of Riester contracts.

In addition, retirement investments are generally made within the framework of a contract that calls for uniform deposits and withdrawals. This provides an additional measure of risk reduction, since the problem of finding the right moment to make an investment (i.e. the “timing risk”) is leveled out over a longer time frame – that is, additional average growth occurs beyond the time of entry. The standard deviation for an initial investment made in a single year during the period from 1970 to 2010 falls from 1.2% for a 30-year investment horizon to 0.57% with regular investments over the entire investment period and a 20-year withdrawal period.<sup>10</sup>

### **3. Portfolios Held by German Households before the Financial Crisis**

In the light of the foregoing considerations, we will now examine the actual effects of the financial crisis upon retirement assets held by German households, using the SAVE database. As a first step, we will describe the asset positions of German households based upon SAVE panel data.

The SAVE survey has been conducted since 2001, and on a yearly basis since 2005. It is a representative panel survey that aims to provide a precise picture of the savings and investment portfolio behavior of German households. In addition to gathering socio-demographic data, the survey collects detailed information on each household’s total assets.<sup>11</sup>

This study is based upon the asset stocks of SAVE households and the composition of their assets at the end of 2007, as reported in the 2008 SAVE survey. We limited the sample of 2,608 households polled in 2008 to those households that were re-surveyed in 2009. This reduces the sample size to 2,222 surveyed households, but it ensures comparability with the asset losses directly surveyed in 2009.<sup>12</sup> We also subjected the SAVE database to a multiple imputation procedure in order to avoid bias from item non-responses.<sup>13</sup> All findings are based upon five multiple imputed datasets weighted according to the 2008 German microcensus.

We then categorized the asset data to distinguish between monetary and retirement assets. Included in monetary assets are savings investments in the broadest sense, building society savings plans, stock and mutual funds, as well as fixed income securities (bonds) and other

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<sup>10</sup> In this regard, for a more detailed account, see Börsch-Supan, Gasche and Ziegelmeyer (2009), Section 3, especially figures 2 and 3 as well as table 1.

<sup>11</sup> See Börsch-Supan, Coppola, Essig, Eymann, and Schunk (2009).

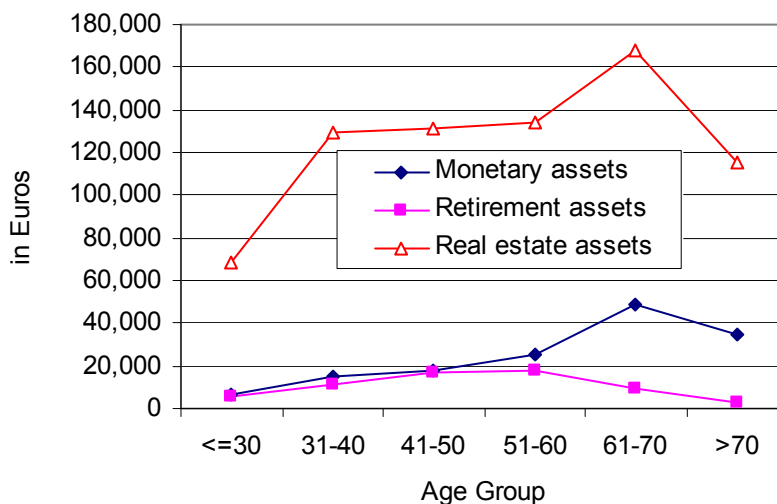
<sup>12</sup> See Börsch-Supan, Bucher-Koenen, Gasche and Ziegelmeyer (2009).

<sup>13</sup> See Schunk (2008) and Ziegelmeyer (2009).

securities. Included in retirement assets are endowment life insurance policies, company retirement plans, Riester and Rürup pensions, as well as private pension insurance contracts. Since these categories are not completely distinct – i.e. monetary assets may also serve to cover retirement costs, and, conversely, certain endowment life insurance policies may have maturation dates that allow them to be used prior to retirement – all asset categories are included in our considerations. Monetary assets and pension assets together constitute financial assets. A household's total gross assets are composed of these financial assets plus real estate assets.

Figure 1 shows the composition of gross total assets according to age groups. The monetary assets of SAVE households amounted to an average of nearly 24,800 euros per household at the end of 2007. Pension assets came to 11,400 euros, and real estate assets were 126,400 euros per household. Thus, real estate assets constitute by far the largest portion of total gross assets. Assets are low at younger ages and grow thereafter. As expected, retirement assets reach their maximum value in the age group of 51- to 60-year-olds. Real estate assets and monetary assets, however, reach their peak in the age group of 60- to 71-year-olds. Differentiating according to income, we find that with increasing income, there is a steep rise in the amount of assets, up to an average in the fifth quintile of 50,000 euros in monetary assets, 28,000 euros in pension assets, and over 250,000 euros in real estate assets. In the next section, we analyze the composition of monetary and pension assets.

**Figure 1: Gross Assets of German Households by Age Group, End of 2007**

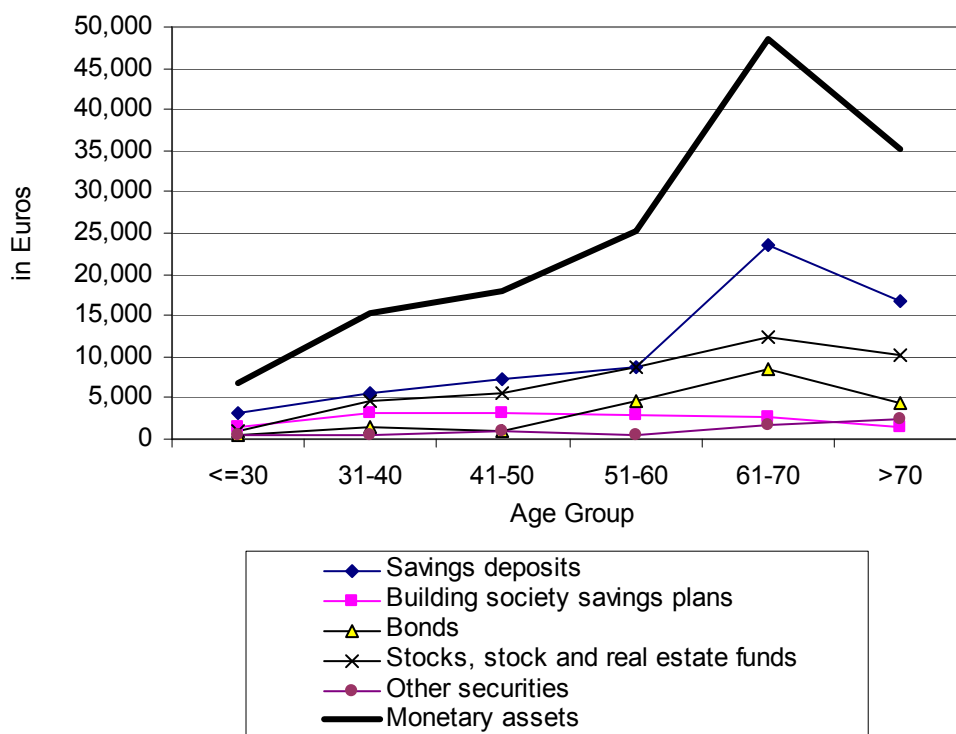


Source: SAVE, our own calculations.

