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Decision Making Clusters in Retirement Savings: Gender Differences Dominate

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Abstract This study explored the impact of demographic factors on individuals' investment choice decisions in retirement savings funds. Analysis found identifiable member clusters across a large and diverse sample of almost 150,000 transactions. Results suggested that gender and risk are the most dominant factors with women showing a strong tendency to make lower risk investment choices. If this behavioural tendency is not addressed through education it will accentuate the hurdles women already face in accumulating adequate saving for retirement.

Keywords Personal finance · Consumer economics · Empirical analysis · Investment decisions · Retirement savings

Introduction

Over the last twenty years ageing populations and the anticipated increase in demand for government age pensions have made the accumulation of retirement savings by individuals a significant policy issue in the developed world (Whitehouse et al. 2009). Australia has been at the forefront of the resulting policy reform agenda (Bateman et al. 2001); the principal policy response has been to boost mandated, employer-funded retirement savings contributions on behalf of employees. The introduction of the Superannuation Guarantee in 1992 provided compulsory employer contributions to retirement savings accounts for almost all Australian employees,[1] extending a more limited regime that commenced in 1986.

As a result of this compulsory contribution regime the assets controlled by retirement savings funds in Australia have grown rapidly, from $245.3 billion in June 1996 (Australian Prudential Regulation Authority 2006) to $1.2 trillion in December 2009 (Australian Prudential Regulation Authority 2010b), even after a significant drop in assets in 2008 as a result of the global financial crisis.

The present study investigated whether demographic clusters exist in the investment strategy choices made by members of four large, Australian not-for-profit retirement savings funds whose members cover a wide range of industries and income levels. Cluster analysis was used to examine the generality of previous findings in the literature, particularly with regard to the relative influences of age and gender, to see whether similar results existed in this large sample from a diverse range of industries. The purpose of the current study was to examine a large data set of investment decisions for evidence of demographic differences. In particular, the analyses sought to determine whether there are clearly defined clusters of people who are similar on a range of demographic variables, and who exhibit similar investment behaviours. Further, the analysis

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[1] Earning at least $450 per month and over 18 years of age.

sought to compare the relative influence of gender and age on the riskiness of investment decisions.

As the retirement savings market in Australia has developed, shifts in fund structure and the competitive environment have led to a shift from defined benefit to defined contribution plans and an increase in the investment choices available (Gerrans et al. 2006). This means that fund members are more exposed to investment risk and are assuming greater responsibility for choosing the investment strategy applied to their savings. The offer of investment strategy choice is not mandatory but retirement savings funds see the offer of these choices as an integral selling feature of their products. The menu of investment strategy choice available to fund members has grown significantly over time. In June 2004 40.1 % of funds with more than four members offered investment strategy choice, with an average of 23 choices per fund (Australian Prudential Regulation Authority 2005). By June 2009 this had risen to 67.9 % of funds and 74 choices (Australian Prudential Regulation Authority 2010a). The extent and amount of investment strategy choice offered varies by category of fund. As at June 2009 the proportion of funds offering choice was lowest for Corporate funds (54 %) and highest for Industry funds (89 %). The number of choices offered was highest for Retail funds (179 choices on average) and lowest for Corporate funds (7 choices on average) (Australian Prudential Regulation Authority 2010a).

Despite the increased availability of investment strategy choice, the majority of members do not exercise choice and remain in their funds' default investment strategy. As at June 2009 total assets in the funds' default investment strategy, across the retirement savings industry, ranged from 23 % for Retail funds to 69 % for Industry funds (Australian Prudential Regulation Authority 2010a). This should not, however, be taken as a measure of members' engagement with or understanding of retirement savings. Firstly, in most Australian funds the default is a well-structured balanced portfolio and remaining in this option may be an active choice on the part of the member. Secondly the data available identifies the proportion of total fund assets in the default option, not the proportion of members or member accounts. Despite these caveats there is a perception among some in the retirement savings industry and among policy makers that it would be "better" if more people clearly made an active choice.

If active choice is to be encouraged then how individuals handle the extensive choice menus offered to them and what determines the decisions they make is clearly of interest to the industry, policy makers and researchers. The adequacy of these decisions is a primary determinant of the employee's lifestyle in retirement. If sub-optimal decisions are made, retirement incomes may be significantly reduced, increasing the extent to which people will rely on government support and hence the success of retirement savings policy reform.

Relevant Literature

Research in the areas of retirement savings and retirement incomes has covered a wide range of issues. The focus of the present study was on decision making and in particular on issues of demographic difference. There is an extensive literature examining individual investment strategy and asset allocation choice in retirement savings.

The introduction of compulsory, employer-sponsored retirement savings in Australia has been accompanied by a significant shift from defined benefit funds (DB) towards defined contribution funds (DC). In 1982 DBs made up 82 % of Australian retirement savings accounts; by 2006 this figure had dropped to 30 % if hybrid DB/DC funds were included and only 2 % for pure DBs (Commonwealth of Australia 2009). Principal drivers of this trend have been the desire by employers to remove their liability for investment risk as the system grew and the need for increased flexibility when members change jobs (Commonwealth of Australia 2009). However it is also apparent that some fund members prefer the level of flexibility and control that a DC fund provides; when employees in the Australian higher education sector were offered the opportunity to remain in an existing DB or move to a DC one-third of members chose to move to the DC (Clark-Murphy and Gerrans 2001a).

