Current identifiable biases in Italian 401(k) plan enrollment decisions: default bias and extremeness aversion

Abstract

Previous researches have demonstrated that consumer's decisions could be affected by some biases even in supplementary pension field. In particular decision-making is very often not guided by reason, and in many cases, if forced to choose, people will decide not to decide, passively accepting the decisions made for them by others.

Such behaviour deserves to be analyzed and studied in order to better understand its consequences, and determine whether the latter can be turned to the advantage of the decision-makers themselves. Using a database of 24 401(k) plans representing 1,732,530 employees, this paper examines the presence of default bias and extremeness aversion in Italian workers' choices regarding the supplementary pension system, as a result of the new rules enacted by the regulator in 2007. The results provide insights important for public policy with reference to the possibility of including these biases in the regulations, with the aim of benefiting employees.

Introduction

The picture portrayed by the OECD survey on supplementary pension systems up to 2007[1] reveals significant differences between European countries. In the Anglo-Saxon countries, the Netherlands and Switzerland, where supplementary pension systems are well established, assets under management in pension funds represent about 70% of GDP. On the other hand, in countries such as Italy, Spain and France where supplementary pension systems are less developed, assets under management in pension funds represent only about 10% of GDP. In these countries therefore, when calculating the 'substitution ratio'[2], public welfare plays a very relevant and significant role.

In many countries important regulatory changes were introduced in 2007, with the aims of furthering the spread of a supplementary pension system, strengthening the rules regarding pension fund government and improving communication between pension funds and participants. Some of the resulting intervention will be applied in future years. For example, in the U.K. as of 1 January 2012 a mechanism for automatic enrollment with supplementary pension funds has been introduced, unless the employee expresses his/her intention to opt out. This mechanism is similar to that introduced in the U.S. with the Pension Protection Act, approved in 2006 and in force since 1 January 2008. The most important part of this reform is the mechanism of employees' automatic enrollment on 401(k) plans, unless the employee expresses a contrary intention (opting out). The aim of this reform is to increase participation in supplementary pension systems, especially by younger workers with lower incomes[3].

With reference to Italy, on 1 January 2007 the Government introduced an important and wide-ranging reform of the pension system[4], designed primarily for employees, with the aim of increasing and developing the supplementary pension scheme in the country. The reform, explained to employees by means of flyers and announcements in mainstream mass media, basically presented workers with three alternatives to choose from, two explicit and one tacit. The two possible expressed alternative options are:

a) to indicate the name of the pension fund the employee wants to enroll with. This pension fund will collect the employee's contribution, that of the employer, and the accumulated severance pay;

b) to declare his/her willingness to leave the accumulated severance pay with the employing company and therefore decide not to enroll with any pension fund. In this case, if the company has more than fifty employees, the employer must switch the accumulated severance pay to the 'Treasury fund' held by the National Social Security Institute (INPS)[5].

If the employee does not express any choice, the tacit option works by providing automatic enrollment and depositing of the accumulated severance pay into one of these alternative options, as follows:

1) enrollment with the pension fund identified by collective agreement or by company agreement;

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[1] 'Pensions at a Glance 2007: Public policies across country', OECD, June 2007
[2] The 'substitution ratio' is the ratio between the first year of retirement and the final salary.
[3] About 1/3 of U.S. workers do not enroll with supplementary pension funds. United States Department of Labor, The 2006 National Summit on Retirement Savings, "Saving for your golden years: trends, challenges and opportunities", Washington D.C., 1-2 March 2006
[4] 'Regulation of complementary pension schemes', Legislative Decree n. 252 of December 5, 2005
[5] The National Social Security Institute is the Italian social security institution responsible for paying pensions and social security welfare.

2) if point 1 does not apply, enrollment with the pension fund that has the highest number of company employees;

3) if points 1 and 2 do not apply, enrollment with the INPS Fund[6], created and managed by INPS.

After choosing the pension fund with which to enroll, either explicitly or tacitly, the worker is asked to choose one or more investment lines[7]. Again, if the employee decides not to decide, the law[8] establishes as the default option the guaranteed line without any risk (no-risk investment line).

Taking into consideration the years 2007-2010, with reference to Italian 401(k) plans, the research questions of this paper are:

1) has the default bias played a significant role in enrollment in the no-risk investment line in the Italian pension fund scheme since the reform[9]?

