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(Working Papers)

The effect of age on portfolio choices:
evidence from an Italian pension fund

by Giuseppe G. L. Cappelletti, Giovanni Guazzarotti and Pietro Tommasino

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THE EFFECT OF AGE ON PORTFOLIO CHOICES: EVIDENCE FROM AN ITALIAN PENSION FUND

by Giuseppe Cappelletti*, Giovanni Guazzarotti* and Pietro Tommasino*

Abstract

Optimal Portfolio Theory prescribes that investors reduce their exposure to financial market risk as they get near to retirement. To assess the effect of ageing on portfolio choices, we study the case of an Italian defined contribution pension fund during the period 2002-08. We find that on average the willingness to hold risky assets does indeed significantly decrease with age, but we also document that inertial behaviour is quite widespread, and can be very costly.

JEL Classification: G21, G23.

Keywords: pension funds, portfolio.

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1 Introduction¹

In recent years, many countries have reformed their public pension system, tightening the eligibility rules and reducing the generosity of benefits (Feldstein and Siebert, 2002). Partly as a result, private pension plans have grown in terms both of assets under management and number of participants (OECD, 2009), becoming increasingly important as a means to provide adequate retirement income.

Contrary to social security schemes, private pension investment requires the worker to make several choices. He or she has to decide whether and how much to contribute, select the most appropriate portfolio and possibly decide when to withdraw. These choices are even more difficult in a time of financial turmoil, when both the probability and the cost of errors are magnified. There is evidence (e.g. Benartzi and Thaler, 2002) that investors do not exploit the freedom of choice granted by their pension plans in the best possible way.

In order to design rules and policies which help workers to get the most out of their pension investments, it is important to understand if and how investors' behaviour is systematically affected by individual characteristics, such as age and/or time to retirement, sex, financial education, income.

While there is an extensive body of research about pension plan participation decisions, far less attention has been devoted to portfolio allocation of fund participants. We aim to shed light on this issue looking at a new panel dataset collecting information on participants to a defined contribution (DC) pension fund for employees of an Italian middle-sized bank.

In particular, we are interested in assessing the effect of ageing on portfolio choices. According to recent optimal portfolio theories (see, e.g., Campbell and Viceira, 2002), investors should reduce their exposure to stock market risk as they get near to retirement. However, it is often found that in reality investors are quite inertial in their behavior.²

As far as we know, only two other papers have studied life cycle patterns in portfolio choices using panel data, both of which consider a sample of US workers. Agnew et al. (2003) use a four year panel of participants in a large 401(k) plan. They include age and time effects in their regression specification together with demographic variables. They find that "age has a negative effect on the share held in equities: each extra year translates into lower allocation to stocks by 93 basis points". Ameriks and Zeldes (2004) use a panel data set from TIAA-CREF (a large US pension fund, open to public sector teachers and university professors) and find that a substantial number of households do not own equities and that individuals seldom take direct action to change their portfolio allocation. Over a

¹The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Bank of Italy. We thank Sandro Momigliano, Giorgio Gobbi, and seminar participants at the Bank of Italy, the 10th Anniversary Conference of CERP (Turin, September 2009), the Netspar Pension Workshop (Amsterdam, February 2010) and LUISS (Rome, April 2010) for useful comments.

²Madrian and Shea (2001), Papke (2004), Agnew et al. (2003), Americks and Zeldes (2004), Mitchell et al. (2006), Biliias et al. (2009).

ten-year period, 44 percent of the sample made no changes to their allocation.

We believe that looking at investors outside the US is interesting because elsewhere the pension fund industry is relatively less developed, and the equity culture is less widespread (Guiso et al., 2003). Our sample is made up of a relatively homogeneous group of agents, characterized by a high degree of financial literacy, as they are mostly clerical and managerial workers in the banking sector. This clearly makes our sample not representative of the whole Italian population. However, it also implies that any deviation from optimizing/rational behaviour observed in our sample should be even more pronounced at the population level.

We use administrative data from an Italian DC pension plan. While administrative records contain relatively few variables for each individual, data of this kind have the important advantage, with respect to survey-based data, of recording actual choices, thereby also reducing the risk of measurement errors.

The observed period goes from 2002 to 2008. Each year fund participants choose to allocate their accumulated wealth in one of five sub-funds, which are unambiguously ranked in terms of their risk profile.³ Contrary to other papers, the set of alternatives is basically unchanged during the whole sample period.⁴

Our empirical analysis shows that on average age induces investors to reduce their exposure to equities, as recent theories predict. However, we also document that many of them are quite inertial in their asset allocation and that this can prove to be costly, as older workers might find themselves over-exposed to stock market risk.

The rest of the paper is organized as follows. In the second section, we describe the structure of the pension fund under examination. In the third section we outline the characteristics of our data set and present some summary statistics concerning investment choices and fund performance. In Section 4, we study the portfolio choices of the workers and the impact of age on the decision to switch from one sub-fund to another, controlling for several other possible determinants. In the last section, we draw some tentative conclusions and policy implications.

2 Fund structure

We draw our data from an Italian DC pension plan. Our dataset includes information on yearly individual investment choices for all 3,820 retirement accounts - outstanding for at

³This set up, which is typical in Italian employer-sponsored pension plans, is also common in other countries. For example, mandatory individual accounts systems in Chile and other Latin American countries allow workers to choose among a limited number of "lifestyle" funds. The same is true for the mandatory systems of Central and Eastern European countries. Other countries (for example Sweden and Australia) allow a much wider variety of choices (Tapia and Yermo, 2007).

⁴This may be important because it has been shown that the behaviour of participants may be impaired/distorted by a high degree of complexity (Choi et al., 2006) or by changes in the menu of investment options (Benartzi and Thaler, 2001, 2002).

least 1 year - from December 2002 to December 2008, for a total of 18,629 year-investor data points. The plan is sponsored by a medium sized Italian bank operating mainly in northern Italy and it is open to all the bank's employees. At the end of 2008, the plan covered about 97% of the workforce. Upon enrolment, participants choose one of the five sub-funds offered by the plan. Once a year, at the end of November, participants can switch between sub-funds and change the level of their contributions. They receive a letter reminding them of the deadline; an advisory service (Internet and telephone-based) is active throughout the year, helping participants to self-assess their risk preferences and to choose the appropriate sub-fund. If they choose to switch, the change is effective from 1 January of the following year. Participants can choose only one sub-fund among those offered by the plan; that is, they cannot divide their accumulated wealth among several sub-funds. When a participant chooses to switch, her entire wealth is disinvested from the previous sub-fund and moved into the new one. Our dataset includes information on yearly individual choices and on demographic and employment characteristics, such as gender, age, marital status, position and seniority of service. As is often the case with administrative data, it contains no information on non-retirement wealth and on income.⁵ This limitation is shared with the above-mentioned studies by Agnew et al. (2003) and Ameriks and Zeldes (2004).

