



Stream 3: Better Superannuation Outcomes, Working Paper

Patterns of voluntary worker retirement savings: a longitudinal analysis

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Draft

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THE CSIRO-MONASH SUPERANNUATION RESEARCH CLUSTER IS A COLLABORATION BETWEEN CSIRO, MONASH UNIVERSITY, GRIFFITH UNIVERSITY, THE UNIVERSITY OF WESTERN AUSTRALIA, THE UNIVERSITY OF WARWICK, AND STAKEHOLDERS OF THE RETIREMENT SYSTEM, TO DEVELOP A RESEARCH AGENDA THAT ESTABLISHES AN EVIDENCE BASE TO FACILITATE BETTER DECISION MAKING WITH RESPECT TO THE SUPERANNUATION AND RETIREMENT SYSTEMS IN THE INTEREST OF BETTER OUTCOMES FOR ALL

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Executive Summary

This paper provides an empirical analysis of voluntary retirement savings decisions within superannuation of a large database of Australian workers drawn from a wide range of employers. In contrast to the limited available evidence, we utilise administrative data rather than reported decisions obtained from surveys. We examine participation in pre-tax (salary-sacrifice) and post-tax savings separately and also explore the inter-relationship between both choices.

Our analysis provides some contrasting evidence to that previously reported. In terms of the level of participation, we find a decline in participation in pre-tax (salary sacrifice) contributions and in post-tax contributions between 2002/03 and 2011/12. The overall participation in pre-tax contributions declined from 24% to 17% and post-tax from 15% to 5% over the period. The 2007/08 financial year is a clear marker with pre-tax contributions recovering before steadily declining after. The decline in post-tax contributions appears more clearly after the 2006/07 financial year. The association between these time markers and government policy changes regards superannuation contributions is apparent but not exclusive explanations.

The declining trend can also be attributed to lower participation among new cohorts of members each year. That is new members at the end of the period had lower participation than new members at the beginning of the period. In fact when year of joining the fund is isolated, those who joined earlier in the period display an increasing participation trend. The lower rate for new members may be accounted for, in part, by changing workforce composition, specifically more part-time workers.

Age, income and males all have a positive association with pre-tax contributions participation whereas for post-tax contributions, male and income have a negative effect on average. The income relationship points to the widening tax incentive for pre-tax contributions as incomes rise, and an attraction in co-contributions for lower income members. A significant interaction effect is revealed between age, gender and income. Female members in the highest income group are more likely to make pre-tax contributions when older.

1. Introduction

The adequacy of retirement savings remains an important issue for individuals, pension funds and governments. This has been magnified by the ageing demographic and the shift in responsibility for making retirement savings choices from government and employer to individuals. The experience of the global finance crisis further brought the question of adequacy in to focus given the impact on accumulated retirement savings. A number of reports suggest that the current compulsory savings are not sufficient or highlighting a retirement savings gap (Commonwealth of Australia 2009; Rice Warner Actuaries 2012; Deloitte Australia 2014); even considering the inclusion of the government age pension receipts (Burnett *et al.* 2014).

Increasing compulsory employer contributions from 9.5% to 12% will mitigate this issue to some extent¹, however, recent policy discussion on lifting the age pension eligibility age to 70 and changes to the indexation of the age pension payments are putting more pressure on superannuation as a means of funding retirement income. Assessment of adequacy requires consideration of a number of inputs including supply (eg. savings levels, savings asset allocation, savings earnings) and demand (eg. expenditure, retirement length). Burnett *et al.* (2014) highlight shortcomings in existing measures of retirement savings adequacy and propose new metrics measured in terms of consumption and years of funding based on adequate consumption.

In the accumulation phase, given a retirement age or constrained savings period, two levers are available to the individual. One is the investment strategy applied to retirement savings, which is an important component influencing retirement savings, and the second is through additional voluntary savings or contributions. In this paper our interest is in the second, specifically providing evidence on historical patterns of voluntary contributions, specifically salary sacrifice (or pre-tax contributions) and post-tax contributions.

A relatively rich private retirement savings literature has emerged in the US with examination of both participation rates and savings rates in savings vehicles such as 401(k), 403(b) and IRAs. Evidence in the Australian context is limited in comparison and several structural features have led to difficulty in applying experiences from

¹ Though the current federal government is proposing to delay the timing of increase

other countries in shaping domestic voluntary contributions policy despite some similar demographic patterns found between different systems. Chief among these is the mandatory retirement savings Australian workers receive through the Superannuation Guarantee, but also included is the role of company stock, particularly in the US, and tax concession limits on savings.

Existing research in Australia is based on population surveys which potentially suffer from a reporting bias in that they require individuals to correctly classify their voluntary retirement savings by type. No evidence is available as to accuracy of such classifications but reported knowledge of the superannuation system has been identified as poor (Agnew *et al.* 2013). Time series information is also limited with existing analysis primarily cross-sectional which thus only provides a snapshot of savings behaviour, without a consideration of trends in retirement savings.

In this paper, we provide a contribution by examining decade-long contribution records from Australian workers who are members of a common superannuation fund drawn from a wide cross-section of employers. This allows investigation of trends in the participation in voluntary contributions. In addition to comparing the role of demographic and social-economic factors in predicting contribution behaviours, particular attention will be focused on identifying the dynamics between salary sacrifice and post-tax contributions as well as the dynamics between past and current year decisions. This study is the first to provide a long term trend of voluntary contribution participation in retirement savings using employer level data and therefore facilitate assessments of policy aimed at improving retirement saving adequacy. The paper is organised as follows: an overview of the dataset will be presented in section 2; the trend in voluntary contribution participation is presented next and followed by econometric analysis on the dynamics of the decisions; section 5 concludes.

2. Overview of Mercer Database and sample statistics

To investigate the trend in voluntary contributions, we utilised individual contribution records from the Mercer Super Trust (MST), Corporate Division. The MST consists of 181 employer level sub-plans with employers drawn from a wide cross-section of Australian industry. The MST provides a common overall structure with

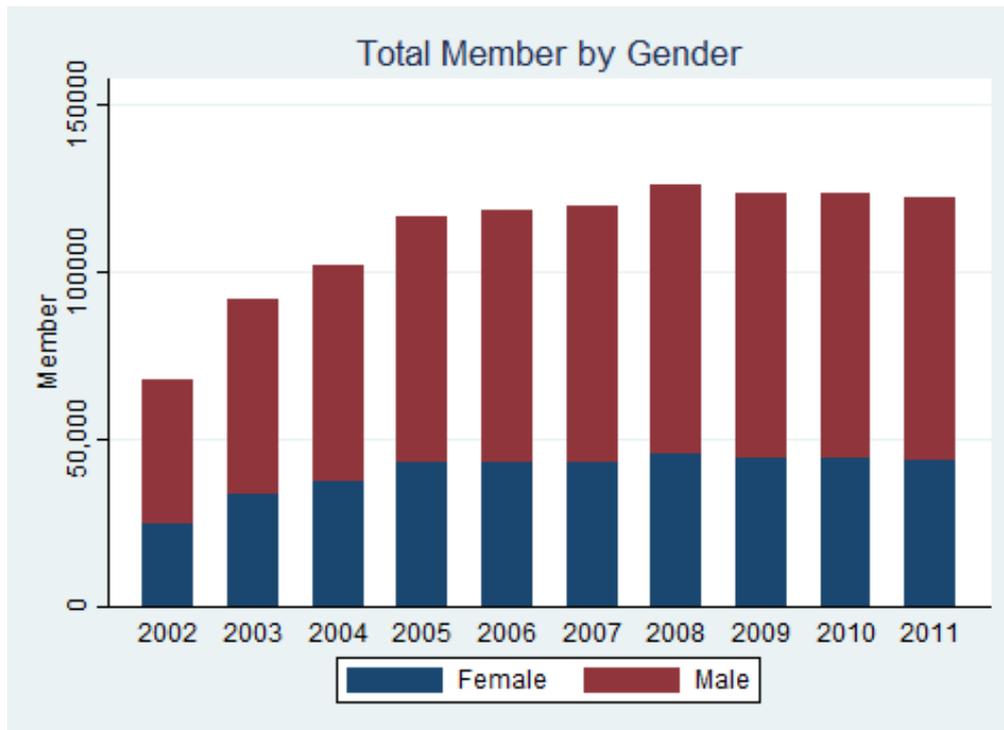
variation/customisation at sub-plan level reflecting employer choices for their workforce. The database includes transaction records on contributions for 489,621 members across a ten-year period (from 2002/03 to 2011/12). The diversity of the sub-plans and large number of members included provide a comprehensive picture of the employee population – including both full and part time members, ranging from junior level employees to executives.