2) in subscribers' investment line choices, is an 'extremeness aversion' bias in operation?

This paper makes a significant contribution to the literature on the topic of bias in the supplementary pension field, considering a generally unexplored market (that of Italy). Moreover, as the Italian pension fund scheme enrollment policy is similar to those in force in other countries, this paper adds to the existing literature on the topic.

The paper is organized as follows: Section 2 presents the most important literature related to biases identifiable in pension fund and retirement plan participant decisions, with special reference to enrollment and asset allocation choices; Section 3 presents the database and analysis testing for default bias and extremeness aversion; Section 4 concludes.

2 – Literature review

In asset allocation portfolio choices and so also for retirement plans, the first decision a person must take concerns the choice of the investment instrument from those available. However, many people decide not to decide. In this case the introduction of a default choice (default bias, Camerer, 2000) ensures a bypassing of the inertia effect, producing the result of an expressed decision, so that default is not neutral.

The default bias exists, given that the phenomenon of omission bias has been identified and refers to the preference for options that require no action (Spranca et al., 1991). According to Kahneman and Miller (1986), the omission bias occurs because individuals anticipate more regret when they have actively made a (wrong) choice. Combining this assumption with the loss aversion (Kahneman and Tvesky, 1979) people tend to avoid taking action (Baron and Ritov, 1994) in the hope of not altering their status quo (Samelson and Zeckhauser, 1988; Kahneman et al., 1991). The default bias plays an important role in a wide range of settings: organic donation decisions (Johnson and

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[6] The INPS Fund is a pension fund created by law.

[7] All pension fund statutes establish the number and the types of lines in which the workers can invest. Moreover, the statute stipulates whether it is possible to diversify across lines or not.

[8] 'Regulation of complementary pension schemes', Legislative Decree n. 252 of December 5, 2005

[9] It is not possible to collect data with reference to 401(k) tacit enrollment because of the privacy law, while it is possible to rebuild data related to the investment line tacit choice.

Golstein, 2003; Abadie and Gay, 2004), car insurance plan choice (Johnson et al., 1993), car option purchase (Park et al., 2000), and consenting to receive email marketing (Johnson et al., 2003).

Beshears, Choi, Laibson and Madrian (2007) have shown the importance of the default bias in 401(k) U.S. plans in every step of the saving lifecycle: saving plan participation, contributions, asset allocation, rollovers and decumulation. Madrian and Shea (2001) and Choi, Laibson, Madrian, and Metrick (2003, 2005) show that automatic enrollment increases 401(K) participation rates and participants tend to stay with the default contribution rate and fund allocation. The phenomenon of inertia in asset allocation choices within pension plans was examined by O'Donoghue and Rabin (1999, 2001) and confirmed in the study by Agnew, Balduzzi and Sundén (2003), who examined about 7,000 retirement accounts from 1994 to 1998 and confirmed the existence of a strong tendency towards the status quo or high inertia related to initially-defined asset allocation. Mitchell, Mottola, Utkus and Yamaguchi (2006a, 2006b) also draw the same conclusions. The strong influence of the default bias in retirement decisions can be explained by a generally widespread lack of willpower. Indeed, Mitchell and Utkus (2004) explain that saving for retirement necessitates similar behavior to that required for dieting or quitting smoking. It would seem that while people intellectually 'understand' the benefits of a specific behaviour they have difficulty in implementing their intentions. This phenomenon is called 'bounded self-control', according to which, in this case, people accept the default choice.

In 2006, the Pension Protection Act introduced the lifecycle management approach within 401(k) plans as a default option in the U.S. Mitchell, Mottola, Utkus and Yamaguchi (2007) have demonstrated how the default bias has contributed to the development and to the increase of this management activity, avoiding the inertia that previously characterized 401(k) plans over time. With this methodology a fund manager takes over all responsibility for selecting asset holdings and rebalancing the portfolio over time. A typical target maturity date (TM) lifecycle fund invests in equities for younger employees, and as the target date approaches the TM fund's equity is gradually reduced towards a more conservative mixed portfolio.