The plan offers five sub-funds: guaranteed returns, money-market, bond, balanced bond and balanced equity. Each sub-fund has a target asset allocation, which the portfolio manager maintains during the year, rebalancing the portfolio when necessary. The money-market sub-fund is invested in euro-denominated money-market instruments (at least 80%) and other debt securities (up to 20%); the bond sub-fund is invested in euro-denominated money-market instruments (up to 20%) and other debt securities (at least 80%); the balanced sub-fund is invested in money-market instruments (up to 20%), other debt securities (up to 80%), and equities (up to 40%); the equity sub-fund is invested in money-market instruments (up to 20%), other debt securities (up to 50%), and equities (up to 60%).⁶ The precise asset allocation of each sub-fund in a given year is communicated to participants every year before they choose their sub-fund. Each sub-fund's return and that of its benchmark are published on a regular basis.

3 Summary statistics

3.1 Participants' characteristics

In Table 1 we present some statistics on the demographic characteristics of plan participants (information on salary, marital status and job position, as of December 2008) and compare

⁵ Actually, income is available only for the last period in our sample, and it is collinear with job position.

⁶ At the end of 2004, there was a change in the target asset allocation of the balanced bond and balanced equity sub-funds, whose target equity shares was increased respectively from 20 to 30 and from 40 to 60.

them with those of Italian private sector workers at large, taken from the latest wave (2006) of the Bank of Italy survey on household income and wealth (SHIW).⁷ Our sample of differs from the Italian population in several respects.

Workers in our sample have, on average, higher earnings than private sector workers in general and a higher level of education (94% have completed high school or college, compared with 44% of private sector employees). They are almost all clerical or managerial workers (98% of the total); mostly male (68%); relatively young (24% are less than 30 years old) and with relatively short job tenure (43% have less than five years of tenure).

About 40% of the participants has been in the sample for all the 7 years.

3.2 Investment choices

At the end of December 2008, 30% of fund participants had their wealth invested in the riskiest portfolio; 36% in the balanced one, 34% in the three remaining portfolios (Table 2).⁸ Through time, there has been a shift in the relative importance of the two riskiest portfolios, which are the only ones which invest in shares: in 2002 they were chosen by 75% of participants, in 2008 this proportion drops to 65%. This is probably related to the disappointing stock market performance during the observed period.

Switches only account for about 9% of all the investor-year observations: most participants confirm their previous portfolio choices most of the time (table 3).⁹ However, during our 7-years period, 25% of the 3,820 individuals observed switched at least once. The percentage rises to 48% among those that joined the plan from the start.

Male and female workers do not differ much in their portfolio choices, even though females switch slightly less than males (8,5% vs 9.9%).¹⁰ With respect to education, the main difference is between the least educated group (people with only a primary school certificate) and the others. Indeed, less than 60% of the former invest in shares, compared with more than 70% in the other groups. More educated switchers are more likely to switch toward more risky lines than less educated ones. There are no clear patterns with regard to job position.

Finally, sizable differences are apparent across age groups. In particular, while the share of those who choose the two sub-funds exposed to stock market risk is above 75% for those younger than 50, it drops to about 50% for those over 50. Moreover, the propensity to switch is higher for older workers, and in particular the elderly are relatively much more likely to switch toward less risky lines.

⁷The survey provides a representative sample of the Italian population. More information is available in Bank of Italy (2008).

⁸At the end of 2008 the total wealth accumulated in the fund amounted to €108 million.

⁹This may be due, at least partly, to the fact that the intention to shift has to be notified to the fund while the choice to remain in the same line is made tacitly.

¹⁰On gender differences in portfolio choices, see Barber and Odean (2001).

3.3 Performance

Looking at monthly annualized returns from 2002 to 2008, we can notice that our sample is characterized by two periods of low returns and high volatility in stock markets. The first started at end-2001 and lasted until mid-2003 and the second started in the summer of 2007, with the recent financial turmoil (Figures 1-3). In particular, in 2008 the annual return of the balanced equity line was equal to -28% while that of the balanced bond sub-fund was -7%. Investing in one of these portfolios would have implied a severe loss in investors' retirement wealth, especially harmful for older workers, given their shorter investment horizon. In this section we try to evaluate the effects of the decision to change sub-fund on realized returns.

First, we look at returns in the year following a switch. In the short term, changing sub-fund has been profitable, allowing the investor to gain on average more than 1% with respect to a passive conduct.

As one-period gains or losses are more important for workers approaching retirement, which do not have the option to wait for market values to recover, we made separate computations for older investors. Workers 50+ y.o. who switched sub-fund at least once earned on average a return 2.9% higher than those who did not. Moreover, in 2008 older workers who switched sub-fund avoided considerable losses which amounted on average to 25% of their retirement wealth, i.e. more than €22,000.¹¹

While looking at one-period-ahead returns might be a sensible approximation for older workers, this is of course not true for younger ones, who have a longer investment horizon. So we also compute gains and losses for the whole sample period. We consider the individuals that were present from the start to the end of the sample and decided to change only once, then compare their 7-years returns at the end of 2008 to what they would have earned if they had not switched. On average, the cumulative gains from switching amount to more than 18%.

4 Multivariate analysis

4.1 A simple empirical framework

For illustrative purposes let us consider a very standard mean-variance investor with utility function:

$$U(\alpha_{it}, \rho_{it}) = \alpha_{it}Er^s + (1 - \alpha_{it})r^b - \frac{1}{2\rho_{it}}Var(\alpha_{it}r^s + (1 - \alpha_{it})r^b),$$

¹¹As we remarked above, if they switch, older participants tend to switch to safer investment lines.

where we assume that there is a risky asset (with mean return $E r^s$ and variance of the returns equal to σ^2) and a riskless asset (with returns equal to $r^b < E r^s$) and that the worker can choose among 3 sub-funds (labeled 0,1 and 2), which differ in the fraction α of the risky asset in their portfolios (without loss of generality, let α be increasing: $0 = \alpha_0 < \alpha_1 < \alpha_2$). We assume ρ to vary systematically according to a set of individual-specific variables X_{it} and an idiosyncratic preference shift ε_{it} :

$$\rho_{it} = \beta X_{it} + \varepsilon_{it}.$$

This parameter measures the propensity to invest in the risky asset and it is thus linked to the degree of risk aversion: the higher ρ the more the investor is willing to accept risk in exchange for higher expected returns. In our simple set-up, it turns out that:

$$\begin{aligned} \alpha_{it} &= \alpha_0 \text{ if } 2\rho_{it} < \frac{\sigma^2}{E(r^s) - r^b}(\alpha_0 + \alpha_1) \\ \alpha_{it} &= \alpha_1 \text{ if } \frac{\sigma^2}{E(r^s) - r^b}(\alpha_0 + \alpha_1) < 2\rho_{it} < \frac{\sigma^2}{E(r^s) - r^b}(\alpha_1 + \alpha_2) \\ \alpha_{it} &= \alpha_2 \text{ if } 2\rho_{it} > \frac{\sigma^2}{E(r^s) - r^b}(\alpha_1 + \alpha_2) \end{aligned}$$