As the focus of the current analysis is on voluntary contribution decisions (including both salary sacrifice and post-tax contributions), we restrict the sample to members between the age of 20 and 69 as at the end of the record financial year, with contributions and salary records.² This selection criteria produces 1,111,992 member-year contribution records for 294,072 members with slightly over 60% of male members.

Figure 1 presents the overall profile of membership which highlights the substantial increase in member numbers in the first five financial years. This is mainly due to a number of sub-plans joining the MST bringing new members to the fund. The member-year records that meet the selection criteria quickly rise from less than 70,000 in 2002/03 to a peak of over 126,000 in 2008/09. The sample includes 181 sub-plans with considerable variability extending from a sub-plan with one member meeting the selection criteria to the largest sub-plan with over 43,000 members.

² That is, positive or zero contributions for all types of superannuation contributions and have positive salary for the whole records.

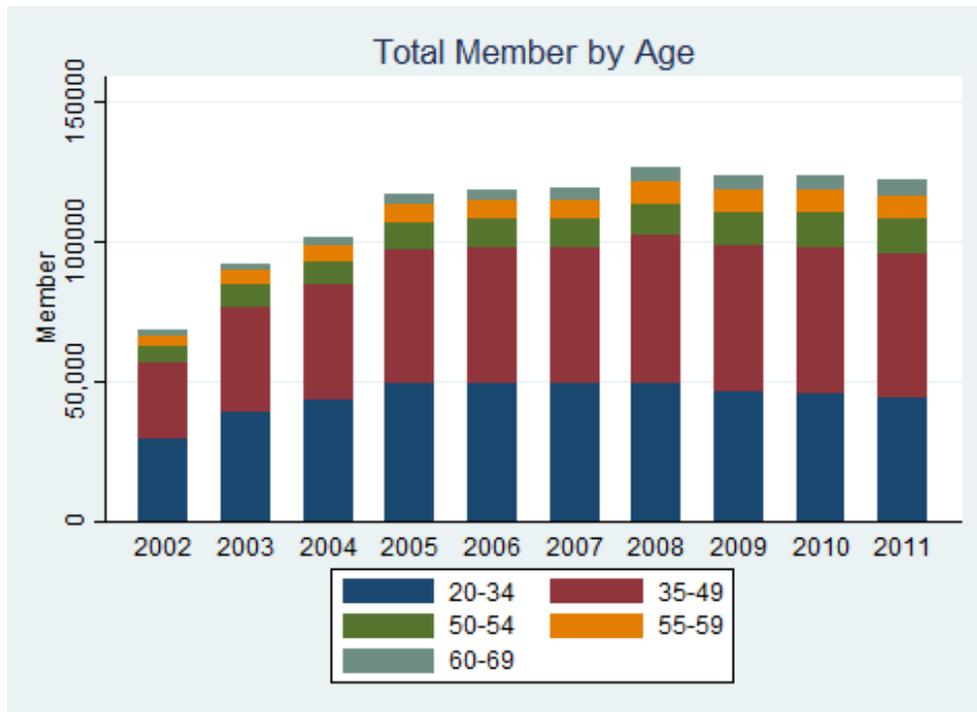
Figure 1 Total Number of Members by Gender and Financial Year



Despite the increase in the number of members, the gender ratio varies only marginally. Approximately 63% of the contribution records in each financial year are from male members. Also steady is the age mixture of the members as exhibited in Figure 2.³ The majority of members are in the early stage of their working career with members in 20-34 years and 35-49 years age brackets each accounting for approximately 40% of all members. Over the sample period, members grow older and the proportion above 50 years old increases by five percentage points. In 2011/12, the proportion of 50-54, 55-59 and 60-69 accounts for 10%, 7% and 5% of all members.

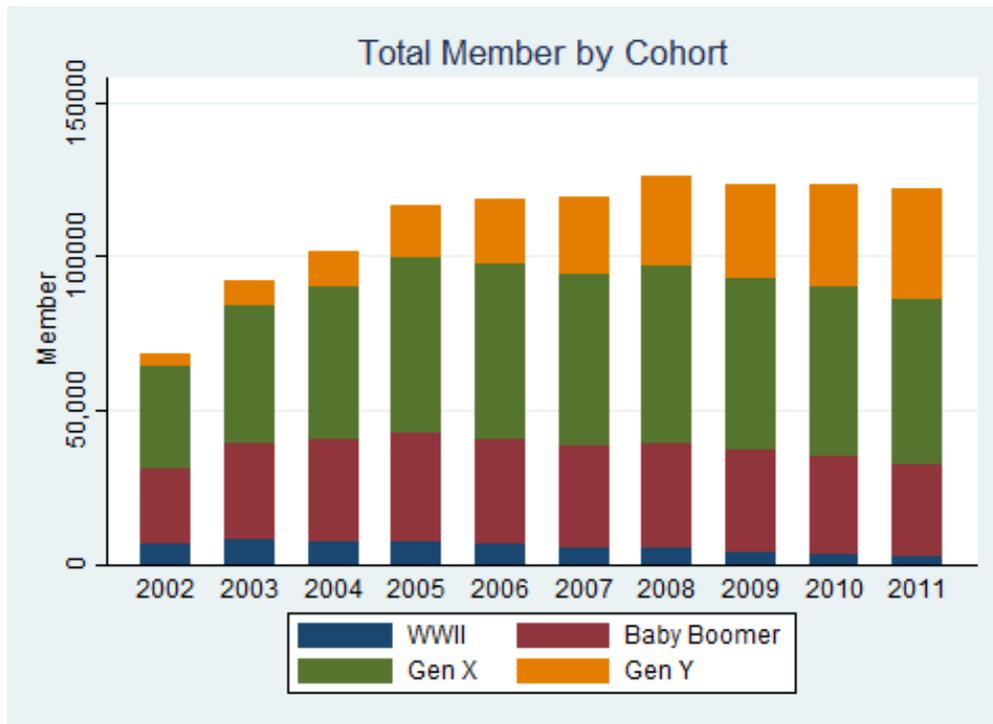
³ We select the age brackets to best align with age markers in contributions (savings) limits which exist over the sample period. Age based restrictions linked to withdrawal of savings (transition to retirement) and the age when withdrawals became become tax free (60 years post 2006/07 financial years) are also considered

Figure 2 Total Number of Members by Age Band and Financial Year



From a cohort perspective (Figure 3), Generation X is the major cohort in the sample. Over 46% members are Generation X, twice as much as that of Generation Y and Baby Boomers. Members born during the World War II (WWII) era (1935-1949) accounts for only 4% of the total members. In spite of the substantial weight of Generation Y in the total sample by member counts, the proportion of Generation Y in the earlier financial years is relatively small with a similar proportion as the WWII group in 2002/03. However, Generation Y is the fastest growing cohort over the period and is as important as the Baby Boomer cohort by 2011/12.