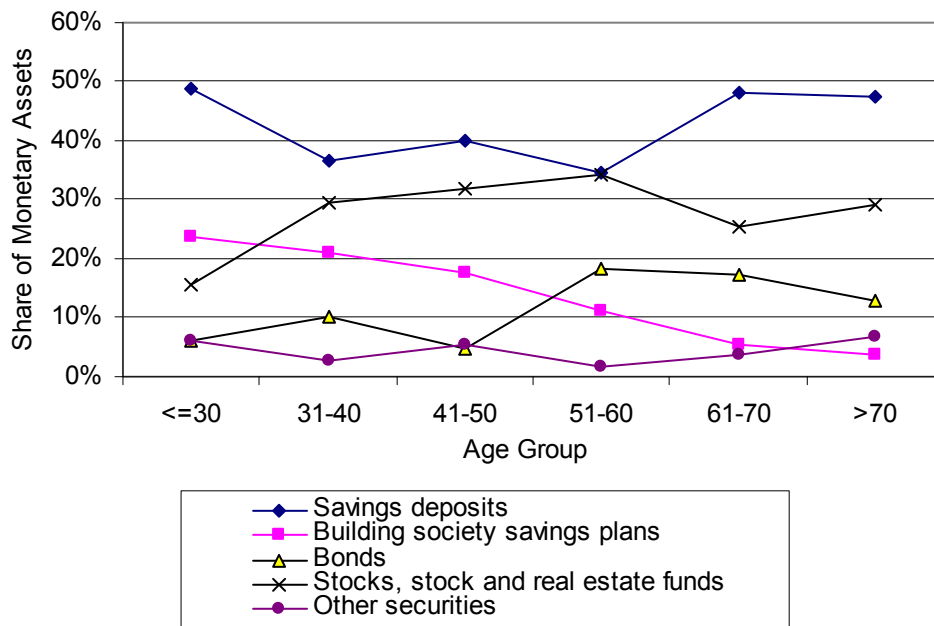
### 3.1 Monetary Assets

If we differentiate monetary assets according to age groups, the typical profile is of a gradual increase with age. Only at retirement age, when savings begin to be used for supplementing retirement income, do asset holdings begin to fall once again (figure 2). Savings deposits constitute the largest proportion of monetary assets throughout all age groups. Whereas they represented almost 50% of the monetary assets of younger and older persons, among the middle aged, riskier investments such as stocks and mutual funds have a somewhat larger share (figure 3).

**Figure 2: Monetary Assets of German Households by Age Group, End of 2007**

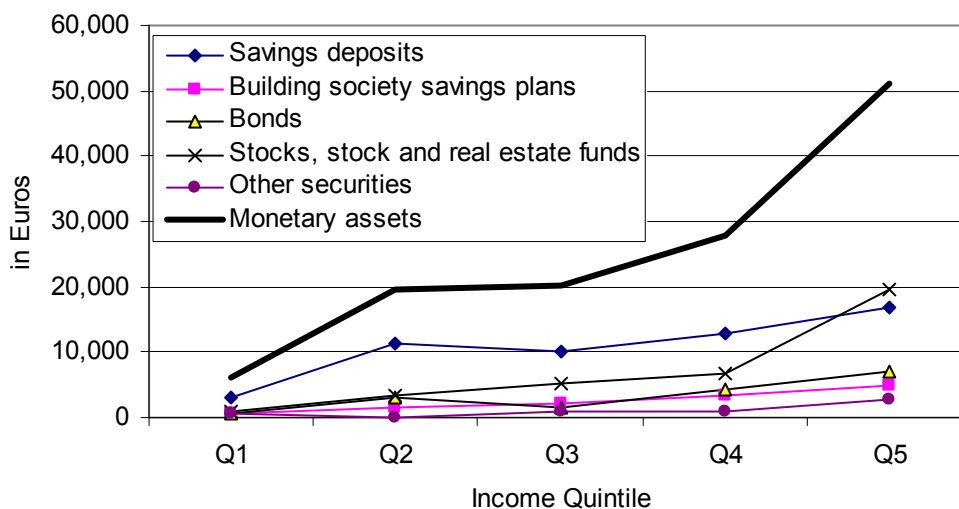


Source: SAVE, our own calculations.

**Figure 3: Structure of Monetary Assets by Age Group, End of 2007**

BSV: building loan contracts, WP: securities.  
Source: SAVE, our own calculations.

Differentiated according to **income groups**,<sup>14</sup> gross monetary assets rise steadily in proportion to income and reach over 50,000 euros in the fifth quintile (figure 4). The significance of savings deposits falls considerably with rising income, and the share of riskier stock and mutual fund investments rises significantly. In the fifth income quintile, stocks and mutual funds are actually the most prevalent form of investment, accounting for almost 40% of assets.

**Figure 4: Monetary Assets of Germany Households by Income Quintile, End of 2007**

Source: SAVE, our own calculations.

<sup>14</sup> This classification is determined according to net household income.

Differentiated by asset levels – as expressed in terms of quintiles of net total assets – a similar picture emerges as to that seen with income groups. On account of the well-known disparities in wealth distribution in Germany, the rise is especially steep for the uppermost quintile.<sup>15</sup>

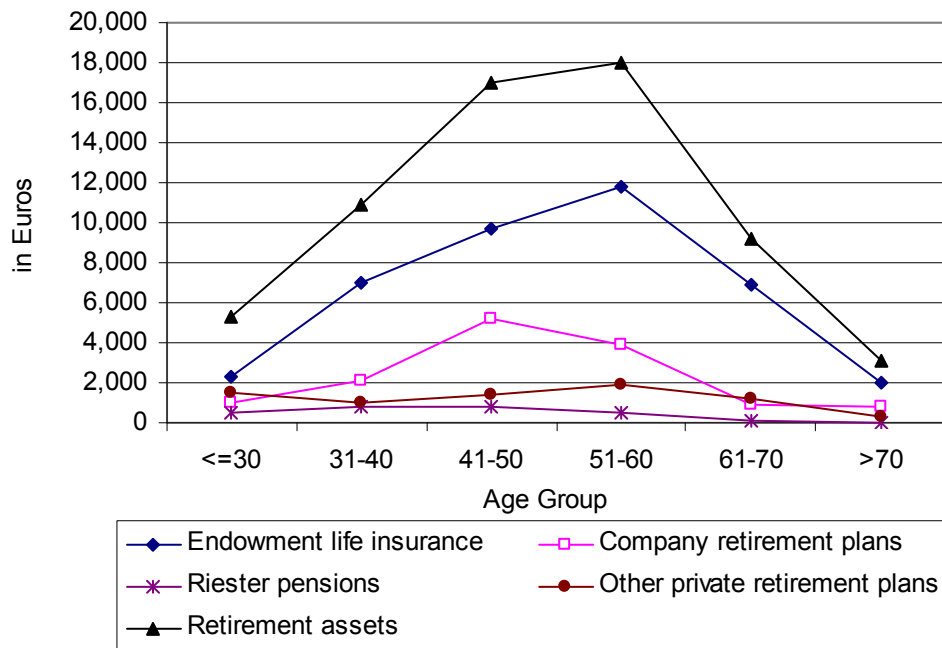
### **3.2 Retirement Assets**

Differentiated according to age, income, and total household assets, retirement assets show a similar pattern as monetary assets. First, they rise with the increasing age of the household, and begin to fall as expected for those over age 60 (figure 5). Classified according to income, retirement assets show a steady rise similar to that seen for quintiles of total assets (figure 6).