Under the standard normality assumption for ε_{it} it is straightforward to derive the conditional distribution of α_{it} given X_{it} :

$$\begin{aligned} P(\alpha_{it} = \alpha_0 | X_{it}) &= P(\beta X_{it} + \varepsilon_{it} < \frac{1}{2} \frac{\sigma^2}{E(r^s) - r^b}(\alpha_0 + \alpha_1)) \\ &= \Phi\left(\frac{1}{2} \frac{\sigma^2}{E(r^s) - r^b}(\alpha_0 + \alpha_1) - \beta X_{it}\right) \\ P(\alpha_{it} = \alpha_1 | X_{it}) &= \\ &\Phi\left(\frac{1}{2} \frac{\sigma^2}{E(r^s) - r^b}(\alpha_1 + \alpha_2) - \beta X_{it}\right) - \Phi\left(\frac{1}{2} \frac{\sigma^2}{E(r^s) - r^b}(\alpha_0 + \alpha_1) - \beta X_{it}\right) \\ P(\alpha_{it} = \alpha_2 | X_{it}) &= 1 - \Phi\left(\frac{1}{2} \frac{\sigma^2}{E(r^s) - r^b}(\alpha_1 + \alpha_2) - \beta X_{it}\right) \end{aligned}$$

where Φ is the cumulative density function of the normal distribution. Note that in this simple specification the thresholds do not vary across individuals.

This is an ordered probit model, where ρ plays the role of the latent variable and α_{it} is the observable choice variable, and it can be estimated using standard maximum likelihood techniques.

4.2 Expected asset allocation

We estimate the model described in the previous section on the pooled set of workers' choices for the 2002-2008 period. Besides age (summarized by four age dummies), we consider as possible determinants of the risk propensity parameter gender, marital status, education and job position. In all our regressions, we also include a full set of year dummies to capture unobserved time-specific effects, among which (perceived) changes in the process driving share prices. These time dummies are also interacted with the four age dummies, to check for possible changes over time of the age effect.

For the sake of clarity, we merge together the guaranteed return, the money-market and the bond sub-funds (however, we checked that results do not vary if we consider each of the five lines separately).

Tables 4 and 5 give our baseline estimation results: in the former table we report the estimated β coefficients, in the latter we report the average marginal effects of a change in the independent variables on the probability to choose each sub-fund. Table 6 shows how the probability of choosing each sub-fund changes through years and age classes.

Overall, the findings of the univariate analysis are confirmed. In particular, the reduction in equity-holding due to ageing is statistically significant. On average, the probability of being in a zero-share portfolio increases with age, while the reverse is true for the probability to be in the riskiest sub-fund. The effect is particularly strong for the fourth age bracket (50+ y.o.).

In order to better assess the economic significance of the effects (Wooldridge, 2002) we compute the expected fraction of equities in the chosen portfolio, α_{it} :

$$E(\alpha_{it}|X_{it}) = \alpha_0 P(\alpha_{it} = a_0|X_{it}) + \alpha_1 P(\alpha_{it} = a_1|X_{it}) + \alpha_2 P(\alpha_{it} = a_2|X_{it}).$$

The relationship between age and the holding of stocks changes across time, becoming stronger at the end of the sample; moreover, while in the first years of the sample the age-stockholding profile is hump-shaped, starting from 2006, it becomes monotonically negative (Table 7 and Figure 4). This may be due to the fact that workers - observing the losses suffered by their colleagues who retired during periods of declining share prices - have learnt that being exposed to stock market risk when they are near to retirement is very risky. In 2002 a married male with a white collar position and a high school degree can be expected to hold in equities a fraction of his portfolio equal to 37% if he is younger than 30, which drops to 25% if he is older than 50. In 2008, these two figures are 38% and 18%, respectively.

Concerning controls, being male and/or having a better job position decreases the probability of choosing a zero-share portfolio and increases the probability of choosing the riskiest portfolio in a statistically significant way (Table 5). No impact is instead attributable to education (in particular, a high school or a university diploma do not change the probability

of holding equities). This could be due to the easy set up provided by the fund, and/or to strong social interaction effects, such that the financial skills of the more educated workers benefit also the less educated participants. We also considered a less parsimonious specification in which age was interacted with all other controls. However, such interactions turned out to be not statistically significant. We can conclude that the relationship between age and portfolio does not differ for workers which are more educated or with a better job position. Finally, we also run a regression in which instead of the four age dummies we included age in years and age squared, but the results did not qualitatively change.

4.3 Conditional switching probabilities

In this section, we focus specifically on shifts from one sub-fund to another. As we saw above, most workers usually stay with the fund they have chosen, however 25% of them switch line at least once. Therefore it is worth examining the effect of ageing on the propensity to switch.

To this aim, we exploit the panel dimension of our data set and run our baseline regression conditional on the sub-fund chosen in the previous year. This also allows us to control for unobservable time-invariant characteristics.

We proceed in two steps. First, we run our baseline regression on different sub-samples, grouping people according to the sub-fund that they chose in period $t-1$ (Table 8). As before, dependent variables include dummies for gender, education, job position, marital status, years, and age.

Second, we use the estimated parameters to compute the conditional probability of switching from one sub-fund to another. The probabilities are summarized in conditional transition matrices (Tables 9, 10, 11 and 12).¹² The elements on the main diagonal of each matrix give, for a particular participant (e.g., a male, middle manager, higher educated, unmarried participant choosing his retirement account asset allocation in 2008), the probability of remaining in the old sub-fund; on the contrary, the elements off the main diagonal give the probability of switching from the sub-fund on the row to the one on the column. We compute different matrices for alternative settings of the X variables in order to assess the impact of each co-variate.

The age effect highlighted in the previous sections is again quite strong (Table 9). The probability of remaining in the riskiest sub-fund is 96% for a less-than-30 y.o. worker, falling to 85% for a 50+ y.o. worker. Moreover, the probability of switching towards less risky lines starting from the balanced one is much lower for the young than for the old participant (6% versus 18%).

The likelihood of switching towards less risky portfolios is higher at the beginning and

¹²A similar approach, applied to a different issue, is adopted by Nickell et al (2000).

at the end of the sample, when the returns from the stock market were particularly disappointing. In 2005 (a year of relatively bullish markets), the probability of not changing fund was 95% for those starting in the riskiest fund and 93% for those starting in the balanced fund. These probabilities were, respectively, 93% and 90% in 2008, and 87% and 86% in 2002 (Table 10). Most importantly, the probability of switching towards riskier lines for those in the zero-equities portfolios was much lower during the end-of-period and the beginning-of-period stock market crashes: indeed, for those starting from the no-shares lines, the probability was 18% in 2005, compared with 4% and 2% respectively in 2002 and 2008. The effect of job position on the probability of switching is not statistically significant (Table 11). This is different from what we found in the previous section, in which we studied the probability of being in a particular sub-fund. Finally, education has a positive but small impact on the probability of switching from the zero-equities fund towards the riskier ones. (Table 12).