Figure 3 Total Numbers of Members by Cohort and Financial Year



All but a small proportion of members have a DC benefit structure with a small proportion of members of a fund where they have a DC and DB benefit. DB only fund members decline over the sample with none by 2011/12. Hence the voluntary contribution participation trend will not be analysed separately by the fund types.

Consistent with overall population data, a wage gap by gender is evident in each year. Females earned less than male counterparts in all financial years although there are salary increases for both genders (Figure 4).

Figure 4 Average Income by Gender and Financial Years



3. Voluntary contribution participations trends

3.1. Background system history impacting contributions

Before reviewing sample evidence it is helpful to consider the rules applicable and other system wide changes. The Superannuation Guarantee (SG) was first introduced in 1992 at 3% for all workers with monthly earnings exceeding \$450, and was gradually increased to 9% by 2002. More recently this has extended to 9.25% and currently 9.5% on a schedule of increments to reach 12%. However, the current analysis covers the decade from 2002/03 where the SG rate was maintained at 9%. Despite the stability in the SG rate, a number of changes were introduced to the system over the period which impacted contributions directly or which impacted broader features of the system including taxation and access.

Government Co-Contributions provide a matching contribution for post-tax contributions made by low income earners. This was introduced in 2003, replacing a Low Income Superannuation Rebate. The maximum amount of match, rate of match, applicable income thresholds and the reduction or taper rate between thresholds varied over the period as summarised in Table 1. The maximum co-contribution was a

150% match to a maximum \$1,500 between 2004 and 2009 and has reduced to a present 50% match to a maximum of \$500.

Table 1 Government Co-Contribution Eligibility and Rates

Period	Co-contribution	Income Thresholds	Reduction above low threshold
30/6/2002 - 1/7/2003	Prior to Co-Contribution introduction, a low-income rebate entitlement was available of 10% of personal contributions (to max \$100) for those on incomes of \$27,000 or less, to a maximum income of \$31,000		
1/1/2003 - 30/6/2004	100% matching up to max co-contribution of \$1,000 for personal contributions of \$1,000	Low threshold: \$27,500 Max income: \$30,342	\$0.08 per dollar
1/7/2004 - 30/6/2007	150% matching up to max co-contribution of \$1,500 for personal contributions of \$1,000	Low threshold: \$28,000 Max income: \$38,000	\$0.05 per dollar
1/7/2007 - 30/6/2008		Low threshold: \$28,980 Max income: \$58,980	
1/7/2008 - 30/6/2009		Low threshold: \$30,342 Max income: \$60,342	
1/7/2009 - 30/6/2012	100% matching up to max co-contribution of \$1,000 for personal contributions of \$1,000	Low threshold: \$31,920 Max income: \$61,920	\$0.03333 per dollar
1/7/2012 - 30/6/2013	50% matching up to max co-contribution of \$500 for personal contributions of \$1,000	Low threshold: \$31,920 Max income: \$46,920	
1/7/2013 - 30/6/2014		Low threshold: \$33,516 Max income: \$48,516	

Major changes were introduced to limits on contributions and the taxation of benefits withdrawn from accounts in the 2007 Simpler Super Reform. In the accumulation phase, the Age Based Limits (ABLs) were replaced with an adjusted age-linked contributions caps⁴ with a transitional period allowing older workers (50 and above) to make higher concessional contributions (details are summarised in Table 2). In addition to simplifying concessional contribution caps, a cap to non-concessional contribution was introduced at \$150,000 to limit excessive retirement savings through superannuation. While the majority of attention has focused on concessional contributions, members have the ability to contribute much larger amounts via post-tax (non-concessional) contributions. While a tax concession is not claimed for contributions as they enter the fund (hence “non-concessional” contributions), the significant concessional tax advantages applicable to superannuation *earnings* on concessional contributions equally applies. To compensate for the adjustments to caps non-concessional contributions up to \$1 million were allowed between May 2006 and June 2007 as a transitional measure.

⁴ The stated intention was to have a single cap but such intent has not occurred in practice

A major change in assessing entitlement of concessional benefits was the move from the Reasonable Benefit Limits (RBLs) to Contribution Caps from July 2007. The RBLs prescribed the maximum balance that could be accumulated and receive concessional treatment when withdrawn. The contributions caps changed the focus to the amount being contributed to the account, though contribution caps were also applicable with the RBLs. The age brackets and caps change over the period with the latter variously linked to indexation, paused and reintroduced.

Table 2 Government Contribution Caps

Financial Year	Concessional Cap			Non-Concessional Cap
	< 35 years	35-49 years	50 to 70 years	
2002/2003	\$12,651	\$35,138	\$87,141	Reasonable Benefit Limits to 6/2007 Up to \$1 million 5/06 – 6/07
2003/2004	\$13,233	\$36,754	\$91,149	
2004/2005	\$13,934	\$38,702	\$95,980	
2005/2006	\$14,603	\$40,560	\$100,587	
2006/2007	\$15,260	\$42,385	\$105,113	
	< 50 years		≥ 50 years	
2007/2008	\$50,000		\$100,000	\$150,000
2008/2009				
2009/2010	\$25,000		\$50,000	
2010/2011				
2011/2012				
2012/2013			\$25,000	
2013/2014			\$25,000, \$35,000 ≥ 60yrs	
2014/2015	\$30,000	\$35,000	\$180,000	

In the decumulation phase, a fundamental change to the system was also introduced from 1st July 2007 with withdrawals from superannuation for those 60 and over becoming tax free.⁵ While the withdrawals from superannuation were afforded considerable tax concessions the “tax-free” blanket rule was a significant event in raising the attractiveness of superannuation for retirement savings if not broader wealth management.

Additional broader system changes over the period included the introduction of portability rules, effective from July 2004, which allowed members to transfer their accumulated balance to a complying fund.⁶ Related changes allowing eligible

⁵ For those in “taxed” superannuation funds whose earnings had been subject to tax on earnings. Those in untaxed funds (eg. some public sector funds) which do not pay tax on income effectively pay this tax at withdrawal.