In the case of portfolio asset allocation choices, another two biases have been indentified: 'extremeness aversion' and 'home bias'. Extremeness aversion is related to people's tendency to avoid options that appear to be at the extreme point of some relevant continuum (Simonson and Tversky, 1992; Benartzi and Thaler, 2002). A plethora of studies (Simonson, 1989; Simonson and Tversky, 1992; Tversky and Simonson, 1993; Wernerfelt, 1995; Dhar et al., 2000; Dhar and Simonson, 2002; Kivetz et al., 2004) have shown that when individuals have to choose between a set of alternatives among which none are dominant, they tend to opt for an intermediate or compromise alternative rather than an extreme. Benartzi and Thaler (2002) have demonstrated that people use the 'avoid extremes' heuristic when choosing between portfolios that can naturally be ordered while Gourville and Soman (2007) have shown that individuals' preferences fall on items that are in the middle, avoiding the range extremes. According to Simonson (1989) the extremeness aversion comes into play especially when people do not have well-defined preferences or selection criteria.

The 'home bias' is the investors' tendency to prefer domestic investment or to hold a minimum share of foreign assets in their portfolios (Gehrig, 1993; Cooper and Kaplanis, 1994; Tesar and Werner, 1995; Kang and Stulz, 1997; Lewis, 1999). The studies by Grubel (1968), French and

Poterba (1991), and Tesar and Werner (1995), show that home bias is a frequent phenomenon in portfolio composition. Coval and Moskowitz (1999) demonstrate the existence of home bias even in the portfolio choices made by U.S. money managers, while the study by Chan, Covrig and Ng (2005) shows that the home bias is not found only in a specific country but is a worldwide phenomena. The studies by Benartzi (2001) and Huberman (2001) show that home bias is also present in retirement choices. In fact the Benartzi (2001) study reports that at least 1/3 of the savings in 401(k) plans are invested in shares of the employing company; at the same time the worker discretionary component is also invested in company shares. Similarly Huberman (2001) finds a tendency among participants in retirement plans to buy shares in their companies rather than investing in other options in their 401(k) plans. This phenomenon is justified because people in general, and not just as regards financial or pension choices, tend to prefer what they are familiar with (Kilka and Weber, 2000).

Choices regarding diversification of the asset allocation portfolio, i.e. the distribution of wealth between several investment instruments aside from those available, play a very important role. According to Simonson (1990) and Kahn and Lehmann (1991), the phenomenon of diversification derives from the fact that individuals are risk averse and have preferences that are not always well defined. Read and Loewenstein (1995) show that time is a fundamental variable in the diversification process. In fact, according to these authors, if people make combined choices of quantities of goods for future consumption, they choose more variety than when they make separate choices immediately preceding consumption. In retirement decisions, time is certainly a crucial variable as 'consumption', meaning fund decumulation performance, is not immediate but delayed in time. Benartzi and Thaler (2001), taking as a starting point the study by Read and Loewenstein (1995), come to define the 1/n heuristic, meaning the diversification technique that provides an equally weighted contribution between the different funds inserted in pension plans. The simplest form of the 1/n heuristic is fifty-fifty, examined by Samuelson and Zeckhauser (1988) with reference to choices made by participants in the TIAA-CREF, the largest defined contribution savings plans in the world. Markowitz also used this method in his portfolio and provided a psychological justification, reported by Zweig (1998): 'My intention was to minimize my future regret. So I split my contributions fifty-fifty between bonds and equities'. Benartzi and Thaler (2001), by comparing the pension plans offered to TWA pilots and those offered to University of California employees, and testing the latter with some decision-making by performing experiments, were able to demonstrate the existence of the 1/n heuristic.

Windcliff and Boyle (2004) review the portfolio theory developed by Markowitz (1952), and demonstrate that contribution diversification choices in 401(k) plans are not so naïve as they at first appear. Indeed, they have shown that if the market presents some indistinguishable and uncorrelated assets, the equally-weighted portfolio (that is to say the 1/n heuristic) is optimal. Huberman and Jiang (2006) examine a sample of more than six hundred 401(k) plans and analyse how the contributions of more than half a million participants are allocated between the different funds within their retirement plans. Contrary to Benartzi and Thaler's (2001) conclusions, Huberman and Jiang (2006) show that participants do not share their contributions equally between the offered funds, but rather tend to allocate them between three or four funds on average, and this figure is not sensitive to the number of funds offered in retirement plans examined, which ranged from 4 to 59.

Agnew (2006), using a demographic database and asset allocation information relating to more than 73,000 employees, shows that higher-salaried employees tend to make significantly better choices in retirement plan decisions. In particular, the study demonstrates that workers who earn at least $100,000 hold less of their company shares and follow the 1/n heuristic rule less.