5 Conclusions

We studied investors' portfolio choices in a very simple real-world setup. Some results prove quite robust across all the empirical exercises we performed. In particular, we found a pronounced tendency to choose safer portfolios as people age. This effect is still there after controlling for several demographic factors, for time effects, and for the sub-fund chosen in the previous period. This result is broadly in line with other micro-evidence from the US market, and is consistent with models of life-cycle rational portfolio allocation.

Still, not all elderly people in our sample reduced their exposure to risk. Looking at the ones present in the sample from the start, it turns out that more than 30% of the elderly workers who were exposed to stock market risk in 2002 were still exposed to it in 2008. As the stock market events of the last decade show, an elderly worker taking risk on the stock market could pay a high price if stocks fall. This evidence suggests that life cycle funds could be a valuable instrument, given that they automatically bring all the participants toward less risky allocations as they get near to retirement (Viceira, 2007). In the Chilean system, for example, a lifecycle fund is the default option for all the workers. Moreover, the riskiest sub-funds are closed to individuals older than a certain age.

The effect of age is more pronounced in the last years of the sample. This might be due to the fact that investors learn from the experience of their colleagues. Indeed, in our sample there have been periods of disappointing stock market performance. Having seen that people who retired during these bear market periods have been severely hit might have pushed investors toward a more active behaviour. A better understanding of this form of learning appears to be an interesting issue for further research.

We also find that job position has an impact on portfolio choice (but not on the prob-

ability of switching): people with a higher position tend to take more risks. This tallies with previous empirical analyses and can be consistent with optimal portfolio allocation (Brunnermeier and Nagel, 2008, Chiappori and Paiella, 2008 and Cappelletti, 2009). We also find that education has no clear impact on portfolio choices, even if it slightly increases the likelihood of switching for those in the zero-shares sub-funds. The weakness of this effect could be due to the easy set up provided by the fund, and/or to strong social interaction effects, in which the financial skills of the educated employees who make up most of our sample also benefit the few uneducated participants. As an issue for further research, one could investigate whether this is due to social interactions taking place among colleagues in the same bank's subsidiary (Dufflo and Saez, 2003).

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Figure 1: Fund performance net of management fees