⁶ The regulations permit transferring fund to refuse a request where it results in a balance below a minimum threshold (\$5000) or where more than one request is received in a 12-month period. Further

members to nominate a different superannuation fund to the one nominated by an employer to receive SG contributions commenced in July 2005.⁷

3.2. Preliminary aggregate analysis

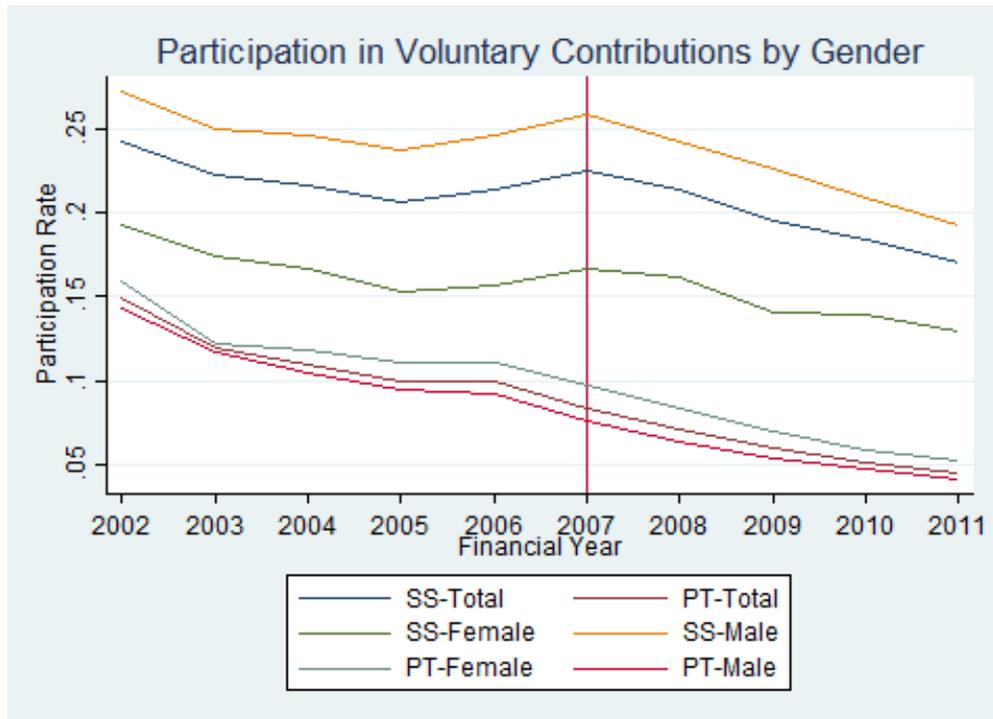
Figure 5 presents the overall trend of participation over the sample period separated by the type of contributions made. Participation rates for both salary sacrifice and post-tax contributions were lower in 2011/12 than in 2002/03. Despite a temporary rise in salary sacrifice participation in 2007/08, the general trends for both types of contributions were negative. Over the sample period, the participation rate for salary sacrifice was consistently higher than that of post-tax contributions by approximately five percentage points.

The estimated participation rate in salary sacrifice contributions is much higher than that reported in the population surveys analysed in comparable years (such as SEARS 2007, SIH 05/06 to 09/10, HILDA wave 10) by Feng (2013). In addition, participation in post-tax contributions in population surveys (SEARS 2007) is much higher than that in salary sacrifice. There are two broad reasons which may individually, or in combination, contribute to this. The first is due to a different demographic profile of the samples. Feng (2013) restricted his analysis of survey data to: individuals 25 to 64 years old; those employed at the time of the survey; with no business income; and annual incomes between of \$2,600 and \$312,000). A second difference may be due to misreporting of the type of superannuation contribution being made. As noted in the first section, reported knowledge of the superannuation system has been identified as poor (Agnew et al. 2013). With the latter there is however no evidence of comparisons between actual and reported contributions.

discretion is permitted to consider the impact on the transferring fund. Originally (ceased in July 2005) portability transfers were not eligible given an employer contribution in the preceding six-months. Further changes to rules have impacted processing time requirements and documentation required.

⁷ Via the Superannuation Industry (Supervision) Amendment Regulations 2003 (No. 5) and Superannuation Legislation Amendment (Choice of Superannuation Funds) Act 2004, no. 102 respectively.

Figure 5 Participation Rate in Voluntary Contributions by Gender (SS: Salary Sacrifice; PT: Post-tax Contributions)



Compared to cross-sectional population surveys, the gender difference in voluntary contribution decisions is more pronounced. Substantially more males choose to make salary sacrifice arrangements than females. As men earn higher income than women and salary sacrifice is only taxed advantaged for higher income earners, such observation is expected. Participation in post-tax contributions, on the other hand, has a higher female rate. However, the gender difference is not as large as that in salary sacrifice arrangements meaning that in aggregate the participation rate is higher for males for making voluntary contributions.

The age pattern in voluntary contributions is consistent with the population survey observations. When individuals age, the probability of making voluntary contributions increases substantially. This trend is observed in all financial years in our sample and for both salary sacrifice and post-tax contributions (Figure 6). In contrast to the declining participation rates in voluntary contributions in aggregate data, older employees' participation in salary sacrifice only reduces modestly and even increased for the 60 above age group. In contrast, participation in post-tax contributions reduces quickly for older age groups. Pooling all financial years, a hump shaped participation pattern is observed for salary sacrifice reaching a peak level at age 60 (Figure 7)

consistent with the life-cycle model of savings. However the post-tax contributions do not peak by age.