Clark-Murphy and Gerrans (2001a) documented demographic differences in this sample; males and those aged under 45 years were over-represented among those choosing to move to the DC. Gallery et al. (2000), with a more limited sample from the same population, suggested differences in financial proficiency largely account for differences in the decision made.

There has been Australian evidence that employees feel ill-informed and ill-equipped for the retirement savings decisions presented to them (Clare 2002; Clark-Murphy and Gerrans 2001b; Plum Financial Services 2001). However it appears the situation has improved (Tuck 2006) and that people increasingly understand the need to accept responsibility for funding their own retirement; in a recent international study Australia ranked equal first in this regard with Hong Kong (AXA 2007).

Turning to demographic influences on decision making, gender has been a significant focus of previous research. Several studies have considered asset allocation in retirement savings and identified gender differences in risk aversion. The majority have found that women show greater risk aversion in the allocation of funds to retirement savings assets both internationally (Agnew et al. 2003; Bajtelsmit et al. 1999; Bernasek and Shwiff 2001; Clark

and Strauss 2008; Hinz et al. 1997; VanDerhei and Olsen 2000; Yilmazer and Lyons 2010) and in Australia (Quinlivan 1997; Gerrans and Clark-Murphy 2004; Watson and McNaughton 2007).

However, a number of international studies provide conflicting evidence. Dwyer et al. (2002) found the level of risk aversion falls with increased financial education, and there is evidence that women are less knowledgeable about the Australian retirement savings system (Worthington 2008). These findings are supported by Martenson (2008) who found that in a sample of Swedish mutual fund and retirement savings investors women were both less knowledgeable and more risk-averse than men but the difference in risk-aversion disappeared after controlling for knowledge. Schubert et al. (1999) found that women are not more risk-averse than men when financial decisions are put in context. Education is emerging as a strong theme related to gender; Clark et al. (2004) found that women are more likely than men to change their retirement saving behaviour in response to education seminars while Lusardi and Mitchell (2008) found not only that older women were likely to have lower levels of financial literacy but that there was a strong link between financial literacy and successful planning for retirement. Gender has also been observed to interact with other demographics variables, such as income, labour force participation and education, in terms of determining the likelihood of savings behaviour (Whitaker et al. 2012).

Engstrom and Westerberg (2003) found that women were more likely than men to move away from a default plan and make investment choice. In an Australian context Brown et al. (2006), using an extensive managed fund database, suggested males are more risk averse. In comparing this apparent contradiction in Australian evidence (Gerrans and Clark-Murphy 2004 vs Brown et al. 2006) it should be noted that the latter study considered those who had voluntarily chosen to invest in managed funds and who might therefore be expected to be relatively well-informed investors. As is the case in the present study, Gerrans and Clark-Murphy (2004) looked at members of a retirement savings fund who received superannuation as part of their employment benefits and had not made any conscious decision to acquire a financial asset, hence they were likely to be less well-informed about investment and financial risk.

The evidence on age and investment choice is also somewhat mixed although in summary there is support for a humped profile where allocation to more risky assets (equity) increases to a peak allocation and then declines with age. In a study across several countries, Guiso et al. (2000) found a humped profile of equity versus age although the evidence weakens after controlling for other variables. Iwaisako and Mitchell (2004) used Japanese data and reported a positive age impact on equity participation, flattening at the highest age group. Agnew et al. (2003) found a peak allocation at age 32.5 years. In an Australian context The Reserve Bank of Australia (2003), utilising data from the 2002 HILDA survey, reported a humped profile of the proportion of households owning equity by household age. Another Australian study (Gerrans et al. 2010) suggested a humped allocation to equity with age but a surprising U-shaped allocation to cash. This seems to contradict a finding by Clark and Strauss (2008) that, while there was little difference in the risk propensity between younger and older groups the middle-aged tend to be more risk averse.

Researchers have also identified age-related sub-groups who appear to make inappropriate choices that may jeopardize their retirement incomes (e.g., younger workers who choose to place their funds in a very low-risk, low-return capital guaranteed investment, Clark-Murphy and Gerrans 2001a; Goodfellow and Schieber 1997). A study reported by Speelman et al. (2007), which looked at primarily female members of one industry fund, found apparently excessive risk aversion among young females but a more moderate attitude to risk among older women, nearer to retirement. This may support the findings of Clark et al. (2004) and others that women are likely to change their allocations as knowledge increases.

Return-chasing behaviour is indicated by a prevalence of investment strategy changes that involve moving from an option with lower historical returns to an option with higher historical returns. While there is an extensive literature in finance indicating that past returns do not influence future returns (e.g., Fama 1991; Malkiel 2007), there are also studies across a range of investments that identify instances of return-chasing behavior, with at least one showing evidence of a connection between age and return-chasing behaviour (Clark-Murphy et al. 2009).