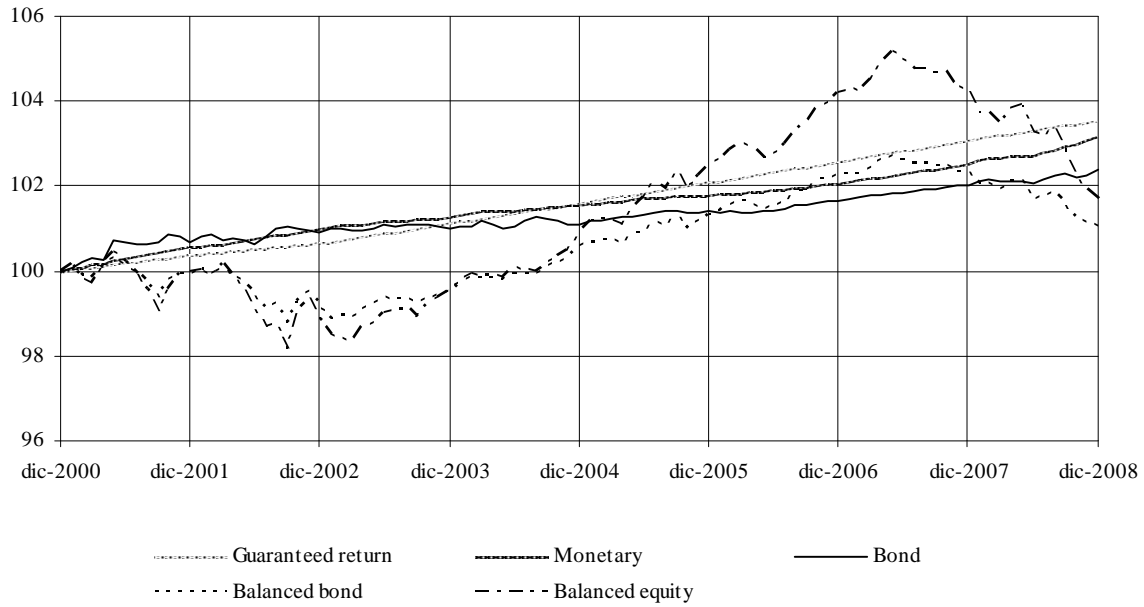


Figure 2: Annualized monthly fund returns

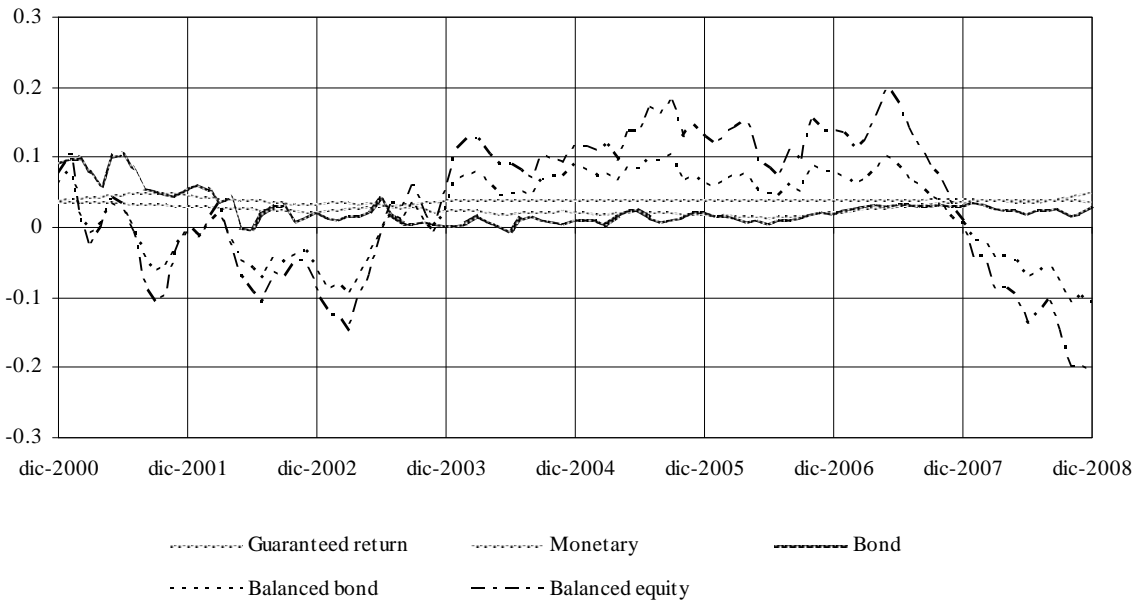


Figure 3: Standard deviation of annualized monthly fund returns

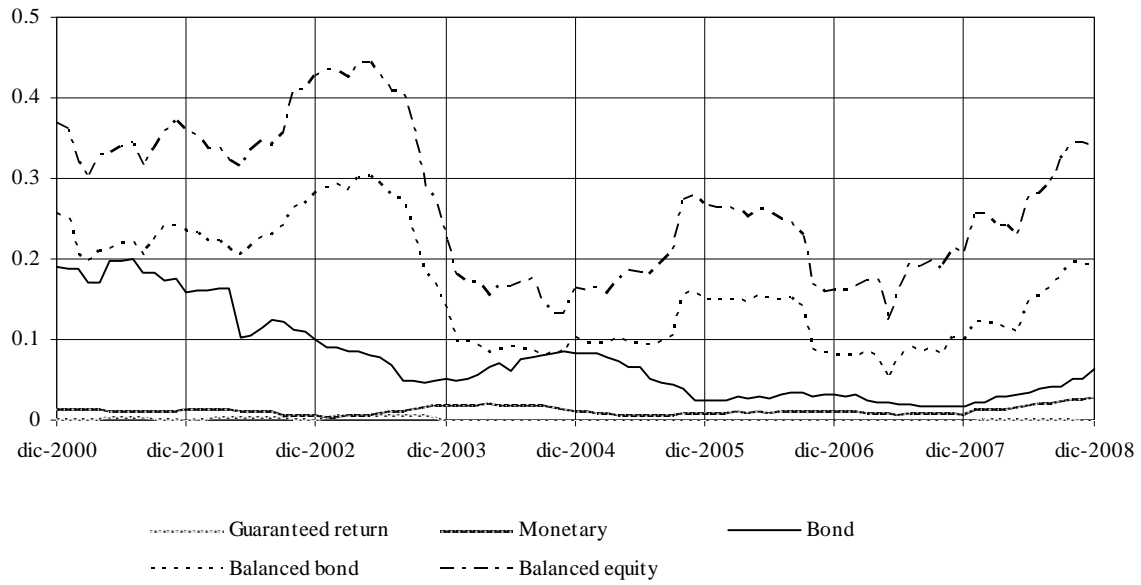


Figure 4: Model-based expected portion of equities by age and years (%)

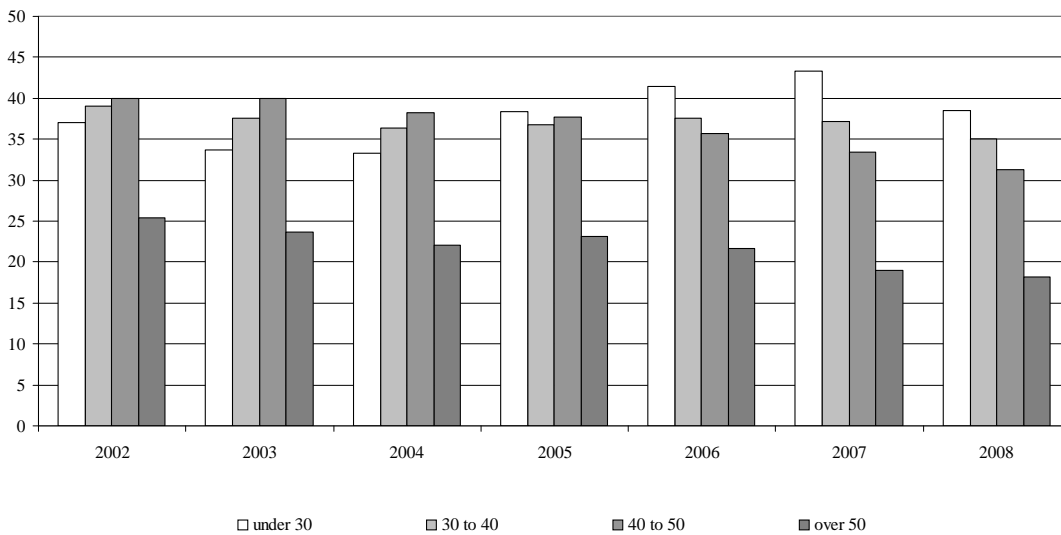


Table 1: Statistics on plan participants
(number of workers and percentages)

	All plan participants		Participants in the panel		Private sector employees	
	number	%	number	%	Private sector (%)	Financial sector (%)
Gender						
Female	1,216	31.8	496	30.5	38.7	49.4
Male	2,604	68.2	1130	69.5	61.3	50.6
Age						
Under 30	920	24.1	55	3.4	22.1	14.4
30-39	1,232	32.3	563	34.6	32.4	28.3
40-49	956	25.0	592	36.4	30.5	34.5
Over 50	712	18.6	416	25.6	15.0	22.7
Marital status						
Unmarried	1,517	39.7	405	24.9	59.6	61.8
Married	1,881	49.2	1100	67.7	32.6	26.4
No longer married	148	3.9	100	6.2	7.9	11.8
Unknown	274	7.2	21	1.3		
Education						
Elementary and middle school	188	4.9	117	7.2	56.3	12.5
High school	2,008	52.6	977	60.1	35.3	60.6
University	1,572	41.2	530	32.6	8.4	26.9
Unknown	52	1.4	119	7.3		
Job position						
Blue collar	76	2.0	18	1.1	63.6	0.3
White collar	2,450	64.1	906	55.7	30.6	76.5
Middle management	1,221	32.0	651	40.0	4.0	18.1
Senior management	73	1.9	51	3.1	1.6	5.1
Salary (thousands of euros)						
Up to 25	188	4.9	83	5.1	92.3	55.6
25-35	1,793	46.9	505	31.1	5.2	24.7
35-45	774	20.3	500	30.8	1.7	14.1
45-55	434	11.4	257	15.8	0.3	2.6
55 +	631	16.5	281	17.3	0.6	3.1
Tenure (years)						
Less than 5	1,635	42.8	1	0.1	-	-
5-14	1047	27.4	723	44.5	-	-
15-24	449	11.8	369	22.7	-	-
25-34	562	14.7	479	29.5	-	-
35 +	127	3.3	54	3.3	-	-
Entry-exit						
Enrolled for 8 years (panel)	1,626	42.6	-	-	-	-
Enter late	1,922	50.3	-	-	-	-
Exit before December 2008	476	12.5	-	-	-	-
Enter late and exit early	130	3.4	-	-	-	-
Unknown	18	0.5	-	-	-	-
Total	3,820	100.0	1626	100.0	-	-

Note: Statistics for private sector employees are taken from the 2006 wave of the Bank of Italy survey on household income and wealth (SHIW).