Figure 6 Participation Rate in Voluntary Contributions by Age Bands

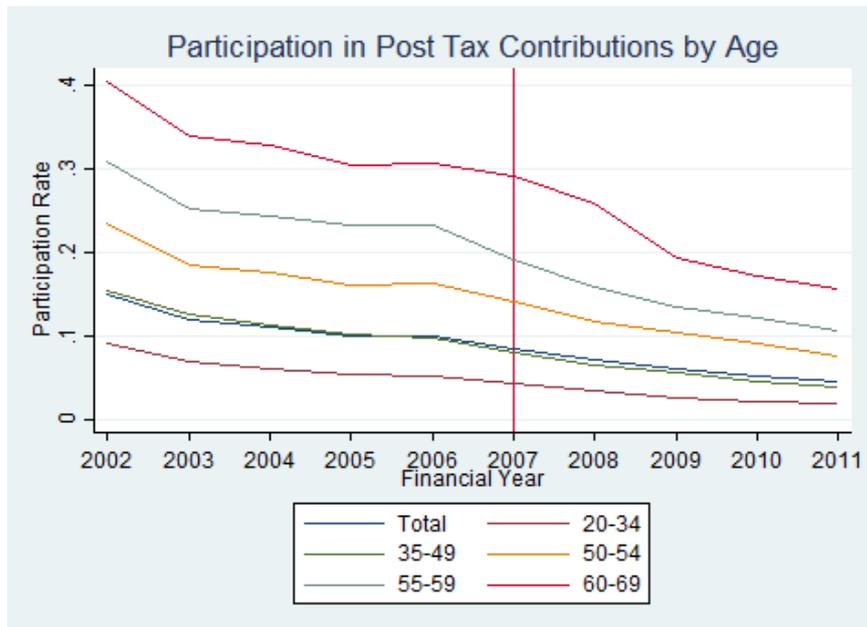
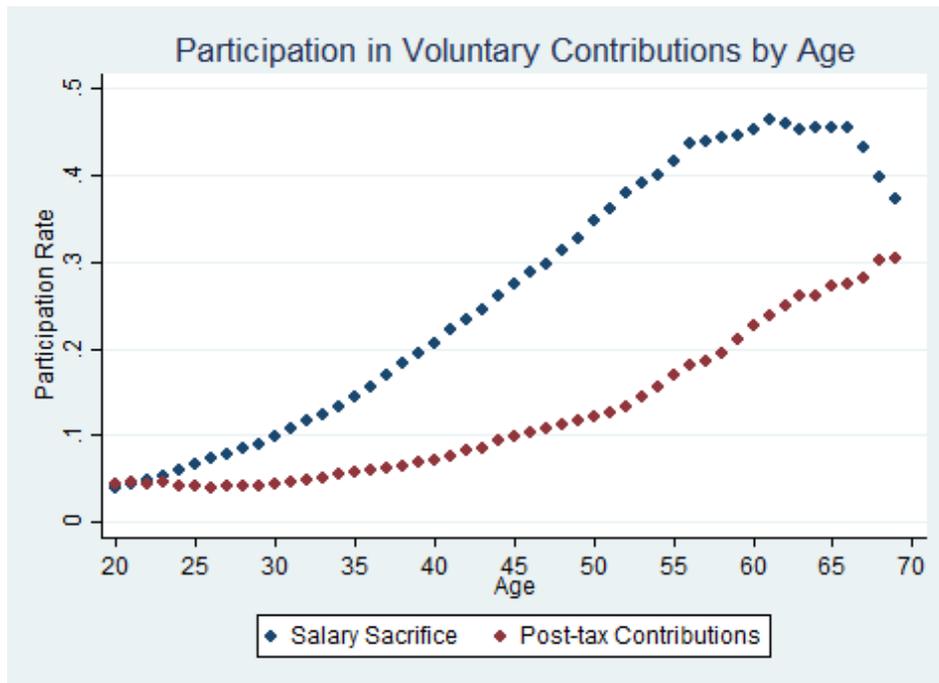
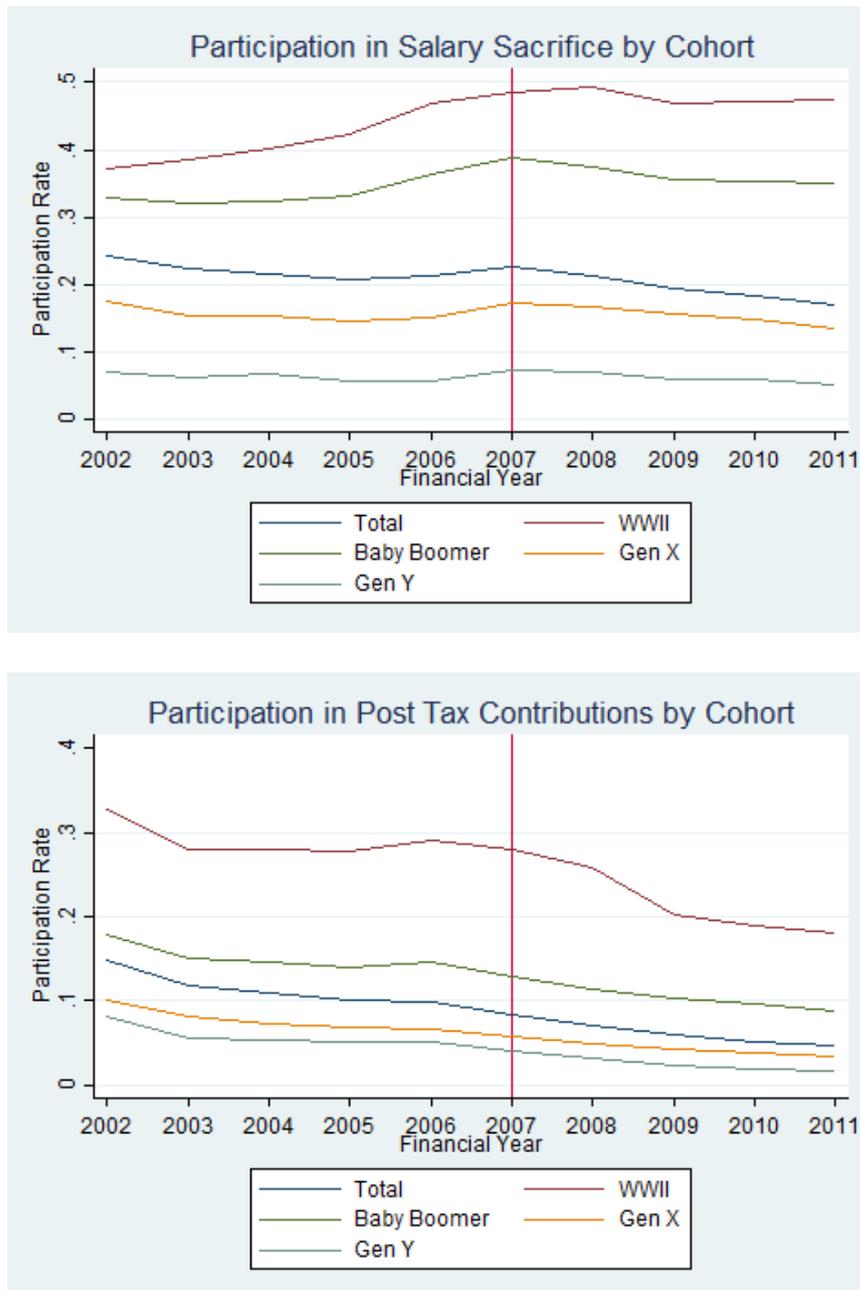


Figure 7 Voluntary Contributions Participation Rate by Age (pooled financial years)



Given the longitudinal nature of the database, we can also examine participation rates by cohorts (Figure 8). Conventional cohort groups are used: World War II (1935-1949), Baby Boomers (1950-1964), Generation X (1965-1979) and Generation Y (1980-1995). When tracking individuals in the same cohort over years, the declining pattern of voluntary contributions is not as distinct as observed above. The younger generations have a substantially lower participation rate and the participation rate in salary sacrifice is much more stable in contrast with the increasing trend reported previously for older generations, though the declines after 2008 are evident.