Taken as a whole the existing literature suggests that a wide range of factors may influence individuals' investment decision making. Many of these factors appear to be behavioural in nature and go beyond the inputs employed in modern portfolio theory as part of the rational decision making framework. There is reasonably clear evidence of demographic differences in retirement savings decision making although the nature of and reason for these remains a matter of debate.

Data and Methodology

Overview of Funds and Data

Four Australian not-for-profit retirement savings funds provided the investment strategy choice history of their members. The funds cover a wide range of industries and occupations ranging from unskilled to senior management. Fund 1 is an industry fund for workers in health and

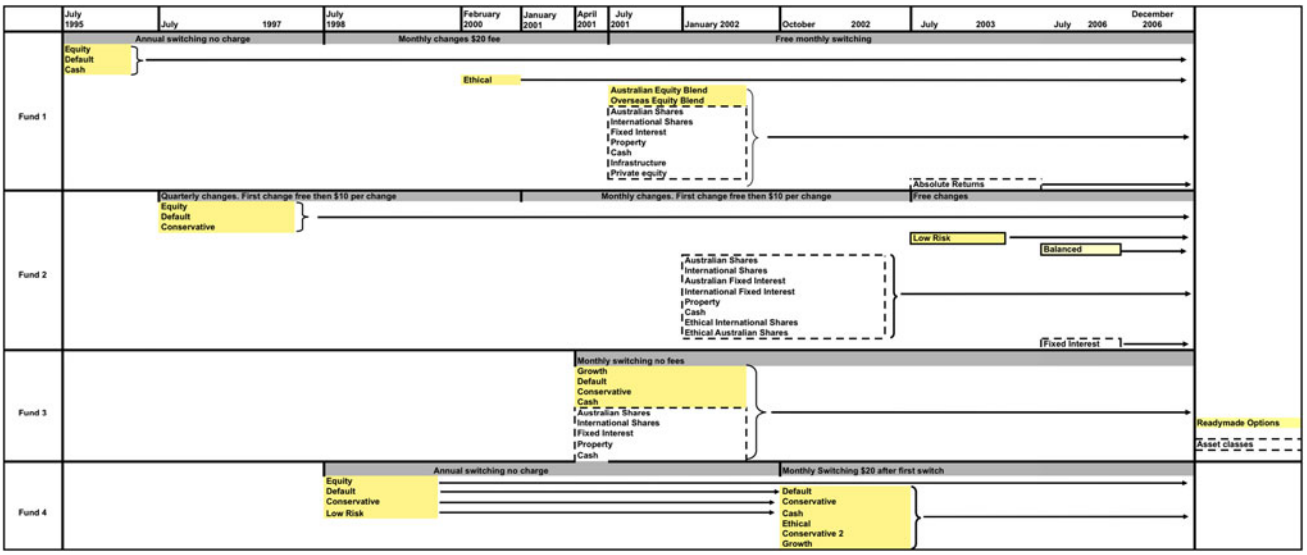

Fig. 1 Timeline of changes to investment options of the funds

community services. Fund 2 is a major industry fund covering workers in a wide range of industries with a historical focus on the manufacturing sector. Fund 3 is responsible for the provision of superannuation services to State public sector employees and employers. Fund 4 is an industry fund providing superannuation benefits for staff in the Australian tertiary education sector, including academic and administration staff.

The funds introduced investment choice for their members between 1995 and 2001 and the level of investment choice varies. During the period covered by the present study three funds allowed members the choice of a selection of readymade options, which have a specified investment strategy, or a do-it-yourself option where members choose their own investment strategy while the other offered a selection of readymade options only.[2] The funds' choice offerings have evolved over time and are summarized in Fig. 1.

Fund Investment Choice Data

For each fund the data included in the present study cover the period from the introduction of investment choice up to the last update or review date for which data were readily available. For Fund 4 this review date was June 2004, and for the remaining three funds the review date was December 2006.[3] Where members were able to choose a different strategy for their future contributions and their existing balance, only changes applied to future contributions were used; the changes made to existing balances will be considered in future work. Where members made more than one investment choice in the period, only their most recent choice was included.

In Fund 1 between July 1995 and December 2006, 70,613 members made changes to their investment strategy. In Fund 2 between July 1997 and December 2006, 30,081 members made changes to their investment strategy. In Fund 3 between July 2001 and December 2006, 23,553 members made changes to their investment strategy. The structure of Fund 4 meant that most members had more than one account. Where this occurred only changes made to the investment strategy for the primary account were considered. Between July 1998 and June 2004, 33,084 Fund 4 members made changes to the investment strategy for their primary account.

[2] This fund has since introduced a DIY choice.