3 – Data and methodology

3.1 – Sample selection

The database used in this paper was created from the list of 401(k) pension funds existing at the end of 2007 (a total of 35), the year of the introduction of Italian pension reform, identified and recognized by the Pension Funds Supervision Commission (COVIP). Those no longer operating at the end of 2010 (2) [10] were eliminated. The 401(k) plans existing before 2007 which did not provide a guaranteed investment line had to introduce one in order to be able to enroll the so-called 'tacit-worker' or 'tacit-member' as provided for by law[11]. For this reason 2007 represents a year of strong discontinuity with the past.

For each 401(k) plan, we analyzed the balance sheet from the years 2007-2010 in order to gather information about: a) the number and the types of investment lines offered in each fund; b) the possibility for the employees to diversify across a number of lines; c) the total number of subscribers at the end of each year examined; d) the number of new subscribers during each year; e) the total number of 'tacit-members' at the end of each year examined; and f) the number of 'tacit-members' during each year examined. Therefore the 401(k) plans whose balance sheets did not show the distinction between tacit- and express-members as well as the total number of 'tacit-members' at year-end or the number of 'tacit-members' during the years examined were eliminated. After this selection, of the original 33 401(k) funds representing 1,988,639 members, our full sample includes 24 401(k) plans (that is to say 72.72%), representing 1,732,530 members (87.12%) at the end of 2007. Data collected are organized in different ways according to the aim of our analysis, as specified in each of the following points.

3.2 – Default bias

The first aim here was to investigate the impact of the default option on asset allocation regarding 401(k) plans. In fact, since 2007, it has been legally required that tacit employees are automatically enrolled with the no-risk investment line inserted in each pension fund. It can be a complex problem for some people to decide their asset allocation; in this case individuals tend to simplify the problem by accepting the available default option, that is to say accepting a choice made by others.

Papke (2004) finds that having the ability to direct the asset allocation of contributions to a specific saving plan leads to a large (36%) increase in the probability of participating. Madrian and Shea (2001) analyzed the 401(k) saving behaviour of employees in a large U.S. corporation. Before the 401(k) plan change, employees were required to affirmatively elect participation in the plan. After the plan change, employees were automatically and immediately enrolled in the 401(k) plan unless they actively opted out of the plan. The authors find that 401(k) participation is significantly higher under automatic enrollment.

In order to assess whether since the Italian pension fund reform the default bias has influenced no-risk investment line enrollment per year (2007-2010), we investigate a unique panel dataset

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[10] COVIP Annual Report 2007 and 2010

[11] 'Regulation of complementary pension schemes', Legislative Decree n. 252 of December 5, 2005

covering 24 Italian defined contribution 401(k) plans. Table 1 summarizes the variables included in the model.

Insert Table 1 about here

The regression used in the model is as follows:

norisk_total = αnorisk_xyear+βtacit_xyear+γnorisk+δt1+τt2+υt3+φt4+ε

Insert Table 2 about here

The regressions results, shown in Table 2, express that tacit enrollments per year have a positive and significant influence on the number of total no-risk subscribers. Then, the second aim is to check whether default option enrollments are significant compared to the total number of subscribers at the end of each year. In this case the following regression is used:

sub = αsub_xyear+βtacit+δt1+τt2+υt3+φt4+ε

The results, shown in Table 3, present a positive and very significant level of influence of the default option on total subscribers.

Insert Table 3 about here

According to Table 3 results the 'tacit members' enrolled with no-risk line at year end has a positive and significant impact on participants total amount at year end in each Italian 401(k) plan. The results also show a negative trend significantly increasing over years. This is due to people who gained the right to retire and then come out of 401(k) plans. The consequence is that no-risk line enrollment, supported by 'tacit members' has a strong influence on the stability and growth of the Italian supplementary pension schemes.

Thus, the results shown in Tables 2 and 3 reveal a positive and significant impact of the tacit-worker, both on no-risk investment enrollments and with reference to total subscribers per year. For this reason Camerer's (2000) conclusion, according to which 'default option is not neutral', is confirmed with reference to Italian 401(k) plans.

3.3 – Extremeness aversion

To assess extremeness aversion in Italian 401(k) asset allocation, only expressed choices can be considered, given that the so-called 'tacit-members' do not express any choice but simply accept the default option determined by the law. In addition, we consider the 401(k) plans based on the number of investment lines offered by each one, as represented in Table 4.