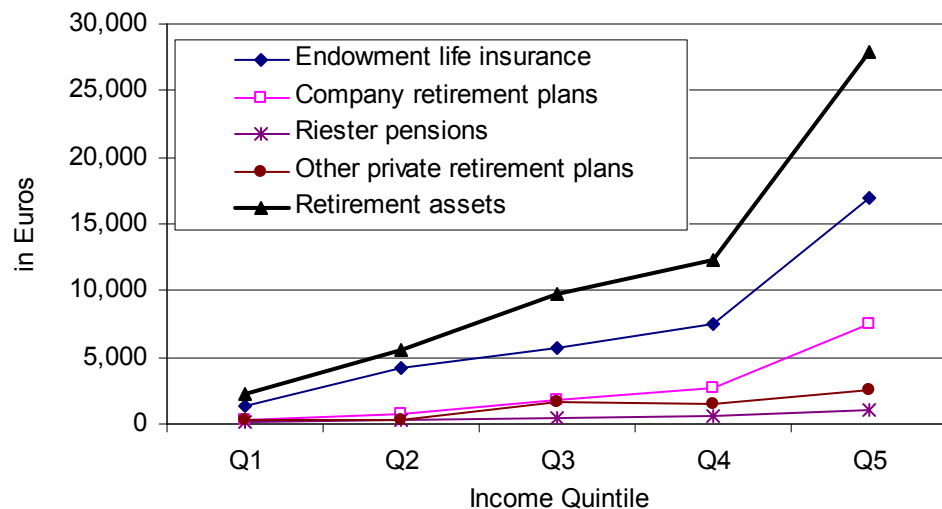
In comparison to monetary assets, retirement assets generally show smaller volumes throughout. Even for the highest income quintile and the highest asset quintile, average retirement assets do not exceed 30,000 euros. The most prevalent retirement asset type, regardless of age, income, or total assets, is the endowment life insurance policy. Riester pensions still represent only a small volume, since Riester pensions have only existed as pension option since 2002 and, as a consequence, there has been relatively little time for these assets to grow. The share of retirement assets attributable of Riester pensions should rise significantly in the future.

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<sup>15</sup> For a more detailed description, see: Börsch-Supan, Gasche and Ziegelmeyer (2009), figures 11 and 12 as well as figure 15.

**Figure 5: Retirement Assets of German Households by Age Group, End of 2007**

Source: SAVE, our own calculations.

**Figure 6: Retirement Assets of German Households by Income Quintile, End of 2007**

Source: SAVE, our own calculations.

The differential distribution of portfolio structures according to age and income allows us to conclude that households were affected by the financial crisis in very different ways. The next two sections will discuss these varied impacts, first regarding the short-term effects of the financial crisis, and the second regarding its long-term effects.

## 4. Short-Term Effects of the Financial Crisis in 2008

In this section, we estimate the effects of the financial crisis in 2008 on monetary and pension assets built up through 2007. We do this by comparing the return trends actually observed during 2008 for individual investment types to a hypothetical “no-crisis” reference situation. The differences in returns and asset values simulated in this way provide a picture of the impact of the financial crisis in 2008. We examine the SAVE households, differentiated according to age and income.<sup>16</sup> The asset losses and yield declines resulting from the crisis are closely linked to the 2007 household portfolio structure detailed in section 3. In our calculations, we carry forward the observed 2007 portfolio structure “as is” through the end of 2008.<sup>17</sup>

In our calculations, we use the returns from 2007 and 2008 presented in table 1.<sup>18</sup> For the hypothetical no-crisis reference situation, we essentially assume the same returns in 2008 as in 2007, with two significant exceptions. First, we assume that stocks did not maintain their unusually high returns seen in 2007, but instead stagnated. This assumption has an impact upon hypothetical returns from Riester pensions. Second, we assume that returns from Riester pensions were correspondingly lower in the reference scenario (3.75%), and thus lower than the returns in 2007.

### 4.1 Losses for the Average Household

Table 2 summarizes the core findings obtained across all SAVE households. As a result of the financial crisis, the average return on monetary assets in 2008 is estimated at -9.1%. Without the financial crisis, the return would have been 2.3%. The financial crisis is thus responsible for a difference in returns totaling -11.4 percentage points. Overall, retirement assets were less affected. On average, retirement investments still achieved positive returns of 1.7% in 2008. Without the crisis, returns would have amounted to 4.6%. The difference in returns from retirement assets for the average household is thus 2.9 percentage points. For all financial assets

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<sup>16</sup> An assessment differentiated according to asset classes may be found in Börsch-Supan, Gasche, and Ziegelmeyer (2009).

<sup>17</sup> The fact that the portfolio structure from 2007 was held constant may induce either an overestimation or an underestimation of losses. An overestimation would occur if households had altered their portfolios at the right time so as to minimize their losses. An underestimation would occur if households had sold at the low points and were not reinvested again as prices began to rise. Börsch-Supan, Gasche, and Ziegelmeyer (2009) explore alternative assumptions.

<sup>18</sup> Essentially, the crude classification of asset classes in SAVE only allows for a schematic presentation of the changes in returns. The many detailed conditions that influence returns from various forms of investment could not be considered. In addition, we did not have reliable information available about patterns of returns or losses in 2008 for specific asset categories.

(monetary assets plus pension assets), the difference in returns comes to 8.7 percentage points.

**Table 2: Average Returns for 2007 and 2008, With and Without the Financial Crisis**

	Monetary Assets			Retirement Assets			Financial Assets		
	2007	2008 without the crisis	2008 with the crisis	2007	2008 without the crisis	2008 with the crisis	2007	2008 without the crisis	2008 with the crisis
<b>Returns</b>	8.7%	2.3%	-9.1%	4.8%	4.6%	1.7%	7.5%	3.0%	-5.7%
<b>Difference in returns</b>		-11.4 percentage points			-2.9 percentage points			-8.7 percentage points	

Source: SAVE, our own calculations.

If one expresses these losses in euro values, the 2008 losses in comparison to a non-crisis reference situation add up to 2,824 euros per household for monetary assets and 335 euros for retirement assets (table 3). If one calculates the losses not in comparison to hypothetical non-crisis 2008 returns but instead in comparison to the actual asset situation in 2007, one finds a monetary asset loss of 2,264 euros. In the context of this comparison with the actual asset situation at the end of 2007, retirement assets actually increased by 191 euros, resulting in a total loss of 2,072 euros for overall household financial assets.

**Table 3: Absolute and Relative Asset Losses Caused by the Financial Crisis**

	Loss (-) or Gain (+)		
	Monetary Assets	Retirement Assets	Financial Assets
<b>Losses in comparison to hypothetical assets without the crisis</b>	€-2.824 (-4.6%)	€-335 (-1.9%)	€-3.159 (-4.3%)
<b>Losses in comparison to actual 2007 assets</b>	€-2.264 (-2.9%)	€191 (+0.4%)	€-2.072 (-1.8%)

Source: SAVE, our own calculations.

In a previous study, Börsch-Supan, Bucher-Koenen, Gasche, and Ziegelmeyer (2009) also asked SAVE households directly about their losses. If one compares their findings with table 3, there is a good correlation. Average self-reported asset losses were about 2,500 euros. Since the households that were surveyed were explicitly asked about losses, in order to improve comparability, one would need to adjust for possible positive return growth – for example, for households that only held savings accounts in their portfolio. If one then includes only those households with losses in the simulation calculations, the average asset losses in the

simulation would almost perfectly approximate the losses of 2,500 euros found in the survey. Nevertheless, the survey values are not directly comparable with the figures calculated here, since they are based upon self-reported estimates.

Average relative asset losses across all households were determined by first calculating the individual rate of loss for each household and then determining the average of all loss rates. This resulted in an average loss rate of 4.3% for financial assets in comparison to reference assets in 2008, and of 1.8% in comparison to actual assets at the end of 2007.

This last figure is lower than the actual loss figures that can be derived from the 2009 SAVE survey data. Based on these data, it is possible to determine that, on average, households experienced a 3.6% loss rate on their financial assets.<sup>19</sup> As some households show positive returns in the portfolio simulation compared to their assets at the end of 2007, these households tend to reduce the average asset loss rate. When households with positive returns are excluded in order to establish comparability with self-reported data (which only covers asset losses), then the average loss percentage increases to 3.3%, thus coming very close to the self-reported value of 3.6%.