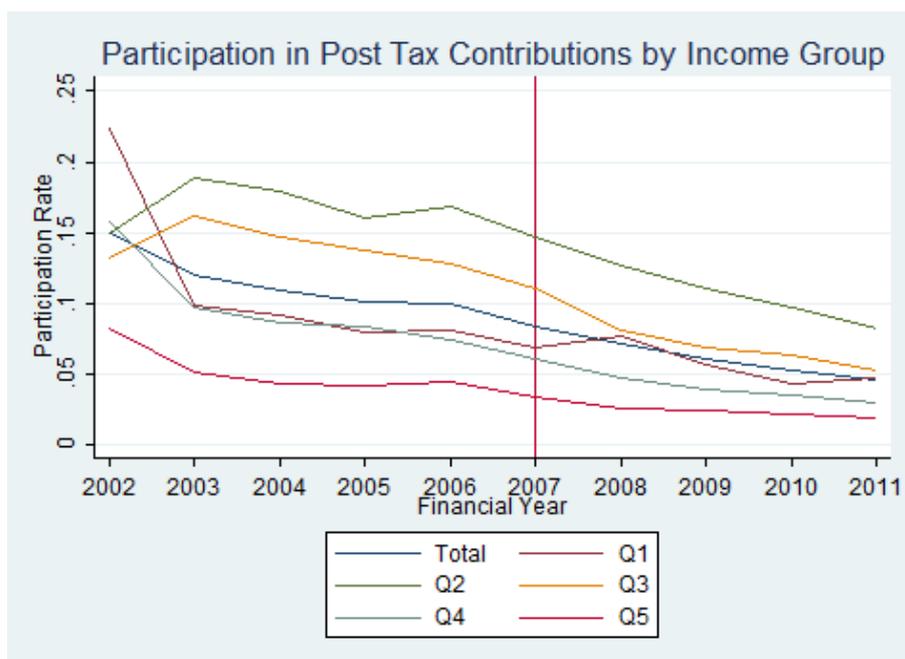
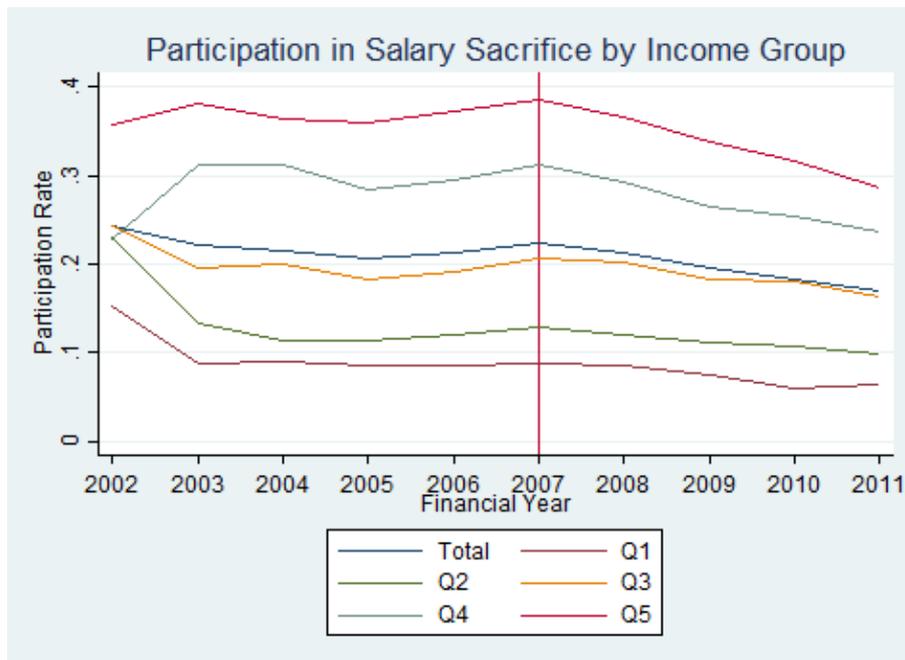
Figure 8 Participation Rate in Voluntary Contributions by Cohorts



Income is also expected to be an important factor in voluntary contribution decisions. Figure 9 provides a breakdown of participation by income quintiles for each financial year. A clear positive income-participation relationship is observed for salary sacrifice. The previously noted negative time trend in participation is only observed in higher income quintiles (where Q1 is the lowest quintile) again with 2007/08 the clear demarcation. The income-participation relationship is not as unambiguous for post-tax contributions with the highest income quintile having the lowest participation, the

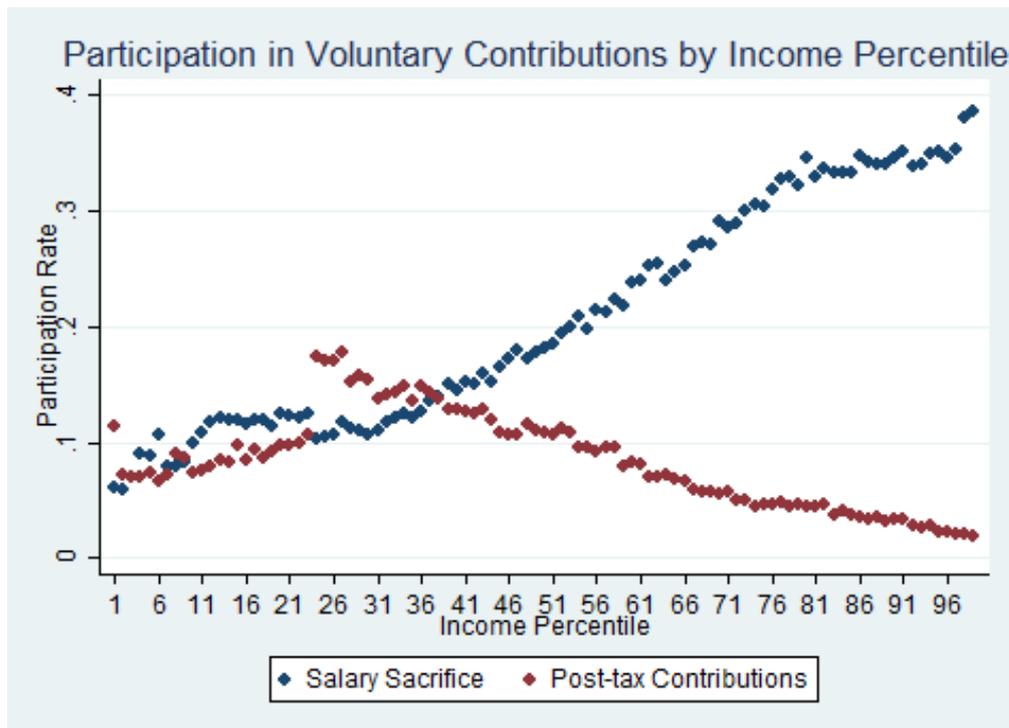
second lowest quintile the lowest and the lowest income quintile in between. The declining time trend is exhibited for all income quintiles. It is important to note, however, that a substantially large proportion of members move between income quintiles across years. People in higher income quintiles are more likely to remain in the same quintile. However, if they move, a considerable amount of them move to the neighbouring quintile. This movement may influence the longitudinal pattern of voluntary contributions.

Figure 9 Participation Rate in Voluntary Contributions by Income Quintiles



The same patterns are observed in pooled data (Figure 10). While there is a near linear increase in participation in salary sacrifice as the magnitude of tax benefit increases, the participation pattern for post-tax contributions highlights the skew towards the lower income earners, suggesting that the positive income effect only influences the very low income earners. This may be evidence of the incentives provided by the government co-contributions.

Figure 10 Voluntary Contributions Participation Rate by Income Percentiles (pooled financial years)