Insert Table 4 about here

In each 401 (k) plan, investment lines are presented to workers sorted by the level of risk, from no-risk (also called 'guaranteed line') to higher risk. According to Bernatzi and Thaler (2002), this is an optimal condition for assessing the presence of extremeness aversion in asset allocation choices. In fact, it is important to bear in mind that savings decisions can be influenced by the framing effect (Tversky and Kahneman, 1981; Chen et al., 1998; Gourville, 1998; Sinha, Smith, 2000; Levin et al., 2002; Del Vecchio et al., 2007; McKechnie et al., 2007). The impact of investment menu design on

participant investment choices in defined contribution retirement plans could have a more powerful influence on the decision making process than the underlying risk and returns characteristics of the investment being offered.

Benartzi and Thaler (2001) asked plan participants to select an investment from three different menus. The investment lines offered ranged from A (low risk) to D (high risk). The first menu offered included options A, B, and C; the second one, just options B and C; the last one, options B, C, and D. Comparing options B and C, which appeared in all three menus, 29% of participants preferred C over B in the first menu; 39% in the second menu and 54% in the third menu. This result shows that in the first menu, where option C was an extreme, it was the least popular; in the third menu, where option C was the middle choice, it was the most popular. Thus the Benartzi and Thaler (2001) experiment demonstrates that participants appear to use a naïve heuristic (i.e. 'avoid extremeness') rather than maintain a consistent set of well-ordered risk preferences. Graph 1 shows subscriber distribution over investment lines and years for Italian 401(k) plan enrollment.

Insert Graph 1 about here

Initial consideration of graphs B, C, and D reveals graphic evidence of extremeness aversion, and the Benartzi and Thaler (2001) solution seems to be valid for Italian 401(k) asset allocation choices. However, more detailed analysis reveals that it is possible to distinguish between symmetric (graphs A and C) and asymmetric (graphs B and D) choices. In asymmetric schemes such as $\{A_1, A_2, A_3\}$ or $\{A_1, A_2, A_3, A_4, A_5\}$ in which there is a non-dominant choice[12], employees tend to opt for an intermediate or compromise alternative (Tversky and Simonson, 1993). Loss aversion (Kahneman and Tversky, 1979, 1984) and regret bias (Festinger, 1957) could guide the choice. In fact, the no-risk investment line (A_1) does not permit participation in a hypothetical market share increase. For some people, the regret bias acts in such a way that this line is not chosen. On the other hand, the high-risk alternative (A_3 or A_5) presents too high a loss level for some people in the case of negative market share performances. For this reason loss aversion deters the choice of this line. Following this reasoning for all the alternatives available, the last choice is the middle choice (Gourville and Soman, 2007). The reasoning expressed above is also valid for a symmetric choice such as $\{A_1, A_2, A_3, A_4\}$. In this case, however, there are not one but two middle choices. As shown in graph C extremeness aversion is at work; in fact employees tend to choose the two middle alternatives. Thus the Benartzi and Thaler (2001) conclusion is confirmed.

A different situation is found in graph A. In this case, only two alternative options are available, $\{A_1$ or $A_2\}$; this is an asymmetric situation because it is not possible to identify a middle choice. In general, in a binary choice there is no extremeness aversion because no option is more extreme than the other. In this case polarization could occur (Chernev, 2004). In fact, as shown in graph A, the medium risk alternative tends to polarize employees' choices. This is due to regret and loss aversion biases. In fact, opting for a guaranteed solution people could lose market share increase over the years, while a medium risk solution could provide market share increase participation and, at the same time, not incur possibly heavy losses. For these reasons the medium risk solution polarized the choices.

To test the impact of extremeness aversion on Italian 401(k) asset allocation choices, the Herfindahl index (1950) is calculated, as shown in table 6. This index is calculated to express the concentration level on the middle choice as

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[12] There is not a dominant investment line between those offered in each 401(k) plan. Before making a decision, employees received an information document in which each investment line was presented, specifying the most relevant advantages and disadvantages.

$$\text{(1) } H_i = \sum_{i,j=1}^{n} (s_{i,j} \times 100)^2$$

In (1) $s_{i,j}$ is the single investment line share at year-end 2007-2010 (j=1-4).