[3] The differences in dates were a result of what was made available by the funds and our decision to maximise the amount of data available to analyse. We do not think that this difference in time period has made any difference to the results, for the following reasons. We do not make any claims about the effects of external events, so the different time periods should not be of consequence. Indeed there were no changes to investment strategy choices and no changes to legislation impacting on investment choice. Furthermore, in terms of any possible effects of external events, a key indicator of the markets is the variability of stockmarket returns. In the 30 months before and after June 2004 the standard deviation of monthly returns was 2.5 and 2.6 % respectively. An F test of equality of variance of the two series of monthly returns does not support a difference. Thus, although the data collected from the funds do not coincide in terms of time period, they are close enough that the financial markets were similar. Thus, we do not believe that this difference has contributed to any of the results we report in the paper. Indeed, the fund that stands out as having the most different cluster solutions (Fund 3) provided data from the same time period as two other funds (Funds 1 and 2).

Variables

As well as investment choice information the databases included limited member demographics. Variables considered in this study were *Gender*, *Age* at the last birthday, *Years* of membership up until the point of sampling, *Employer Contributions* (used as a proxy for income) in the previous 12 months, *Account Balance,* and *Choice Number* (indicating the number of choices made to date). Two additional variables were constructed. The first, *Performance Change,* represented a percentage comparison between the performance in the previous 6 months of the option the member had chosen (New) relative to their existing (Old) choice. This variable can indicate whether a member may be chasing an option with better historical performance than the one(s) they have previously chosen. For Funds 3 and 4, monthly option performance data was only available after July 2001 and November 2002 respectively. In order to calculate the performance change for choices made prior to January 2002 (Fund 3) and May 2003 (Fund 4), actual monthly investment returns data were supplemented with returns based on crediting rates or benchmarks.

The second constructed variable, *Risk,* measured the risk of the new option chosen. This variable was derived from information provided to investors by the funds relating to the investment options. This took the form of information booklets that included graphs and other data indicating the estimated relative risk of the various investment options, in relation to their estimated likely return. While this variable may not be a completely accurate depiction of the actual risk associated with each investment option, it nonetheless represents information members had available to use when making their decision about which option(s) to choose. The rationale for analysing this variable, then, was to determine whether the information provided to members regarding the relative risk of investment options appeared to impact upon members' choices.

Results

A two-step cluster analysis was performed using SPSS (v.17) to determine whether there were well-defined subgroups within the sample on the basis of the variables examined and, if so, to generate a profile of these groups in terms of their investment choices. The cluster analysis was set to automatically find the "best" number of clusters using the Log Likelihood distance measure and Schwarz's Bayesian Clustering Criterion.

A total of 157,331 transactions were available for analysis, however only 148,628 (94.5 %) transaction records contained information on all of the variables mentioned above.

Three clusters were produced and their profiles are presented in Table 1. A MANOVA was conducted to test whether the clusters were significantly different from each other with respect to the range of dependent variables. An overall difference was detected (Pillai's Trace: approx. $F(14, 297240) = 7704.395$, $p < 0.05$). Univariate ANOVAs were performed on each dependent variable. These tests indicated that the clusters differed significantly on each dependent variable (Table 6). Tukey's post hoc comparisons between each cluster on each dependent variable indicated that every cluster was significantly different from the other two clusters on all variables.

There are two large, single gender clusters (1 and 3) and one small, mixed gender cluster (2). Members of Cluster 2 are older and have made more changes to their investment options. They also have the greatest performance difference between their new and old investment options, with the new option performing better than the old option; this indicates return chasing. Members of Cluster 2 have the highest account balance and employer contributions by a considerable margin and choose options with a moderate amount of risk (compared to Clusters 1 and 3). There are almost three times as many males as females in Cluster 2.

Clusters 1 and 3 are similar in a number of respects. They comprise young people (with almost the same mean age), and so typically have short membership periods, small account balances, small employer contributions, and have made few changes to their investment options. There was also very little difference in the performance of their old and new options. The two clusters differ substantially, however, on gender and risk. Cluster 1 is entirely female and choose options with significantly lower risk than Cluster 3, which is all male.

Table 1 Cluster profiles all funds

Cluster	*n*	Gender	Age last birthday	Years of membership	Employer contributions	New–old performance (%)	Risk	Account balance	Choice number
1	85,493	Female (100 %)	37.70 (0.04)	1.52 (0.01)	2,049 (16)	0.03 (0.01)	3.39 (0.00)	25,215 (199)	1.14 (0.01)
2	5,640	Male (72 %) Female (28 %)	51.66 (0.15)	8.39 (0.04)	14,117 (62)	1.35 (0.04)	3.48 (0.02)	303,021 (773)	3.97 (0.04)
3	57,495	Male (100 %)	38.00 (0.05)	1.78 (0.01)	2,759 (19)	0.15 (0.01)	3.71 (0.00)	36,943 (242)	1.22 (0.01)

Except for *n* and Gender, values are means. Unless otherwise indicated, values in parentheses are standard errors