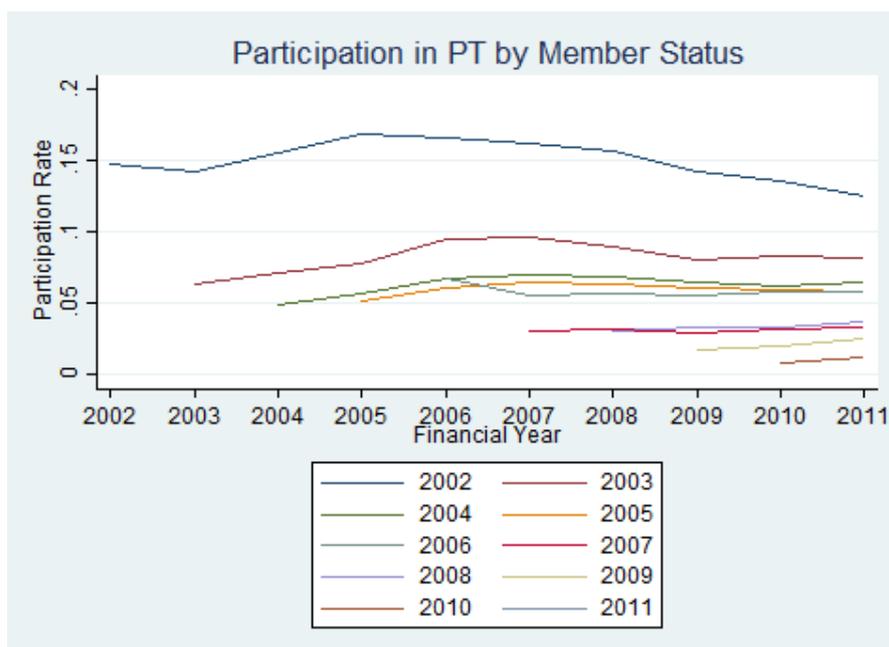
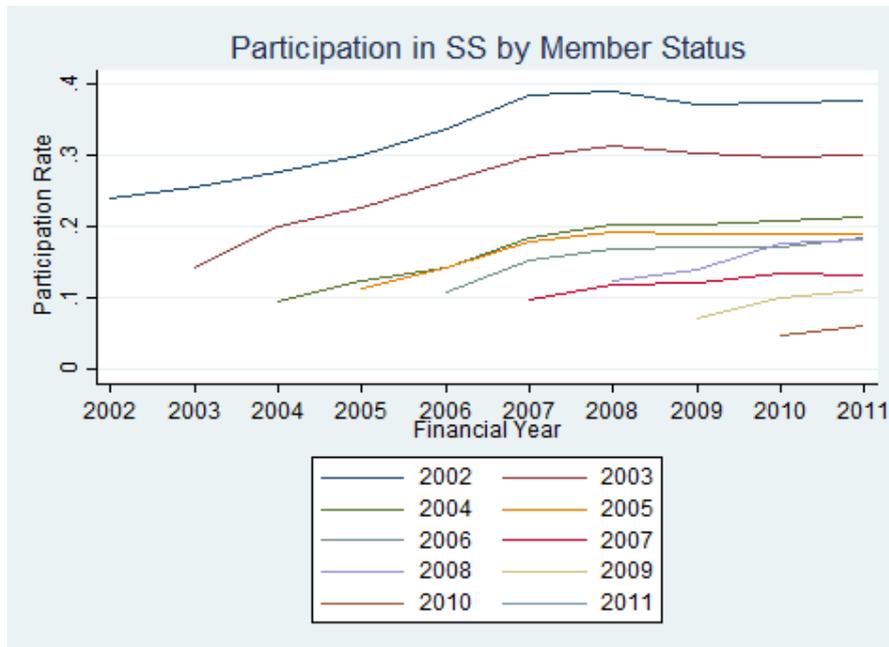
The above analysis suggests that popularity in voluntary contributions has been declining over time. If true, this is contrary to the reform effort made in promoting voluntary contributions. One possible explanation is that members joining their sub-plan display behaviour influenced by a combination of financial market conditions and the government policy environment.

Figure 11 tracks participation in voluntary contributions by cohorts defined by the year when the first employer contribution is recorded.⁸ In contrast to the declining pattern suggested above, this disaggregation suggests that most of the cohorts exhibit an increasing likelihood of participating in salary sacrifice contributions over time and a stable participation rate in post-tax contributions. The growth rate in participation

⁸ As the contribution records start from 2002/03, the cohort is left truncated.

slows for those joining in 2007/08. The graph highlights that earlier cohorts have a much higher participation rate when first joining their sub-plans and subsequently. Whilst there is a declining trend evident in cohorts with a longer history, it appears that it is the newer joining cohorts who account for the observed declining trend in participation overall. Newer members have a lower participation rate than their predecessors and the increase in participation over their history is not as marked as earlier cohorts.

Figure 11 Voluntary Contributions Participation Rate by Record Starting Year (SS: Salary Sacrifice; PT: Post-tax Contributions)



We further break down participation in voluntary contributions for each cohort examined in consideration of the length that a member stayed in the Trust's sub-plans (Figure 12 and Figure 13).⁹ The same lower trend is highlighted as above. The graph also highlights a further possible reason for decreased participation linked to employment type, specifically increased part-time/casual employment. For those with short term histories, part-time or shorter contract employees, participation rates are lower. Even among the same observed membership history, participation is lower in later years. That is, a member joining in 2003 with an eventual one year history has a higher participation than the equivalent person in 2012. In most cases, the longer one stays in the same sub-plan, the more likely they are to participate in voluntary contribution. This is uniform for both salary sacrifice and post-tax contributions.

The breakdown in participation again highlights the significant demarcation in 2007/08. Prior to this, participation edged up for all cohorts and both types of voluntary contributions. The declining trend in voluntary savings coincides with two offsetting events within the 2007/08 financial year. The first is the Simpler Super reforms, discussed above, which given the removal of tax on withdrawals is expected to have a positive effect on savings. Offsetting this is the emerging financial stress of the global financial crisis though this was more evident in 2008/09 which also coincides with announcements of reductions in contributions caps. The analysis in this section provides some insights to the general decreasing pattern in voluntary contributions, however, puzzles remain as to why new members consistently have less enthusiasm for voluntary contributions.

⁹ When a member leaves their employer, she is transferred to the Personal Division of the trust, though some individuals are retained within their original sub-plan. It is not possible to track salary for the new employment if commenced, and hence the contribution records after termination are excluded.

Figure 12 Participation Rate in Voluntary Contributions by Record Starting and End Years (Salary Sacrifice)