The method used to calculate the relative losses shown in table 3 that is appropriate for microdata is  $\frac{1}{n} \sum_{i=1 \dots n} \text{Verlust}_i / \text{Vermögen}_i$ . From a macroeconomic viewpoint, however, the aggregate variables are often divided – that is, the aggregate or average asset loss is measured in relation to the aggregate or average reference assets  $\frac{1}{n} \sum_{i=1 \dots n} \text{Verlust}_i / \frac{1}{n} \sum_{i=1 \dots n} \text{Vermögen}_i$ . Calculated in this way, the rate of loss for financial assets is 8.5%, and for retirement assets the rate of loss is 2.8%.<sup>20</sup>

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<sup>19</sup> See Börsch-Supan, Bucher-Koenen, Gasche and Ziegelmeier (2009).

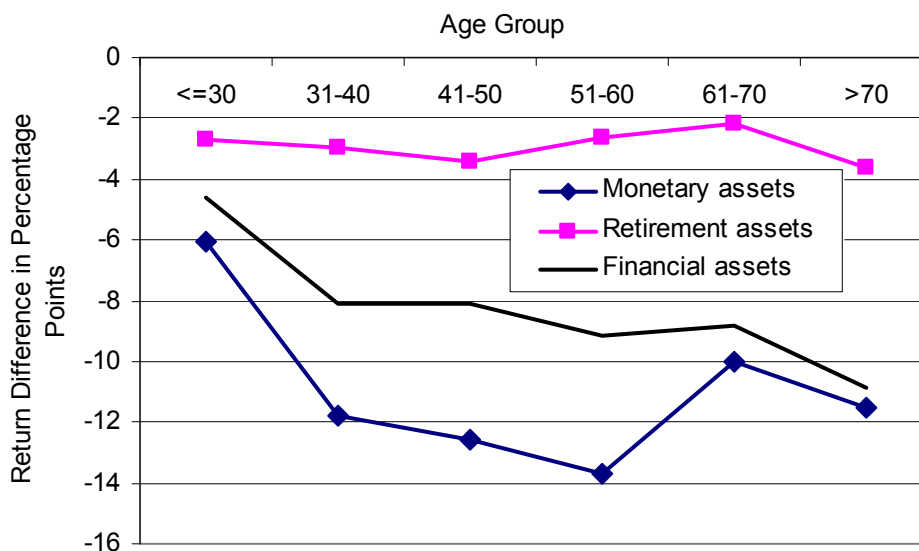
<sup>20</sup> One obtains a higher average percentage of loss than in table 3, since the rates of loss for households with lower financial assets are smaller than those of households with larger financial assets.

## 4.2 Differentiation by Age and Income

Since the financial crisis has especially affected returns from stock and mutual fund investments, it is households whose portfolios contain a large proportion of such investments that have experience the most severely negative effects. The structure of losses thus roughly reflects the proportion of stocks held in a household's portfolio.

If one differentiates the SAVE households according to age groups, the difference in returns for monetary assets compared to the non-crisis reference scenario amounts to between 6 and 14 percentage points (figure 7). Since the proportion of stock investments is greatest among 51- to 60-year-olds, the highest losses are seen in this group. For retirement assets, the loss drivers are lower yields from endowment life insurance policies as well as falling returns from Riester pensions (insofar as these are tied to investment funds) and company retirement plans. Due to the fact that Riester pensions and company retirement plans represent only a small proportion of retirement assets, retirement assets on the whole were not severely affected by the negative performance of the stock market.

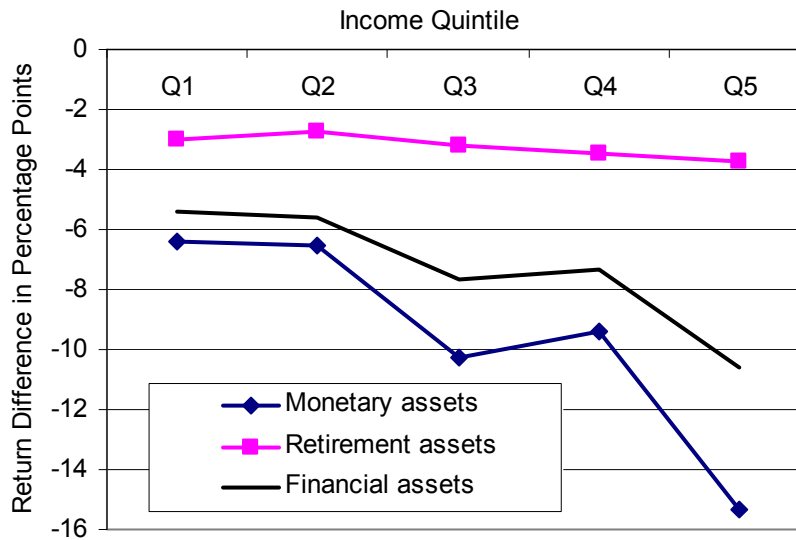
**Figure 7: Declines in Returns by Age Group in Relation to the No-Crisis Reference Scenario, 2008**



Source: SAVE, our own calculations.

A similar picture according to portfolio composition emerges if one differentiates households according to income (see figure 8).

**Figure 8: Declines in Returns by Income Quintile in Relation to the No-Crisis Reference Scenario, 2008**



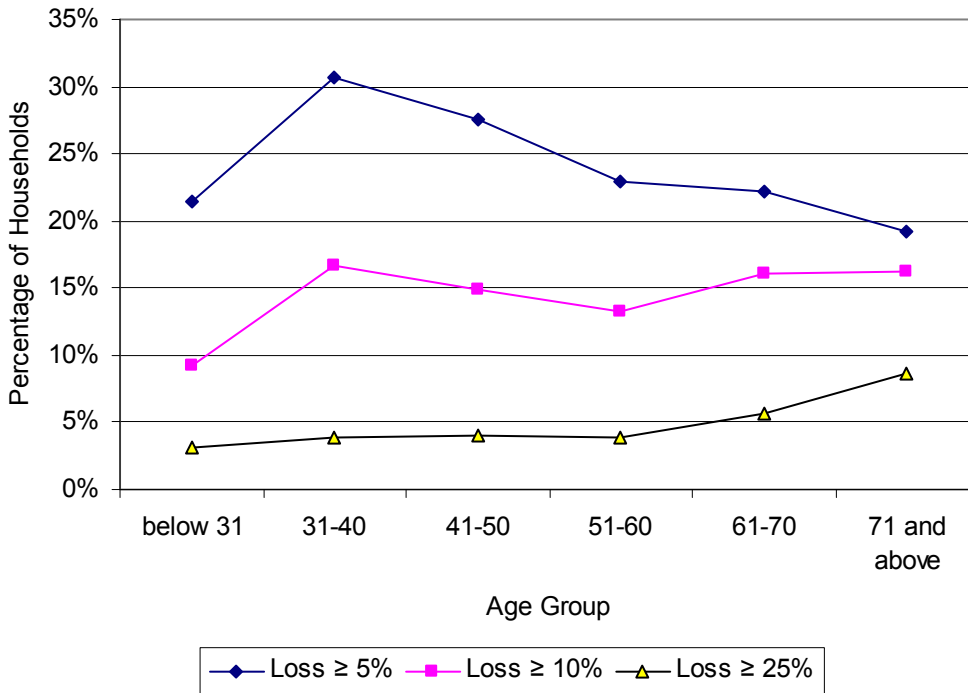
Source: SAVE, our own calculations.