Table 2: Statistics on choices among sub-funds
(number of observations and percentages)

	Composition of observations by fund (per cent)					Observations
	Guaranteed return	Monetary	Bond	Balanced bond	Balanced equity	
Total	1,372	1,723	2,097	7,301	6,136	18,629
Year						
2002	2.0	7.8	14.9	39.9	35.3	1,980
2003	3.6	8.9	16.0	37.8	33.7	2,119
2004	6.5	7.9	12.5	40.2	32.9	2,228
2005	7.8	6.3	9.7	40.5	35.8	2,390
2006	9.3	6.1	8.0	41.6	35.0	2,907
2007	9.1	10.6	10.0	39.5	30.8	3,490
2008	9.6	14.4	10.6	35.7	29.7	3,515
Gender						
Female	4.7	8.1	13.0	43.9	30.3	5,782
Male	8.6	9.7	10.5	37.1	34.1	12,847
Age						
Under 30	4.4	7.1	11.3	37.1	40.1	4,256
30-39	6.1	7.4	10.2	39.8	36.5	6,229
40-49	7.6	7.4	9.6	41.5	33.9	5,006
Over 50	13.4	18.9	15.9	37.0	14.8	3,138
Marital status						
Unmarried	5.2	7.0	11.4	38.8	37.6	6,635
Married	8.9	9.9	10.4	39.8	30.9	10,492
No longer married	6.3	4.6	12.2	42.4	34.5	870
Education						
Less than high school	6.8	17.0	17.9	38.1	20.1	1,010
High school	7.6	8.8	12.0	39.8	31.8	10,251
University	7.1	8.8	9.3	38.5	36.2	7,292
Job position						
Blue collar	1.6	14.2	16.2	51.8	16.2	247
White collar	6.1	8.1	11.5	40.2	34.2	11,622
Middle management	9.5	11.1	10.7	37.2	31.5	6,331
Senior management	14.5	11.0	9.3	34.3	31.0	429
Salary (thousands of euros)						
Up to 25	6.5	9.2	14.2	38.0	32.2	911
25-35	5.3	7.4	10.4	40.7	36.2	8,095
35-45	8.1	9.3	13.8	38.2	30.7	4,328
45-55	8.2	12.1	11.3	37.7	30.6	2,346
55 +	11.7	11.9	9.0	38.1	29.3	2,949
Tenure (years)						
Less than 5	6.0	9.7	11.5	35.8	36.9	6,899
5-14	7.4	7.3	9.6	40.3	35.6	5,346
15-24	5.6	6.9	11.7	42.5	33.2	3,271
25-34	11.2	12.7	12.9	42.6	20.6	2,763
35 +	19.7	25.1	14.9	31.1	9.1	350

Table 3: Statistics on switches between sub-funds
(number of decisions and percentages)

	Total investment decisions	No change	Switching to a new fund	Switches over total decisions (%)	Switches to a safer fund over total switches (%)	Switches to a riskier fund over total switches (%)
Year						
2002	1,861	1,521	340	18.3	86.5	13.5
2003	1,966	1,864	102	5.2	84.3	15.7
2004	1,984	1,704	280	14.1	64.3	35.7
2005	2,156	1,965	191	8.9	44.0	56.0
2006	2,341	2,094	247	10.6	64.4	35.6
2007	2,887	2,712	175	6.1	72.0	28.0
2008	3,490	3,250	240	6.9	87.1	12.9
Gender						
Female	5,095	4,664	431	8.5	67.1	32.9
Male	11,590	10,446	1,144	9.9	74.2	25.8
Age						
Under 30	5,857	5,373	484	8.3	57.0	43.0
30-39	5,125	4,624	501	9.8	71.9	28.1
40-49	4,094	3,700	394	9.6	81.5	18.5
Over 50	1,609	1,413	196	12.2	92.3	7.7
Marital status						
Unmarried	5,575	5,100	475	8.5	61.3	38.7
Married	9,859	8,868	991	10.1	77.1	22.9
No longer married	829	764	65	7.8	80.0	20.0
Education						
Elementary/middle school	978	883	95	9.7	87.4	12.6
High school	9,318	8,446	872	9.4	77.2	22.8
University	6,322	5,727	595	9.4	62.5	37.5
Job position						
Blue collar	223	205	18	8.1	83.3	16.7
White collar	10,190	9,267	923	9.1	65.9	34.1
Middle management	5,854	5,267	587	10.0	81.6	18.4
Senior management	418	371	47	11.2	76.6	23.4
Salary (thousands of euros)						
Up to 25	830	761	69	8.3	60.9	39.1
25-35	6,850	6,275	575	8.4	59.8	40.2
35-45	4,102	3,667	435	10.6	77.5	22.5
45-55	2,187	1,969	218	10.0	84.9	15.1
55 +	2,716	2,438	278	10.2	82.7	17.3
Tenure (years)						
Less than 5	5,081	4,703	378	7.4	57.1	42.9
5-14	5,293	4,778	515	9.7	68.0	32.0
15-24	3,230	2,896	334	10.3	76.9	23.1
25-34	2,745	2,429	316	11.5	90.5	9.5
35 +	336	304	32	9.5	90.6	9.4
Total	16,685	15,110	1,575	9.4	72.3	27.7

Table 4: Ordered probit model: pooled regression
(parameter estimates)

variable	coef.	variable	coef.
Gender		Age	
Female	-	Under 30	-
Male	0.1094*** (0.0189)	from 30 to 40	0.2276*** (0.0704)
Education		from 40 to 50	0.3557*** (0.0714)
Primary/middle school	-	Over 50	-0.3435*** (0.0824)
High school	0.1781*** (0.0418)	Time of the choice	
University	0.1851*** (0.0438)	2002	-
Job position		2003	-0.1111 (0.0737)
Blue collar workers	-	2004	0.0961 (0.0746)
White collar workers	0.1462** (0.0688)	2005	0.3123*** (0.0732)
Middle management	0.1636** (0.0707)	2006	0.4789*** (0.0673)
Senior management	0.2366*** (0.0906)	2007	0.2863*** (0.0649)
Marital status		2008	0.2045*** (0.0674)
Unmarried	-	cut 1	-0.2049 (0.0875)
Married	-0.0165 (0.0209)	cut 2	0.8812 (0.0876)
No longer married	0.111*** (0.0422)	Observations	14665
		pseudo R-squared	0.0352

Note: Ordered probit model estimated on the whole pooled sample. The dependent variable takes values 0, 40, and 60, conditional on the participant investing in a zero-shares fund, balanced bond fund or balanced equity fund.