One interpretation of the separation of clusters observed here is that Age and associated variables separate Cluster 2 from Clusters 1 and 3, and that Gender and Risk separate Clusters 1 and 3. A discriminant function analysis was performed to test this hypothesis. This analysis produced two discriminant functions that reproduced the cluster membership with 97.9 % accuracy. Both functions accounted for a significant amount of variance in the data (Function 1: Wilk's Lambda = 0.016, $\chi^2 = 618098.495$, df = 16, $p < 0.001$; Function 2: Wilk's Lambda = 0.495, $\chi^2 = 104420.358$, df = 7, $p < 0.001$). The structure matrix produced by this analysis indicated that Function 1 was significantly correlated with Gender and Risk only, whereas Function 2 was significantly correlated with the remainder of the variables. These results support the proposed hypothesis, suggesting that Function 1 reflects a dimension related to Gender and Risk and this dimension discriminates Clusters 1 and 3 from each other. Function 2 reflects an Age related dimension and this discriminates Cluster 2 from Clusters 1 and 3. Given the size differences between Clusters 2 and the other two clusters, the Gender and Risk dimension is clearly the dominant dimension upon which the clusters are discriminated, which is underlined by the fact that this dimension accounts for 96.8 % of the variance, whereas Function 2 only accounts for 3.2 %.

To investigate whether the cluster solution observed with the entire data set was mirrored in each of the four funds, a series of further two-step cluster analyses were performed. The data for each fund were divided into two groups along gender lines, resulting in eight separate analyses (i.e., four funds × Male vs Female).

Fund 1

Female Fund 1 members separated into two clusters, with their profiles presented in Table 2. A MANOVA was conducted to test whether the two clusters were significantly different from each other. An overall difference was detected (Pillai's Trace approx. F (7, 49588) = 17083.004, $p < 0.05$). Univariate ANOVAs indicated that the clusters also differed on each dependent variable (Table 6).

Cluster 1 is smaller in number and older than Cluster 2. There are the expected differences associated with age—compared to Cluster 2, Cluster 1 has been a member of the fund for many more years, employer contributions are three times higher, and their account balance is over eight times greater. Cluster 1 also shows some history of making changes to their investment strategy, chasing higher performance and being prepared to take on more risk.

Male Fund 1 members also separated into two clusters (see Table 2). A MANOVA detected an overall difference between the clusters (Pillai's Trace approx. F(7, 16220) = 4947.358, $p < 0.05$). Univariate ANOVAs indicated that the clusters differed significantly on each dependent variable (Table 6).

The pattern of differences between Clusters 1 and 2 in the male data is the same as that observed between Clusters 1 and 2 in the female data. A major difference of note, though, is that while the male Cluster 1 took on more risk in their investments than the male Cluster 2, both clusters took on more risk than the female Cluster 1. In other words, risk was generally higher in the male data.

Fund 2

Female Fund 2 members separated into two clusters (see Table 3). A MANOVA indicated a significant overall difference between these clusters (Pillai's Trace approx. F(7, 7075) = 2007.939, $p < 0.05$). Univariate ANOVAs indicated that the clusters differed significantly on each dependent variable (Table 6).

Male Fund 2 members also separated into two clusters (see Table 3). A MANOVA indicated that the clusters differed significantly on all of the dependent variables combined (Pillai's Trace approx. F(7, 20413) = 7073.920, $p < 0.05$). The clusters also differed significantly on each dependent variable (Table 6).

The pattern of differences in the profiles of the female and male clusters observed in Fund 2 was the same as those observed in Fund 1.

Fund 3

Female members of Fund 3 separated into five clusters (see Table 4). A MANOVA indicated an overall significant difference between the clusters (Pillai's Trace approx. F(28, 54520) = 2711.304, $p < 0.05$). Univariate ANOVAs indicated a significant difference between the clusters on all of the dependent variables (Table 6). Tukey's post hoc comparisons between each cluster on each dependent variable indicated that every cluster was significantly different from the other four clusters on all variables, except in a few cases. On the Choice Number variable, there were no differences between Clusters 3 and 4, 3 and 5, 4 and 5, and 1 and 5. On the Age and Years variables, there were no differences between Clusters 3 and 4. On the Performance Change variable, there was no difference between Clusters 1 and 2. On the Employer Contributions variable, there was no difference between Clusters 1 and 3.

The pattern of differences between the five female clusters is not as straightforward to characterize as in the other funds. Cluster 1 stands out as being the oldest, having the greatest employer contribution, showing the greatest tendency for performance chasing, moderately risky options, the highest account balance, and over 10 previous changes to investment strategy. Other noteworthy features

Table 2 Cluster profiles Fund 1

Gender	Cluster	*n*	Age last birthday	Years of membership	Employer contributions	New–old performance (%)	Risk	Account balance	Choice number
Female	1	7,079	47.34 (0.13)	8.06 (0.02)	4,237 (40)	0.78 (0.03)	3.47 (0.01)	87,195(520)	1.80 (0.01)
	2	42,517	35.47 (0.06)	0.42 (0.01)	1,470 (16)	−0.21 (0.01)	3.27 (0.01)	10,569 (212)	1.02 (0.00)
Male	1	2,674	46.79 (0.23)	5.91 (0.04)	5,647 (84)	0.80 (0.05)	3.56 (0.02)	125,443 (1238)	2.18 (0.02)
	2	13,554	36.37 (0.10)	0.40 (0.02)	1,677 (37)	−0.10 (0.02)	3.48 (0.01)	14,968 (550)	1.05 (0.01)