### 4.3 Distribution of Losses

The SAVE database allows us to calculate not only the average losses for different age, income, and asset groups, but also individual losses for each household, which makes it possible to analyze the distribution of losses. Thus, 24.3% of the SAVE households suffered losses of at least 5% of their financial assets in 2008, if losses are calculated on the basis of the difference between simulated financial assets at the end of 2008 with and without the crisis. Among these households, 14.4% lost at least 10% of their financial assets. Only 4.8% of the households lost 25% or more of their financial assets.

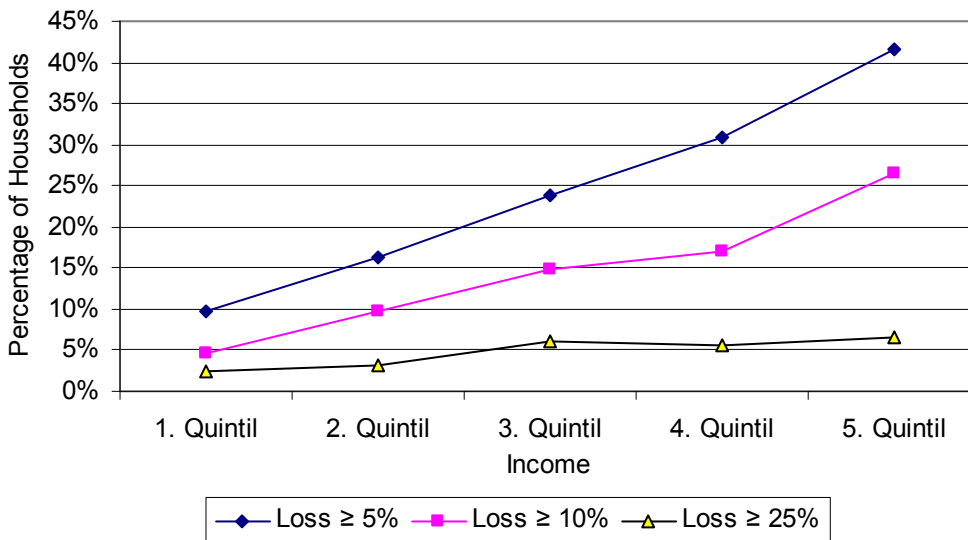
The youngest age group (up to 30 years) was least often affected by losses of more than 25% and 10% (figure 9). Extreme losses of more than 25% rose by age from 3.1% (age group up to 30) to 8.7% (age group over 70). The picture among losses above 10% and 5% is less consistent. Among households suffering at least 10% asset losses, there is an upward trend with age from 9.2% to 16.2%; however, the age group between 31 and 40 interrupts this pattern, with 16.7% losing 10% of asset or more. The higher proportional losses sustained by this age group are also reflected at the 5% loss level: 30.6% of households in the 31-to-40 age group had losses of at least 5%, whereas the corresponding share for the other age groups was generally around 25%.

**Figure 9: Proportion of Households by Age Group with Losses of at Least 5%, 10%, and 25% in Comparison to the No-Crisis Reference Scenario, 2008**



Source: SAVE, our own calculations. Losses as a percentage of financial assets.

**Figure 10: Proportion of Households by Income Quintile with Losses of at Least 5%, 10% and 25%<sup>a)</sup> in Comparison to the No-Crisis Reference Scenario, 2008**



<sup>a)</sup> Losses as % of financial assets.  
Source: SAVE, our own calculations.

By contrast, the pattern of losses according to income groups (figure 10) and total assets shows a consistent pattern. Along income quintiles, one finds a virtually linear increase from 9.7% to 41.6% of households suffering at least 5% losses. For losses of 10% or higher, the

proportion rises from 4.6% in the lowest quintile to 26.5% in the highest, while the difference for the 25% level ranges from 2.3% up to 6.6%. Similarly, one observes a steady rise across total asset quintiles from poor to rich.

To establish comparability with self reports on asset losses from SAVE households,<sup>21</sup> it is advisable (as previously described) to compare the simulated assets at the end of 2008 with the financial crisis to actual assets at the end of 2007. Using this comparison, an additional 16.7% of households are affected by losses of at least 5%. Even so, 11.4% of the households face losses of at least 10% and 4.4% of households contend with losses of at least 25%. These figures are higher than the self-reported results from SAVE households regarding asset losses in 2008. For example, according to self reports, only 9.3% of surveyed households had losses of more than 10% of their financial assets. We assume that the discrepancy of about 2 percent in this instance arises primarily from the fact that some households lacked knowledge about the magnitude of their own losses. This is also shown by the small proportion of households (about 20%) that reported experiencing any asset losses at all. Looking at more extreme asset losses, there is a discrepancy with self-reported outcomes that appears to operate in the reverse direction: in the context of self-reporting, 2% of the households indicated that they had suffered financial asset losses of at least 50%. In the simulation calculations, however, maximal relative asset losses are limited to -40% – i.e. the loss experienced if a household was exclusively invested in stocks. Therefore, the simulation calculations are unable to completely model the impacts suffered by individual households, since in reality, there may be households who owned assets whose value decreased by far more than 40% over the course of 2008 (for example, if they owned Lehman certificates, German bank stocks, commodity company stocks, or Chinese and Russian stocks).

Overall, what emerges both from the self-reported information and from the losses simulated in this study is that in 2008, the average household was only affected by a minor level of asset losses. However, there are households that have been severely affected by asset losses as a result of the financial crisis. The degree to which households were affected varies significantly as a function of household age, income, and total assets.

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<sup>21</sup> See Börsch-Supan, Bucher-Koenen, Gasche and Ziegelmeier (2009).

## 5. Long-Term Impacts of the Financial Crisis on Returns from Private Pensions

In the previous section, declines in returns in 2008 – the year in which the dislocations of the crisis were most severe – were considered. The discussion in section 2, however, showed that due to the long-term nature of retirement investments, fluctuations in returns are smoothed out and short-term losses can be counterbalanced. Furthermore, the effects of the financial crisis vary in relation to past savings behavior and to the period of time in which withdrawal payments may have been made prior to the crisis. This, in turn, is primarily determined by the age of the individual. Consequently, in this section we examine long-term return trends for different age cohorts and estimate cohort-specific declines in returns resulting from the financial crisis.

### 5.1 Assumptions and Long-Term Scenarios

In this subsection, we calculate the internal interest rate for a series of payments composed of savings contributions and pension benefits paid from accumulated assets. These calculations of returns are based upon an average SAVE survey participant who begins to build his or her pension assets at age 20 and saves 4% of his or her average income during each subsequent year.<sup>22</sup> The portfolio composition and thus the composition of savings contributions corresponds to that of the average SAVE household at the end of 2007 (see section 3). The beneficiary enters retirement at the statutory retirement age that is valid at that time. The duration of retirement corresponds to long-term life expectancy as projected by the German Federal Statistical Office.<sup>23</sup> It is assumed that the saved capital stock at the end of the contribution period leads to pension payments in equalized annuities. The pension payments are calculated such that all accumulated assets at the time of retirement are used up by the anticipated end of life.<sup>24</sup>

To establish the returns paid on capital stock saved in this way, we take the average yields from the assumed portfolio for pension assets and for all financial assets, minus a yearly de-

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<sup>22</sup> The average income for statutory social security was used in these calculations. For previous years, the actual growth rates were added on; for future years, the rates from the middle variant in the 2008 pension insurance report were used.