All explanatory variables are dummies. Results for the interaction terms between age and year dummies are omitted. The reference dummies are: female, primary and middle school, blue collar workers, unmarried, 2002. Significance levels: 1% (***), 5% (**), 10% (*).

Table 5: Ordered probit model: pooled regression
(average marginal effects)

variable	Zero-share fund		Balanced bond fund		Balanced equity fund	
	coeff.	std.	coeff.	std.	coeff.	std.
Gender						
Female	-	-	-	-	-	-
Male	-0.0368 ***	0.006	-0.0032 ***	0.001	0.04 ***	0.007
Education						
Less than high school	-	-	-	-	-	-
High school	-0.043	0.032	-0.0078	0.009	0.0508	0.040
University	-0.0061	0.006	-0.0007	0.001	0.0068	0.007
Job position						
Blue collar	-	-	-	-	-	-
White collar	-0.0866 ***	0.023	0.0033	0.004	0.0833 ***	0.020
Middle management	-0.0996 ***	0.024	0.0018	0.004	0.0978 ***	0.020
Senior management	-0.1304 ***	0.028	-0.0045	0.006	0.1348 ***	0.029
Marital status						
Unmarried	-	-	-	-	-	-
Married	0.0077	0.007	0.0008	0.001	-0.0085	0.008
No longer married	-0.0323 **	0.013	-0.0059 **	0.003	0.0382 **	0.016
Age						
Under 30	-	-	-	-	-	-
From 30 to 40	0.0199 ***	55.000	0.0115 ***	0.003	-0.0315 ***	0.010
From 40 to 50	0.0354 ***	0.009	0.0104 ***	0.003	-0.0458 ***	0.011
Over 50	0.2993 ***	0.012	-0.0386 ***	0.005	-0.2608 ***	0.010
Time of the choice						
2002	-	-	-	-	-	-
2003	0.0252 **	0.011	0.002	0.004	-0.0273 **	0.013
2004	0.0443 ***	0.011	0.0042	0.004	-0.0485 ***	0.013
2005	0.022 **	0.011	0.0031	0.004	-0.025 *	0.013
2006	0.02 *	0.011	-0.0027	0.004	-0.0174	0.013
2007	0.0356 ***	0.010	-0.009 **	0.004	-0.0266 **	0.012
2008	0.075 ***	0.011	-0.0001	0.004	-0.0749 ***	0.012

Changes in the population average probability of choosing a sub-fund when the value of a dummy variable changes from zero to one.

The reference dummies are: female, less than high school, blue collar, unmarried, 2002. Results on the interaction terms between age and year dummies are omitted.

Significance levels: 1% (***); 5% (**), 10% (*).

Table 6: Model-based probabilities of choosing a certain sub-fund
(percentage points)

	2002	2003	2004	2005	2006	2007	2008
<i>Zero-share fund</i>							
under 30	18.4	23.2	23.7	16.7	12.8	10.9	16.5
from 30 to 40	15.9	17.8	19.3	18.8	17.6	18.3	21.3
from 40 to 50	14.7	14.6	16.8	17.5	20.3	23.5	27.0
over 50	37.1	40.5	43.8	41.5	44.4	50.1	51.7
<i>Balanced bond fund</i>							
under 30	39.7	41.3	41.4	38.8	36.0	34.0	38.7
from 30 to 40	38.3	39.4	40.1	39.9	39.3	39.7	40.8
from 40 to 50	37.5	37.5	38.9	39.3	40.5	41.4	41.9
over 50	41.0	40.1	39.1	39.8	38.9	36.5	35.7
<i>Balanced equity fund</i>							
under 30	41.8	35.5	34.8	44.5	51.1	55.1	44.7
from 30 to 40	45.8	42.8	40.6	41.3	43.0	42.0	37.9
from 40 to 50	47.8	47.9	44.2	43.2	39.2	35.1	31.2
over 50	21.9	19.3	17.1	18.7	16.7	13.4	12.5

Note: Estimated probabilities implied by the ordered probit model. The reference is a male, white collar, high school and married worker.

Table 7: Expected asset allocation
(percentage points)

	2002	2003	2004	2005	2006	2007	2008
under 30	37.0	33.7	33.3	38.4	41.5	43.3	38.4
from 30 to 40	39.0	37.5	36.4	36.7	37.6	37.1	35.0
from 40 to 50	39.9	40.0	38.2	37.7	35.7	33.5	31.3
over 50	25.4	23.6	22.0	23.2	21.7	19.0	18.2

Note: Model implied expected shares of stocks assuming that the zero-share, balanced bond and balanced equity funds have values equal to 0%, 30% and 60% respectively. The reference is a male, white collar, high school, married worker.

Table 8: Ordered probit model: separate regressions
(parameters estimates)

	Zero-shares fund	Balanced bond fund	Balanced equity fund
Male	0.0910 (0.0760)	0.108** (0.0449)	-0.0614 (0.0587)
Primary and middle school	-	-	-
High school	0.534*** (0.206)	0.0482 (0.0889)	-0.0198 (0.125)
University degree	0.660*** (0.211)	0.132 (0.0956)	-0.0261 (0.132)
Blue collar workers	-	-	-
White collar workers	0.433 (0.411)	-0.111 (0.143)	0.376 (0.256)
Middle management	0.230 (0.418)	-0.143 (0.148)	0.304 (0.257)
Senior management	0.476 (0.462)	-0.0696 (0.205)	0.535* (0.290)
Married	-0.101 (0.0776)	0.0124 (0.0464)	-0.138** (0.0559)
Under 30 y.o.	-	-	-
From 30 to 40 y.o.	0.212** (0.0972)	-0.192*** (0.0637)	-0.225*** (0.0787)
From 40 to 50 y.o.	0.148 (0.121)	-0.204*** (0.0703)	-0.317*** (0.0875)
over 50 y.o.	-0.378*** (0.142)	-0.618*** (0.0775)	-0.706*** (0.105)
2002	-	-	-
2003	-0.0964 (0.253)	0.504*** (0.0815)	0.590*** (0.106)
2004	0.847*** (0.225)	0.531*** (0.0883)	0.0902 (0.0806)
2005	0.855*** (0.226)	0.827*** (0.0845)	0.499*** (0.0957)
2006	0.686*** (0.229)	0.806*** (0.0826)	0.0203 (0.0792)
2007	0.124 (0.238)	0.674*** (0.0772)	0.229*** (0.0865)
2008	-0.239 (0.249)	0.266*** (0.0746)	0.361*** (0.0919)
cut 1	2.942*** (0.474)	-1.215*** (0.165)	-1.616*** (0.288)
cut 2	3.612*** (0.476)	2.439*** (0.170)	-1.206*** (0.286)
Observations	3761	6565	5592
pseudo R-squared	0.1183	0.0605	0.0454

Note: The table shows parameter estimates of ordered probit models run separately for participants starting from a zero-share, balanced bond and balanced equity funds.