Insert Table 5 about here

The results presented in Table 5 indicate an insignificant concentration in the extreme choices in each 401(k) plan except for the two investment lines in which there is polarization. In addition, the concentration level does not dramatically alter over the years and the investment line choice changes, ranging from 2 to 5 options, as shown in Graph 1. In fact, the medium risk is the most popular investment line, but when faced with five options the employees choose the low risk solution. This situation cannot be explained rationally, but factors include the influence of menu design on decision making, the inconsistent set of well-ordered risk preferences (Simonson, 1989) and, of course, extremeness aversion.

To test the statistical significance of the middle option choice, in addition to the Herfindhal index an ologit regression was calculated. The model variables used are presented in Table 6.

Insert Table 6 about here

The ologit regression is justified because of the dependent variable line, whose value ranges from 0 to 4 according to the investment line risk level.

Insert Table 7 about here

The regression results, shown in Table 7, indicate a significant polarization in the case of two investment lines and a preference for the middle choice (at 95%) related to the five investment lines choice. This result confirms and supports the Herfindahl index.

4 – Conclusions

How individuals make decisions is a very important and interesting field of study, especially bearing in mind the consequences that may ensue. Specifically, in this study supplementary pension choices are subject to careful analysis because of the wide gap between the moment in which the choice is made and the future time of 'enjoyment'. In fact, a wrong or an unsuitable asset allocation choice in terms of pension funds could seriously compromise the maintenance of living standards after retirement. For this reason, the pension funds reform introduced in Italy in 2007 represents a strong discontinuity with the past and a necessary step towards coming into line with other European countries.

This paper has verified the existence of two biases in Italian 401(k) subscriber choices: default bias and extremeness aversion. The former, introduced by law with reference to so-called 'tacit-members', has a significant impact not only on participation in the no-risk investment line but also on total 401(k) participants during the 2007-2010 period. The latter, related to the expressed choices made by participants, has a significant impact on investment line choice. In particular, the results presented in this paper show that many Italian 401(k) plan subscribers avoid extreme investment lines, opting for the middle one without any consideration of the risk level and expected returns. The consequences of these biases are not negligible.

The default option adopted by the regulator is not neutral, and may also significantly modify 401(k) plan enrollments and the related asset allocation. In the literature the default option is adopted with

reference to enrollment stage, contribution rate, rollovers and decumulation. In this paper, because of the short history of the new Italian supplementary pension scheme, we have analyzed and tested only the enrollment stage. Since default choices can affect individual financial choices, the question could arise as to whether the no-risk investment line as the default option for all tacit-members is the best solution. In fact, a set of different default options for tacit-members, according to their age and risk tolerance, could be theorized. Moreover, again with reference to Italy, with the increase in subscriptions and the passing of time, it should be checked whether the tacit-members become passive-savers as stated by Madrian and Shea (2001).

The extremeness aversion phenomenon opens a rather more complex forum for discussion. In fact, the choices made based on this bias are often contrary to rationality because they are not dictated by an awareness of risk profiles, but rather are influenced by menu design. In this context, the dilemma arises as to which is the optimal number of investment lines available in 401(k) plans. In fact, as demonstrated in this paper, in the case of symmetric choices there is polarization and in the case of asymmetric choices there is extremeness aversion.

A solution to the consequences of both biases examined could be the introduction of a life-cycle investment line, independently managed by a manager who would change asset allocation depending on the members' age. The regulator could adopt this kind of investment line for tacit-members; at the same time it could consider standardizing the investment line number in each 401(k) plan, for example at five, in which the life-cycle line is in the middle. Being aware of the existence and the consequences of the biases examined in this paper could be a source of inspiration for the Italian regulator, permitting exploitation of these specific behaviours to the subscribers' benefit.