<sup>23</sup> Statistisches Bundesamt, *11. koordinierter Bevölkerungsvorausberechnung, Variante IW2*

<sup>24</sup> Thus, inheritances were excluded. Since we were basing our assumptions on the remaining life expectancy according to the Coordinated Population Projection of the Federal Statistical Office, and not from a higher life expectancy that might have been derived from life insurance mortality tables, the returns in this setting may seem to be somewhat too optimistic. In any event, this is somewhat compensated for by our pessimistic assumptions regarding management costs.

duction of 20% to cover the costs of privately funded pension products.<sup>25</sup> For the years from 1960 through 2007, we use historical returns. Accordingly, in the reference scenario we assume that the stock market index continues to grow at its long-term average annual growth rate for the time period from 1970 through 2007 – 8.15%. In order to make allowances for the impact of demographic change upon capital returns, a yield deduction is applied for each year through 2050. This deduction reaches a total one percentage point by 2050, so that the yield by 2050 is reduced to 7.15%.

For other investment types, we also introduce a return deduction in order to account for demographic change. For example, in the case of endowment life insurance policies it is assumed that even for 2009 the net return would be 4% lower than it would have been without the crisis. For 2010, we assume the original pattern of returns without the impact of the crisis is resumed once again. By 2050, according to our assumptions, the net return from endowment life insurance policies thus falls to 3.7%. On the basis of these different patterns of change in returns for individual investment classes, weighted average returns are computed for the three asset categories (monetary assets, financial assets and pension assets) based on the portfolio distribution in 2007.<sup>26</sup> The assets are then projected forward according to this rate of return from the year 2008 onward.<sup>27</sup>

Although it is subject to wide fluctuations, the annual interest return for financial assets from funded pension plans (without costs) thus falls into a range between 8.9% in 1960 and almost 3.7% in 2050, and for retirement assets it reflects a significantly more stable trajectory of returns between 5.8% and 3.6% (figure 11).<sup>28</sup>

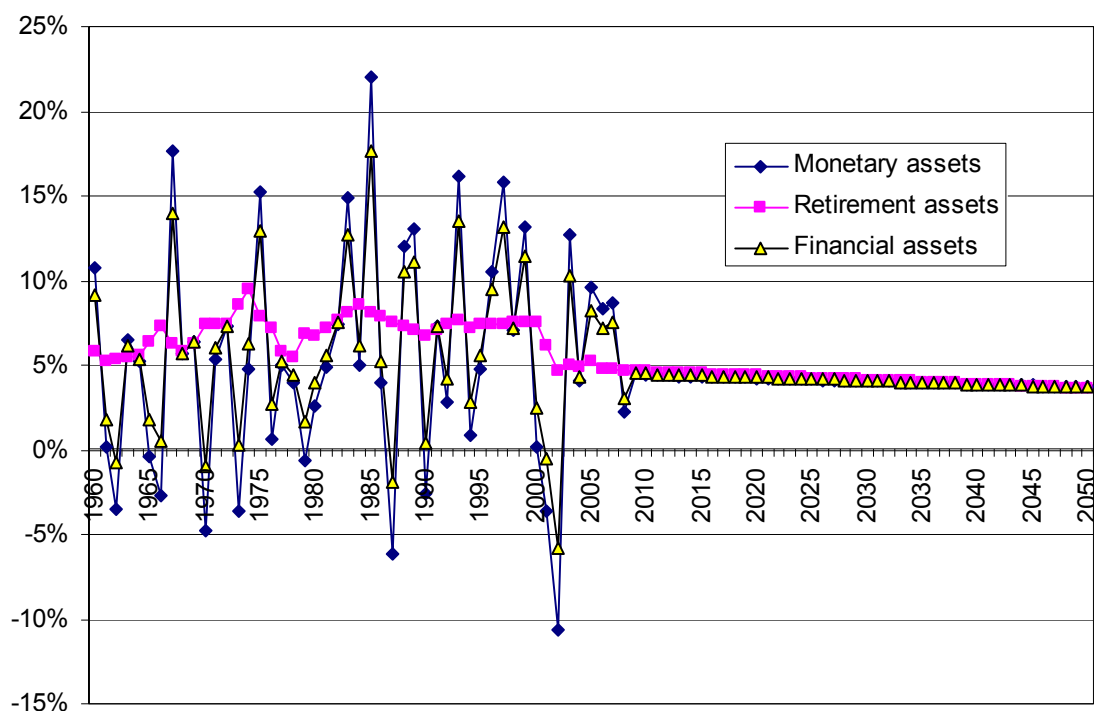
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<sup>25</sup> Thus, the returns from privately funded investments were calculated very prudently, especially since some investments, like savings accounts, do not charge any additional costs, since these costs are already incorporated in the lower interest returns of savings accounts. In addition, large government support-based boosts in returns from Riester contracts were not considered.

<sup>26</sup> This process carries the implicit assumption that the portfolio structure for new investments parallels the portfolio structure for assets in the initial year 2007.

<sup>27</sup> See course of returns in figure 27 from 2009.

<sup>28</sup> The rate of returns from monetary assets and from retirement assets, and thus also those from total financial assets, are very similar during the projection time period (values from 2009 in figure 11), since low-interest savings deposits represent a large proportion of monetary assets and thus compensate for the higher returns from stock investments, so that on average for all types of monetary assets, there is a similar rate of return as for the fixed-interest securities that are found in retirement assets.

**Figure 11: Returns by Investment Class**

Source: our own presentation.

We consider four scenarios:

- In **scenario 1 (reference scenario)** it is assumed that the financial crisis never occurred, and that the return trends for the individual asset classes described above are applied.
- In **scenario 2 (key scenario)** lower returns are first assumed for 2008 (see table 1). Thereafter, returns converge back upon the path they would have followed without the crisis.
- In **scenario 3 (pessimistic scenario)** it is assumed that the crisis has the effect of causing a long-term structural retreat in capital returns. Therefore, it is assumed that the average rate of return from 2010 onward is a tenth smaller than in scenario 2. Thus, there are long-lasting reductions in returns in comparison to the reference scenario.
- In **scenario 4 (optimistic scenario)** it is assumed that after the drop in returns, a counter-movement takes place with higher than proportional capital returns, so that from 2011 on, returns not only resume those in the reference scenario, but actually compensate completely for the earlier loss in assets.

## 5.2 Findings

For the reference scenario, our results show that the returns from funded private pension plans are highest for the age cohort born in 1940 (figure 12), since this group is able to profit most from earlier high rates of return. Thereafter, the cohort-specific returns of funded pension plans fall, since capital market returns also show a falling tendency. As a whole, returns for pension assets in the reference scenarios without the financial crisis range from 5.1% (1940 cohort) to 3.0% (2000 cohort). For financial assets as a whole, returns range from 4.7% to 3.0%. The somewhat lower returns for financial assets stem from the fact that low-interest savings deposits make up around 30% of all financial asset investments, thus leading to a lower average rate of return.

Scenario 2 is viewed as the “key scenario,” and will therefore be discussed more extensively. The financial crisis leads to a decline in returns for the birth cohorts from 1940 through 1990 that amounts to a maximum of 0.1 percentage points for retirement assets and a maximum of 0.2 percentage points for financial assets. Individuals born after 1990 will first begin to invest after 2010, and thus after the financial crisis, so they are not affected by it. The largest losses in returns are experienced by those who just entered retirement and those nearing retirement age, since they have accumulated considerable assets by the time of the crisis and thus suffer the most extensive losses. For them, there is hardly time to compensate for losses. Later birth cohorts have not accumulated as many assets, so their losses are small when compared to their accumulated lifetime savings. The large impact upon older cohorts should not be mentioned without also considering the absolute level of returns, since even with the financial crisis, older cohorts still witness far higher returns than younger cohorts (figure 12). The drops in returns for financial assets are greater than for retirement assets, since the drastic fall in the value of stock investments has had a greater impact on financial assets (figure 13).