Except for *n* and Gender, values are means. Unless otherwise indicated, values in parentheses are standard errors

Table 3 Cluster profiles Fund 2

Gender	Cluster	*n*	Age last birthday	Years of membership	Employer contributions	New–old performance (%)	Risk	Account balance	Choice number
Female	1	1,535	45.00 (0.28)	5.67 (0.06)	3,369 (90)	1.77 (0.07)	3.99 (0.03)	94,340 (1,443)	2.10 (0.02)
	2	5,548	33.85 (0.15)	0.39 (0.03)	1,269 (47)	−1.02 (0.04)	3.64 (0.02)	16,462 (759)	1.04 (0.01)
Male	1	5,119	46.56 (0.15)	8.24 (0.04)	4,646 (56)	1.69 (0.04)	4.01 (0.02)	135,663 (1127)	2.15 (0.01)
	2	15,302	33.65 (0.09)	0.78 (0.02)	2,144 (33)	−0.55 (0.02)	3.87 (0.01)	25,519 (652)	1.08 (0.01)

Except for *n* and Gender, values are means. Unless otherwise indicated, values in parentheses are standard errors

Table 4 Cluster profiles Fund 3

Gender	Cluster	*n*	Age last birthday	Years of membership	Employer contributions	New—old performance (%)	Risk	Account balance	Choice number
Female	1	411	50.72 (0.49)	2.88 (0.04)	4,795 (93)	1.62 (0.10)	3.67 (0.02)	192,978 (1729)	10.22 (0.25)
	2	3295	43.51 (0.17)	3.78 (0.02)	2,575 (33)	1.48 (0.03)	4.12 (0.01)	41,194 (61)	1.55 (0.09)
	3	3907	37.53 (0.16)	0.20 (0.01)	4,646 (30)	−0.56 (0.03)	4.05 (0.01)	53,323 (561)	1.02 (0.08)
	4	4875	37.74 (0.14)	0.16 (0.01)	390 (27)	−0.72 (0.03)	4.08 (0.01)	18,401 (502)	1.02 (0.07)
	5	1150	46.20 (0.29)	1.17 (0.02)	1,501 (56)	0.36 (0.06)	1.78 (0.01)	27,330 (1034)	1.23 (0.15)
Male	1	1057	51.01 (0.32)	1.97 (0.03)	4,130 (111)	−0.25 (0.07)	2.32 (0.02)	121,085 (1980)	6.98 (0.26)
	2	2865	44.29 (0.19)	3.79 (0.02)	3,190 (68)	1.79 (0.04)	4.18 (0.01)	54,904 (1203)	2.02 (0.16)
	3	5992	38.96 (0.13)	0.21 (0.01)	2,740 (47)	−0.59 (0.03)	4.10 (0.01)	42,497 (832)	1.04 (0.11)

Except for *n* and Gender, values are means. Unless otherwise indicated, values in parentheses are standard errors

of the clusters are that Clusters 2, 3 and 4 all chose options of relatively high risk, whereas Cluster 5 chose options with extremely low risk.

Male members of Fund 3 separated into three clusters (see Table 4). A MANOVA indicated a significant overall difference between the clusters (Pillai's Trace approx. $F(14, 19812) = 3105.435, p < 0.05$). Univariate ANOVAs indicated significant differences between the clusters on all dependent variables (Table 6). Tukey's post hoc comparisons between each cluster on each dependent variable indicated that every cluster was significantly different from the other two clusters on all variables.

The pattern of differences between the three male clusters of Fund 3 is quite different to that observed for females. Cluster 1 is senior in age but surprisingly has had a much shorter period of membership in the fund compared to the other two clusters. They do have larger employer contributions than these clusters and a much greater account balance. Their investments are very low in risk and there is a record of frequent past activity. The major difference between Clusters 2 and 3 concerns age, employer contributions and the difference between new and old investments: Cluster 2 is older, has higher employer contributions and appears to have been chasing returns. Both Clusters 2 and 3, though, have chosen high risk options.

Fund 4

Female Fund 4 members separated into three clusters (see Table 5). There was an overall significant difference between these clusters, as indicated by a MANOVA (Pillai's Trace approx. $F(14, 33516) = 5834.028, p < 0.05$). Univariate ANOVAs indicated that the clusters differed on all of the dependent variables (Table 6). Tukey's post hoc