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Tables and Graphics

Table 1 – Model variables

Variable	Description
sub	total number of enrollments at the end of each year per 401(k) plan
sub_xyear	total number of enrollments per year for each 401(k) plan
tacit	total number of tacit employees at the end of each year per 401(k) plan
tacit_xyear	tacit enrollment per year for each 401(k) plan
norisk	total number of expressed no-risk subscribers
norisk_xyear	total number of expressed no-risk subscribers per year for each 401(k) plan
norisk_total	total number of no-risk subscribers
t1, t2, t3, t4	time dummies (t1=2007; t2=2008; t3=2009; t4 = 2010)

Table 2 – Regression analysis of default option on the no-risk investment choice per year

	Random effects	Fixed effects
Constant	0.581***	2.020***
	(0.0854)	(0.456)
norisk_xyear	-0.0102	-0.00202
	(0.00972)	(0.0117)
tacit_xyear	0.0422***	0.0381***
	(0.00736)	(0.00943)
norisk	0.944***	0.767***
	(0.0143)	(0.0579)
t2	-0.165***	-0.104***
	(0.0341)	(0.0378)
t3	-0.175***	-0.0735
	(0.0409)	(0.0516)
t4	-0.168***	-0.0455
	(0.0481)	(0.0619)
Note: *** p<0.01, ** p<0.05, * p<0.1 (Standard errors in parentheses)		

Table 3 – The impact of the default option on total subscribers 401(k) plans over the years

	Random effects	Fixed effects
Constant	9.563***	9.899***
	(0.0262)	(0.198)
sub_xyear	0.0173	0.0173*
	(0.0119)	(0.0100)
tacit	0.134***	0.0875***
	(0.0321)	(0.0283)
t2	0.0325	0.0489
	(0.0358)	(0.0303)
t3	0.0275*	0.0479
	(0.0453)	(0.0384)
t4	0.0102	0.0321
	(0.0479)	(0.0406)
Note: *** p<0.01, ** p<0.05, * p<0.1 (Standard errors in parentheses)		

Table 4 –Numbers of 401(k) plans related to investment lines

No. investment lines	Number of 401(k) plans examined
2	6
3	11
4	5
5	2

Table 5 – The Herfindahl index

The Herfindhal index is designed to measure industry concentration. It ranges from a minimum of 0, indicating perfect competition, to a maximum of 10,000 indicating complete monopoly.
The Herfindahl index scale is:

Low	0 to 1,000
Medium	1,000 to 1,800
High	1,800 to 10,000

	2 investment lines			
	2007	2008	2009	2010
No-risk	209.64	333.43	394.24	495.88
Medium risk	1728.25*	1450.28*	1312.48*	1160.69*
	3 investment lines			
	2007	2008	2009	2010
No-risk	15.55	12.16	15.41	16.72
Medium risk	1011.71*	916.16	872.95	859.66
High risk	77.16	74.77	72.59	72.49
	4 investment lines			
	2007	2008	2009	2010
No-risk	62.08	61.91	71.33	84.31
Low risk	626.79	689.13	698.97	681.45
Medium risk	1019.04*	908.68	839.20	792.50
High risk	3.60	3.72	4.00	4.33
	5 investment lines			
	2007	2008	2009	2010
No-risk	15.22	10.81	7.45	6.60
Very low risk	21.65	32.04	34.74	37.38
Low risk	4212.50**	4193.76**	4346.66**	4276.27**
Medium risk	184.59	187.38	163.82	170.69
High risk	42.27	35.49	37.20	38.49

Note: * indicates medium concentration; ** indicates strong concentration

Table 6 –Model variables used in the ologit regression

Variable name	Description
line	Investment line type from 0 to 4
sub	Total number of subscribers per year
t1, t2, t3,t4	Time dummies (t1=2007; t2=2008; t3=2009; t4 = 2010)

Table 7 – Ologit results

	2 investment lines	3 investment lines	4 investment lines	5 investment lines
Sub		-5.93e-07	-1.76e-05	0.000293**
		(1.30e-05)	(1.08e-05)	(0.000138)
Sub2	1.22e-09**	0	8.34e-11	-6.36e-09**
	(4.89e-10)	(9.20e-11)	(5.29e-11)	(3.04e-09)
t2	-0.0428	0.000510	0.0197	-0.0184
	(0.898)	(0.452)	(0.570)	(0.792)
t3	-0.0448	0.00139	0.0381	0.0126
	(0.896)	(0.452)	(0.571)	(0.792)
t4	-0.0587	0.00205	0.0557	-0.0543
	(0.896)	(0.452)	(0.571)	(0.793)
Note: *** p<0.01, ** p<0.05, * p<0.1 (Standard errors in parentheses)				

Graph 1 – Subscriber distribution over 401(K) investment lines at year-end

Graph A
2 investment lines - subscribers distribution

Graph B
3 investment lines - subscribers distribution

Graph C
4 investment lines - subscribers distribution

Graph D
5 investment lines - subscribers distribution