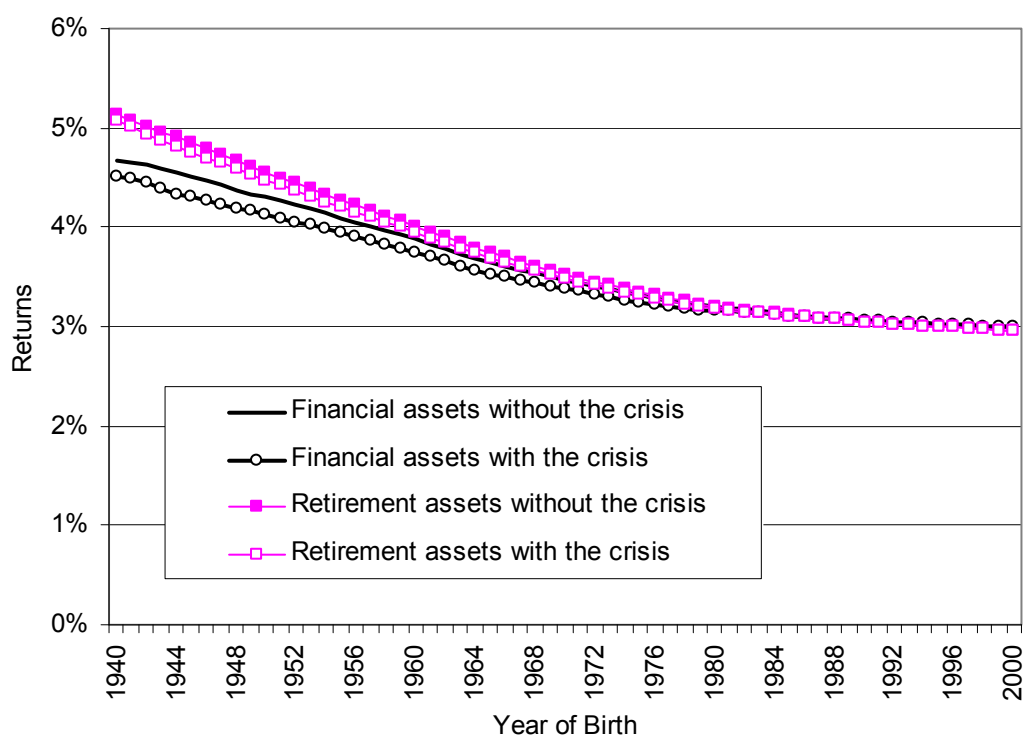
Scenario 2 is directly comparable to the scenarios simulated in the MEA study about the effects of the financial crisis on contribution-based statutory pensions.<sup>29</sup> In that study, it was assumed that the rate of increase in aggregate employee compensation would return to pre-crisis levels after a drop during the crisis. This corresponds to the assumption in our current study that capital returns will return to their pre-crisis levels following a period of decline. Therefore, the loss of returns calculated for Scenario 2 are fully comparable to those suffered by a beneficiary of the statutory pension insurance system as a result of the financial crisis. In this respect, from both a qualitative and quantitative viewpoint, these patterns are quite simi-

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<sup>29</sup> See Börsch-Supan, Gasche and Wilke (2009).

lar. The maximum decline in returns for statutory pension insurance according to various scenarios ranges from 0.1 to 0.3 percentage points,<sup>30</sup> which corresponds to the order of magnitude of the losses described in this study. In the statutory pension system, those most severely affected by the crisis are individuals who at the time of the crisis had already accumulated considerable investments in the form of *Entgeltpunkte* (earning points), which are the determinant of benefit amounts in the statutory system.<sup>31</sup> In private pension plans, those most severely affected are those who have saved large amounts of actual capital assets. Cohorts gainfully employed for the first time after the crisis or who first began accumulating assets after the crisis remain unaffected. Thus, impressive parallels emerge between contribution-based statutory pensions and funded private pension plans. Both forms of retirement provisions have been affected by the crisis. Yet the impacts have been limited.

**Figure 12: Returns from Private Pension Plans in the Crisis Scenario (Scenario 2) and No-Crisis Reference Scenario**

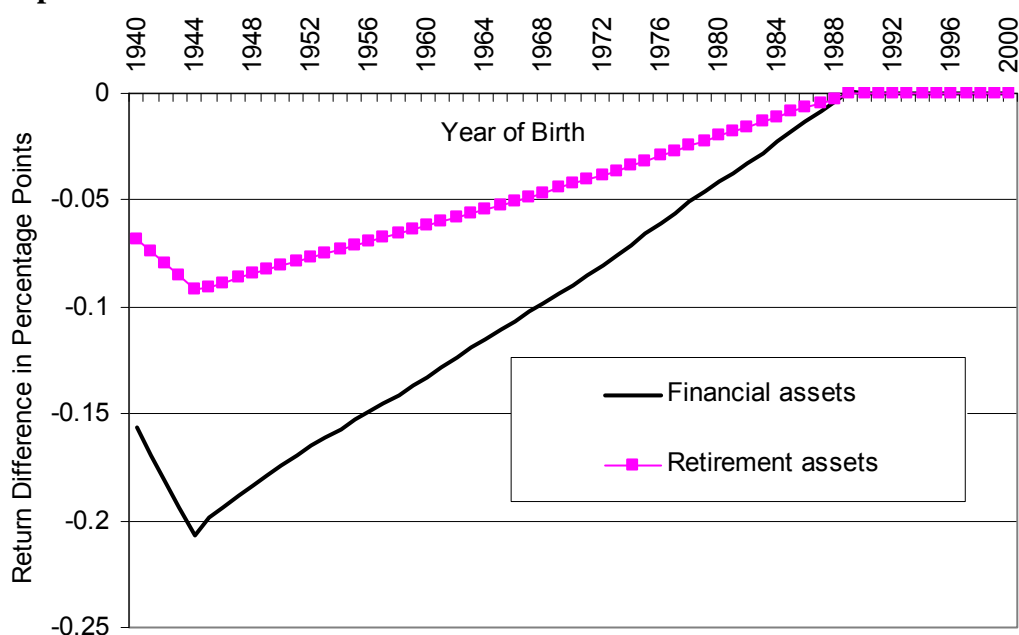


Source: SAVE, our own calculations.

<sup>30</sup> See Börsch-Supan, Gasche, and Wilke (2009), p. 87, figure 18.

<sup>31</sup> See Börsch-Supan, Gasche and Wilke (2009), chapter 7.

**Figure 13: Cohort-Specific Declines in Returns from the Financial Crisis (Scenario 2) in Comparison to the No-Crisis Reference Scenario**

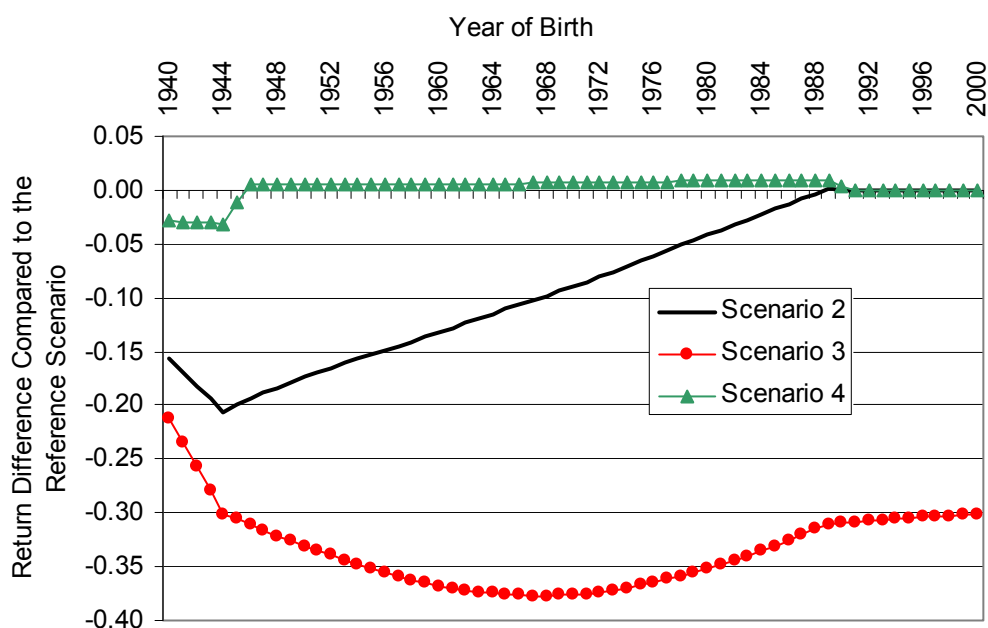


Source: SAVE, our own calculations.