Table 5 Cluster profiles Fund 4

Gender	Cluster	*n*	Age last birthday	Years of membership	Employer contributions	New–old performance (%)	Risk	Account balance	Choice number
Female	1	4,107	46.84 (0.16)	6.92 (0.04)	6,994 (91)	1.75 (0.05)	3.18 (0.01)	111,699 (1017)	1.73 (0.01)
	2	6,576	36.20 (0.12)	1.11 (0.03)	3,378 (72)	0.10 (0.04)	4.65 (0.01)	24,800 (804)	1.02 (0.00)
	3	6,083	37.37 (0.13)	0.84 (0.04)	1,819 (75)	0.44 (0.04)	1.43 (0.01)	22,217 (836)	1.01 (0.00)
Male	1	2,969	49.44 (0.18)	8.87 (0.06)	13,553 (167)	1.98 (0.06)	3.64 (0.01)	237,845 (1928)	1.98 (0.01)
	2	7,380	36.71 (0.12)	1.57 (0.04)	5,025 (106)	0.19 (0.04)	4.71 (0.01)	41,584 (1223)	1.05 (0.01)
	3	4,633	41.01 (0.15)	1.97 (0.05)	2,776 (134)	0.93 (0.04)	1.43 (0.01)	44,957 (1543)	1.06 (0.01)

Except for *n* and Gender, values are means. Unless otherwise indicated, values in parentheses are standard errors

comparisons between each cluster on each dependent variable indicated that every cluster was significantly different from the other two clusters on all variables, with two exceptions. On the Choice Number variable there was no difference between Clusters 2 and 3. On the Account Balance variable there was no difference between Clusters 2 and 3.

Male Fund 4 members were also separated into three clusters (see Table 5). A MANOVA indicated that there was an overall significant difference between the clusters (Pillai's Trace approx. $F(14, 29948) = 5402.496$, $p < 0.05$). A series of univariate ANOVAs was performed on each dependent variable, and these all indicated significant differences between the clusters (Table 6). Tukey's post hoc comparisons between each cluster on each dependent variable indicated that every cluster was significantly different from the other two clusters on all variables, with two exceptions. On the Choice Number variable there was no difference between Clusters 2 and 3. On the Account Balance variable there was no difference between Clusters 2 and 3.

The pattern of differences between the clusters in Fund 4 is very similar for females and males. Cluster 1 is a relatively smaller group, more senior in age and so has the expected age-related differences (i.e., longer membership, greater employer contributions, larger account balances, and more of a history of making changes to investment strategy). Members in this cluster also show signs of return chasing, and choose options with moderate risk (the females tend to be lower than the males). Members in Clusters 2 and 3 are similar except for a small number of dramatic differences. They are both relatively young, and have been in the fund for a short period. They have similar account balances, both show little sign of return chasing, and have little history of making previous changes to investment strategy. Interestingly, for both females and males, Cluster 2 has almost twice the employer contribution of Cluster 3, indicating a higher income. Cluster 2 also has investment choices with very high risk. Cluster 3 in contrast has choices with extremely low risk.

Discussion and Conclusion

The extensive cluster and discriminant analysis used in the present study has highlighted a range of similarities and differences within and between funds in the investment strategy choice of members. The most consistent and significant finding is that gender and risk are the dominant dimensions on which clusters are discriminated. Across all funds and within each fund the majority of clusters are single gender. Across all funds and in Fund 1 the female clusters choose lower risk options than the male clusters but the results are not uniform, particularly for Funds 3 and 4. In Funds 1 and 2 younger females choose lower risk options than older females but this connection is less strong in Funds 3 and 4. An interesting result, supporting previous findings, is the strong connection between age and return-chasing behaviour. In all funds, except Fund 3, return-chasing behaviour consistently increases with age. This seems to be an indicator that as retirement gets nearer people are becoming concerned about the level of their retirement savings and are seeking to increase their funds by improving returns without, necessarily, increasing risk. The results of the present study show no consistent correlation between age and risk level. The two oldest groups in Fund 3, one male and one female, choose very low risk options which might be seen as a shift to more conservative investments prior to retirement but this pattern is not apparent in the other funds. Indeed in Fund 1 the youngest group, which also happens to be female, has the lowest risk while in Fund 3 the two youngest groups, one male and one female, have the highest risk.

It is likely that some of the diversity in results between funds results from the nature of their membership. Fund 1's membership is likely to be the most homogenous while Funds 3 and 4 are likely to be the least homogenous. It is also possible that diversity may result from the fund's structure and the way they communicate with their members on matters related to investment strategy choice; these are both areas for future research.

It is important to note that the funds that supplied data for this study differed in the fees charged for making a change to an investment strategy. As indicated in Fig. 1,