The reference is a female, primary and middle school, blue collar, unmarried, under 30 y.o., 2002. Significance levels: 1% (***) ; 5% (**), 10% (*).

Table 9: Model-based conditional transition matrix by age
(percentages)

Initial fund	Chosen fund		
	Zero-shares	Balanced bond	Balanced equity
<i>under 30 years old</i>			
Zero-shares	98.7% -	1.1% -	0.2% -
Balanced bond	6.2% -	92.1% -	1.7% -
Balanced equity	1.6% -	2.6% -	95.8% -
<i>from 30 to 40 years old</i>			
Zero-shares	97.8% (-1.93)	1.8% (1.98)	0.4% (1.66)
Balanced bond	8.9% (3.02)	90.0% (-2.85)	1.1% (-2.57)
Balanced equity	2.8% (2.76)	3.9% (2.93)	93.3% (-2.89)
<i>from 40 to 50 years old</i>			
Zero-shares	98.1% (-1.19)	1.6% (1.2)	0.3% (1.13)
Balanced bond	9.1% (2.9)	89.9% (-2.76)	1.0% (-2.5)
Balanced equity	3.5% (3.35)	4.5% (3.63)	92.0% (-3.56)
<i>over 50 years old</i>			
Zero-shares	99.5% (1.84)	0.4% (-1.92)	0.1% (-1.49)
Balanced bond	17.9% (7.14)	81.8% (-6.43)	0.3% (-4.34)
Balanced equity	7.7% (4.54)	7.8% (6.02)	84.6% (-5.34)

Note: The reference individual is a male worker, white collar, with a high school degree, married, choosing the investment fund at the end of 2008. The percentages show model-based probabilities to switch from the initial fund (rows) to the chosen fund (columns); the values within parentheses show the t-statistics of the difference between the probability in the same cell and the corresponding probability in the reference matrix (the top matrix). Probabilities in bold are statistically different from those of the reference matrix at the 5% significance level.

Table 10: Model based conditional transition matrix by year
(percentages)

Initial fund	Chosen fund		
	Zero-shares	Balanced bond	Balanced equity
<i>year 2002</i>			
Zero-shares	96.2% -	3.1% -	0.7% -
Balanced bond	14.0% -	85.5% -	0.5% -
Balanced equity	6.1% -	6.7% -	87.2% -
<i>year 2005</i>			
Zero-shares	82.1% (-4.73)	12.3% (4.73)	5.6% (3.95)
Balanced bond	2.8% (-7.19)	93.1% (4.51)	4.0% (5.8)
Balanced equity	2.0% (-4.48)	3.1% (-5.14)	94.9% (4.92)
<i>year 2008</i>			
Zero-shares	97.8% (0.85)	1.8% (-0.86)	0.4% (-0.8)
Balanced bond	8.9% (-3.35)	90.0% (3.23)	1.1% (3.17)
Balanced equity	2.8% (-3.64)	3.9% (-3.79)	93.3% (3.79)

Note: The reference individual is a 30-to-40 years old male worker, white collar, with a high school degree and married. The percentages show model-based probabilities to switch from the initial fund (rows) to the chosen fund (columns); the values within parentheses show the t-statistics of the difference between the probability in the same cell and the corresponding probability in the reference matrix (the top matrix). Probabilities in bold are statistically different from those of the reference matrix at the 5% significance level.

Table 11: Model-based conditional transition matrix by job position
(percentages)

Initial fund	Chosen fund		
	Zero-shares	Balanced bond	Balanced equity
<i>blue collar workers</i>			
Zero-shares	99.3% -	0.6% -	0.1% -
Balanced bond	7.3% -	91.3% -	1.4% -
Balanced equity	6.3% -	6.8% -	86.9% -
<i>white collar workers</i>			
Zero-shares	97.8% <i>(-1.55)</i>	1.8% <i>(1.55)</i>	0.4% <i>(1.49)</i>
Balanced bond	8.9% <i>(0.84)</i>	90.0% <i>(-0.88)</i>	1.1% <i>(-0.69)</i>
Balanced equity	2.8% <i>(-1.09)</i>	3.9% <i>(-1.28)</i>	93.3% <i>(1.17)</i>
<i>middle management</i>			
Zero-shares	98.7% <i>(-0.7)</i>	1.1% <i>(0.69)</i>	0.2% <i>(0.72)</i>
Balanced bond	9.4% <i>(1.05)</i>	89.6% <i>(-1.11)</i>	1.0% <i>(-0.84)</i>
Balanced equity	3.3% <i>(-0.93)</i>	4.4% <i>(-1.07)</i>	92.3% <i>(0.99)</i>
<i>senior management</i>			
Zero-shares	97.5% <i>(-1.1)</i>	2.0% <i>(1.12)</i>	0.4% <i>(1)</i>
Balanced bond	8.3% <i>(0.34)</i>	90.6% <i>(-0.34)</i>	1.2% <i>(-0.34)</i>
Balanced equity	1.9% <i>(-1.33)</i>	2.9% <i>(-1.62)</i>	95.1% <i>(1.46)</i>

Note: The reference individual is a 30-to-40 years old male worker with a high school degree, married, choosing the fund at the end of 2008. The percentages show model-based probabilities to switch from the initial fund (rows) to the chosen fund (columns); the values within parentheses show the t-statistics of the difference between the probability in the same cell and the corresponding probability in the reference matrix (the top matrix). Probabilities in bold are statistically different from those of the reference matrix at the 5% significance level.

Table 12: Model-based conditional transition matrix by education (percentages)

Initial fund	Chosen fund		
	Zero-shares	Balanced bond	Balanced equity
<i>lower than high school</i>			
Zero-shares	99.5% -	0.5% -	0.1% -
Balanced bond	9.7% -	89.4% -	0.9% -
Balanced equity	2.7% -	3.8% -	93.5% -
<i>high school</i>			
Zero-shares	97.8% (-2.43)	1.8% (2.53)	0.4% (1.91)
Balanced bond	8.9% (-0.53)	90.0% (0.52)	1.1% (0.56)
Balanced equity	2.8% (0.16)	3.9% (0.16)	93.3% (-0.16)
<i>university</i>			
Zero-shares	97.0% (-2.86)	2.4% (3.02)	0.5% (2.16)
Balanced bond	7.6% (-1.29)	91.1% (1.23)	1.3% (1.48)
Balanced equity	2.9% (0.2)	3.9% (0.2)	93.2% (-0.2)

Note: The reference individual is a 30-to-40 years old male worker, white collar, married, choosing the investment fund at the end of 2008. The percentages show model-based probabilities to switch from the initial fund (rows) to the chosen fund (columns); the values within parentheses show the t-statistics of the difference between the probability in the same cell and the corresponding probability in the reference matrix (the top matrix). Probabilities in bold are statistically different from those of the reference matrix at the 5% significance level.

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