If one assumes that there has been a structural reduction in returns (scenario 3), then the returns for individual age groups are lower for all cohorts (figure 14). The financial crisis thus also affects the very young. The greatest declines in returns are suffered by those born in the 1950s through the 1980s, since they are affected by both the financial crisis and the subsequent reduction in returns. By contrast, younger cohorts will be scarcely affected at all by the financial crisis, but they will still need to cope with its long-term indirect effects.

In the “optimistic scenario” (scenario 4), only the cohort from 1940 will experience minor declines in returns (figure 14). This can be attributed to the fact that this group, since its members are already retired, has to consume capital during the time of the crisis. Consequently, not all of the assets of this group profit from the post-crisis expansion. For other cohorts, because of the compensatory effects of the expansion following the crisis, there are virtually no long-term effects observable.

**Figure 14: Cohort-Specific Declines in Returns for Total Financial Assets in Comparison to the Reference Scenario**



Source: SAVE, our own calculations.

Our results also clearly show that for retirement assets that are invested over the long-term, long-term structural changes are far more significant than short-term fluctuations stemming from the economic cycle, even when allowing that such fluctuations might be quite severe. Thus, reductions in returns for younger generations on the basis of falling capital returns attributable to demographic change are much more significant than any reductions in returns caused by the financial crisis. The difference in returns between the 1940 cohort, which is hardly affected at all by the reduction in capital returns brought about by demographic change, and the 2000 cohort, which is fully affected, comes to more than 2 percentage points (figure 12). The financial crisis itself, even in the worst-case scenario 3, only leads to a fall in returns of 0.4 percentage points (figure 14).

## 6. Conclusions

The financial crisis has left its mark on private assets. Asset losses in 2008 considered in comparison with the no-crisis scenario amount to an average of about 3,000 euros. The average relative asset loss percentage for financial assets amounts to 4.3%. These losses rise in tandem with the share of stocks held in a household's investment portfolio. As a result, households with higher incomes and higher overall assets as well as households with older persons and persons of middle age have been most seriously affected by the crisis.

As a whole, retirement assets have been less drastically affected. Here, the relative loss is around 2%. This is mostly the result of the fact that the share of stocks in private pension investments is relatively low. In addition, the long-term nature of retirement investments tends to counterbalance the effects of significant but short-term crises. Finally, an additional smoothing of the long-term return trend is achieved due to the uniform contributions and disbursements from endowment insurance policies, pension funds, and savings plans.

While the average losses sustained by German households thus remain limited, there are nevertheless some households that have been badly shaken by the crisis. Thus, 14% of households lost at least 10% of their financial assets, and 4.8% of households had to absorb losses of at least 25% of their financial assets. In addition, older households were disproportionately affected by losses. This makes sense because for them, too little time remains to balance out their losses by accumulating additional savings.

The analysis of overall cohort-specific retirement returns with and without the financial crisis shows a moderate decline in returns of no more than 0.2 percentage points for financial assets. Those affected most severely are cohorts already in retirement and those nearing retirement, but in general, their returns are significantly higher than the returns for younger cohorts, even considering the effects of the financial crisis, since the structural decrease in capital returns induced by demographic change has a significantly greater impact than the financial crisis.

These findings display a remarkable degree of symmetry with the aforementioned study concerning the effects of the financial crisis on the contribution-based statutory pension system. The study demonstrated permanent asset losses in the form of the devaluation of *Entgelt-punkte* (earning points) totaling at between 5% and 8%, which is of an order of magnitude comparable to the losses calculated here of 2% (for pension assets) and 4% (for financial assets). The loss in implicit returns from statutory pension insurance caused by the crisis was quantified at between 0.1 and 0.3 percentage points, which is thus similar to the losses calculated here of 0.1% (for retirement assets) and 0.3% (for financial assets). Both analyses show the greatest impact upon those who are already retired and those about to retire, since these cohorts had already accumulated significant assets at the time of the crisis, either in the form of earning points or the form of financial capital.

Thus, neither the private nor statutory pension systems were entirely spared from the crisis. The effects have remained within certain bounds, however, such that the financial crisis in Germany has not led to a pension crisis. The symmetrical effects upon all systems demonstrate that a mixture of funded private retirement plans and a contribution system is best suited

for meeting current demographic challenges. The financial crisis has not changed this perspective at all, but instead, has actually strengthened this basic insight.

## 7. Literature

- Benz, T., B. Raffelhüschen, and Vatter, J. (2009): *Finanzmarktkrise und Altersvorsorge – Wie groß sind die Verluste wirklich?* Deutsches Institut für Altersvorsorge, Cologne.
- Börsch-Supan, A., F. Heiss, A. Ludwig, and J. Winter (2003): Pension Reform, Capital Markets, in: *German Economic Review* 4(2), p. 151-181.
- Börsch-Supan, A., M. Gasche, and C. Wilke (2009): *Auswirkungen der Finanzkrise auf die Gesetzliche Rentenversicherung, ihr Beitragszahler und ihre Rentner*, MEA study no. 9, Mannheim.
- Börsch-Supan, A., T. Bucher-Koenen, M. Gasche, and M. Ziegelmeyer (2009): *Deutsche Privathaushalte in der Finanz- und Wirtschaftskrise – Betroffenheit und Reaktionen*, MEA study no. 10., Mannheim.
- Börsch-Supan, A., M. Coppola, L. Essig, A. Eymann, and D. Schunk (2009): *The German SAVE Study: Design and Results*, MEA study no. 6, Mannheim.
- Börsch-Supan, A., M. Gasche, and M. Ziegelmeyer (2009): *Auswirkungen der Finanzkrise auf die private Altersvorsorge*, MEA Discussion Paper 193-09, Mannheim.
- Gesamtverband der deutschen Versicherungswirtschaft (GDV) (2009): *Bericht zur Geschäftsentwicklung 2008*.
- GVG – Gesellschaft für Versicherungswissenschaft und -gestaltung e.V. (Hrsg.) (2009): *Auswirkungen der Wirtschafts- und Finanzkrise auf die Alterssicherung*, Informationsdienst No. 328, Cologne, September 2009.
- Krüger, D. and A. Ludwig (2007): On the Consequences of Demographic Change for Rates of Returns to Capital, and the Distribution of Wealth and Welfare, in: *Journal of Monetary Economics*, 54(1), p. 49-87.
- Langer, T. and N. Nauhauser (2003): *Gibt es einen Cost-Average Effekt?* Working Paper, University of Mannheim.
- OECD (2009): *Pensions at a Glance 2009*, Paris.
- Schunk, D. (2008): A Markov Chain Monte Carlo Algorithm for Multiple Imputation in Large Surveys, *Advances in Statistical Analysis* 92, p. 101-114.
- Ziegelmeyer, M. (2009): *Documentation of the logical imputation using the panel structure of the 2003-2008 German SAVE Survey*, MEA Discussion Paper 173-09, Mannheim.