Table 6 Univariate comparisons between clusters

Fund (df)	Dependent variables						
	Age	Years	Employer contributions	Performance change	Risk	Account balance	Choice number
All Funds	$F = 3918.97$	$F = 11629.05$	$F = 17991.79$	$F = 604.33$	$F = 1093.75$	$F = 60715.50$	$F = 2728.88$
(2, 148625)	Partial $\eta^2 = .05$	Partial $\eta^2 = .14$	Partial $\eta^2 = .20$	Partial $\eta^2 = .01$	Partial $\eta^2 = .02$	Partial $\eta^2 = .45$	Partial $\eta^2 = .04$
Fund 1 Females	$F = 6686.98$	$F = 77689.51$	$F = 4025.39$	$F = 860.70$	$F = 169.04$	$F = 18645.48$	$F = 11719.30$
(1, 49594)	Partial $\eta^2 = .12$	Partial $\eta^2 = .61$	Partial $\eta^2 = .08$	Partial $\eta^2 = .02$	Partial $\eta^2 = .00$	Partial $\eta^2 = .27$	Partial $\eta^2 = .19$
Fund 1 Males	$F = 1723.54$	$F = 16394.90$	$F = 1882.54$	$F = 249.77$	$F = 10.97$	$F = 6654.28$	$F = 4765.91$
(1, 16226)	Partial $\eta^2 = .10$	Partial $\eta^2 = .50$	Partial $\eta^2 = .10$	Partial $\eta^2 = .02$	Partial $\eta^2 = .00$	Partial $\eta^2 = .29$	Partial $\eta^2 = .23$
Fund 2 Females	$F = 1248.90$	$F = 6506.46$	$F = 423.64$	$F = 1155.05$	$F = 88.32$	$F = 2282.94$	$F = 2547.11$
(1, 7081)	Partial $\eta^2 = .15$	Partial $\eta^2 = .48$	Partial $\eta^2 = .06$	Partial $\eta^2 = .14$	Partial $\eta^2 = .01$	Partial $\eta^2 = .24$	Partial $\eta^2 = .26$
Fund 2 Males	$F = 5370.83$	$F = 26692.49$	$F = 1474.55$	$F = 2634.48$	$F = 53.75$	$F = 7161.98$	$F = 5826.57$
(1, 20419)	Partial $\eta^2 = .21$	Partial $\eta^2 = .57$	Partial $\eta^2 = .07$	Partial $\eta^2 = .11$	Partial $\eta^2 = .00$	Partial $\eta^2 = .26$	Partial $\eta^2 = .22$
Fund 3 Females	$F = 462.58$	$F = 10842.09$	$F = 2993.35$	$F = 822.68$	$F = 8631.64$	$F = 2598.54$	$F = 335.19$
(4, 13633)	Partial $\eta^2 = .12$	Partial $\eta^2 = .76$	Partial $\eta^2 = .47$	Partial $\eta^2 = .19$	Partial $\eta^2 = .72$	Partial $\eta^2 = .43$	Partial $\eta^2 = .09$
Fund 3 Males	$F = 730.89$	$F = 13632.22$	$F = 70.94$	$F = 1014.69$	$F = 4769.38$	$F = 669.37$	$F = 217.36$
(2, 9911)	Partial $\eta^2 = .13$	Partial $\eta^2 = .73$	Partial $\eta^2 = .01$	Partial $\eta^2 = .17$	Partial $\eta^2 = .49$	Partial $\eta^2 = .12$	Partial $\eta^2 = .04$
Fund 4 Females	$F = 1556.65$	$F = 7110.92$	$F = 988.22$	$F = 385.34$	$F = 24246.09$	$F = 2387.82$	$F = 4984.60$
(2, 16763)	Partial $\eta^2 = .16$	Partial $\eta^2 = .46$	Partial $\eta^2 = .10$	Partial $\eta^2 = .04$	Partial $\eta^2 = .74$	Partial $\eta^2 = .25$	Partial $\eta^2 = .37$
Fund 4 Males	$F = 1689.55$	$F = 4893.79$	$F = 1358.42$	$F = 368.66$	$F = 27719.66$	$F = 4101.09$	$F = 3873.27$
(2, 14979)	Partial $\eta^2 = .18$	Partial $\eta^2 = .40$	Partial $\eta^2 = .15$	Partial $\eta^2 = .05$	Partial $\eta^2 = .79$	Partial $\eta^2 = .35$	Partial $\eta^2 = .34$

All F values are significant, $p < 0.05$

fees ranged from no charge to $20 per change, with related restrictions associated with the number of changes permissible in a prescribed time period. It is possible that such fees could deter people from making any changes to their investment strategy. As a result, any conclusions drawn from the current sample reflects the behavior of people who have not been discouraged from making a change by such fees. This constitutes a limitation of the present study.

The present study, using a large sample from a diverse range of industries, supports and extends the findings of previous research which indicates that individuals' decisions about retirement savings investments are not driven solely by the risk-return framework of portfolio theory and the economically rational decision making model. Demographic factors, notably gender, and behavioural factors, such as the belief that high past-returns are an indicator of future returns, influence decision making. Gender is clearly a critical issue. Women are at a disadvantage in their ability to accumulate sufficient funds for retirement as a result of more disrupted work patterns and lower incomes across their working lives. It seems likely that these disadvantages are being reinforced by a gender tendency to make sub-optimal investment strategy choices. The good news is that there is evidence this tendency reduces as knowledge and confidence increases (Clark et al. 2004; Lusardi and Mitchell 2008). In an environment where individuals have and will continue to take more responsibility for the provision of their retirement income it is therefore critical both the industry and governments have a strong focus on education and communication. In particular, information provided to investors by superannuation funds should be tailored to suit demographic groups and to address fallacious beliefs that underlie behaviours such as return chasing.

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