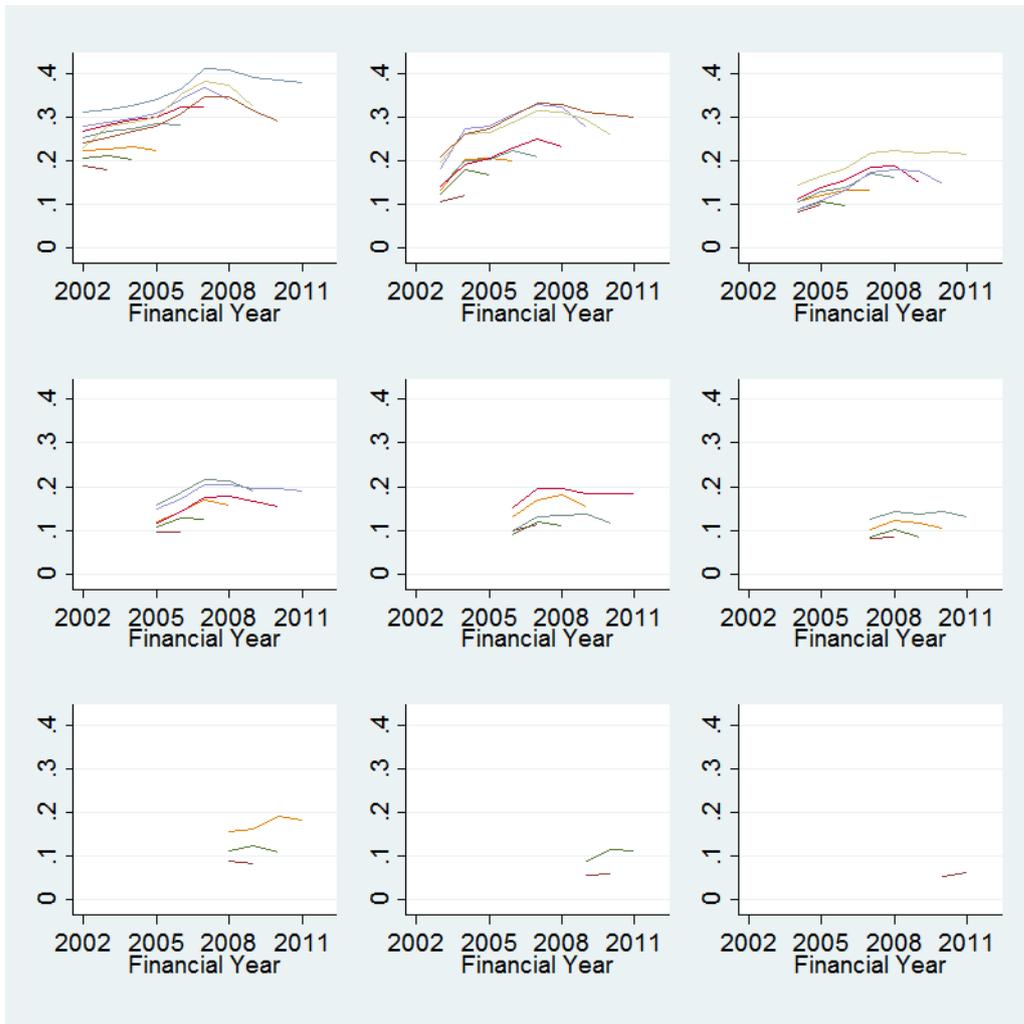
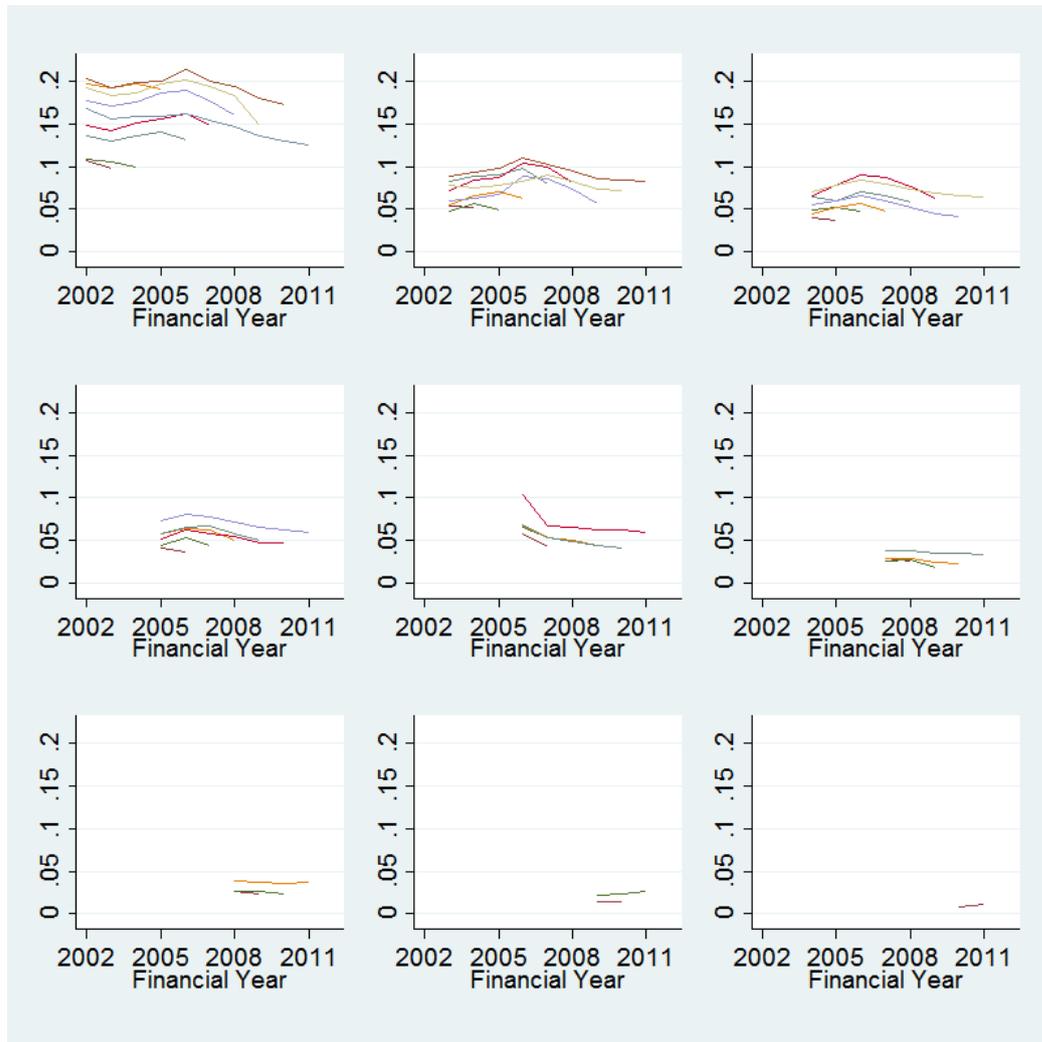


Figure 13 Participation Rate in Voluntary Contributions by Record Starting and End Years (Post-tax Contributions)



4. Determinants and correlations of voluntary contribution decisions

The above analysis provides an overall picture of the participation in voluntary contributions. To better account for a range of factors together regression analyses was also performed to examine the correlation between demographic and socio-economic factors and the decision to make voluntary contributions. In addition, the regression analyses attempts to identify peer influences in the decision making process, the impact of past decisions, and the interaction in the decisions of the two types of contributions.

To achieve the above goals, we perform a number of regression analyses ranging from pooled logit and bivariate probit models to panel logit models. For each model, two specifications are examined (standard specification and lagged specification) with a different set of explanatory variables (X) included as summarised in equation 1:

$$y_{ijt}^* = \beta_j X_{it} + \mu_{ijt} \quad (1)$$

where y^* is the latent probability of member i participating in voluntary contributions j (separately salary sacrifice and post-tax contributions) in period t . X represents the vector of explanatory variables examined, which include: demographics (age, gender); social-economic (natural log of income, tenure); fund specific variables (fund type, average fund level participation rate in voluntary contributions); year dummies as well as a three way interaction between age, gender and income. In the lagged specification, the previous year's income and fund level participation rate are used instead of current year's along with an indicator of the member participated in voluntary contribution. The error term μ has a specific form in different estimation models.

Table 3 presents the average marginal effects (AME) for the pooled logit model. As reported in previous US literature (Huberman *et al.* 2007; Purcell 2009; Copeland 2010; Dushi *et al.* 2011; Gough & Niza 2011), age is an important predictor of voluntary contribution decisions. An increase in age indicates a higher likelihood of making additional salary sacrifice contributions but not post-tax contributions, most likely due to salary sacrifice being more tax attractive than post-tax contributions.

Table 3 Average Marginal Effects for Pooled Logit Regression Estimations

This table presents the average marginal effects for the likelihood of participating in salary sacrifice and separately for the likelihood of participating in post-tax contributions. Values can be interpreted as the impact of a unit change whereas income can be viewed as the semi-elasticity. The model estimated allows for age-squared and for an interaction between gender, income and age.

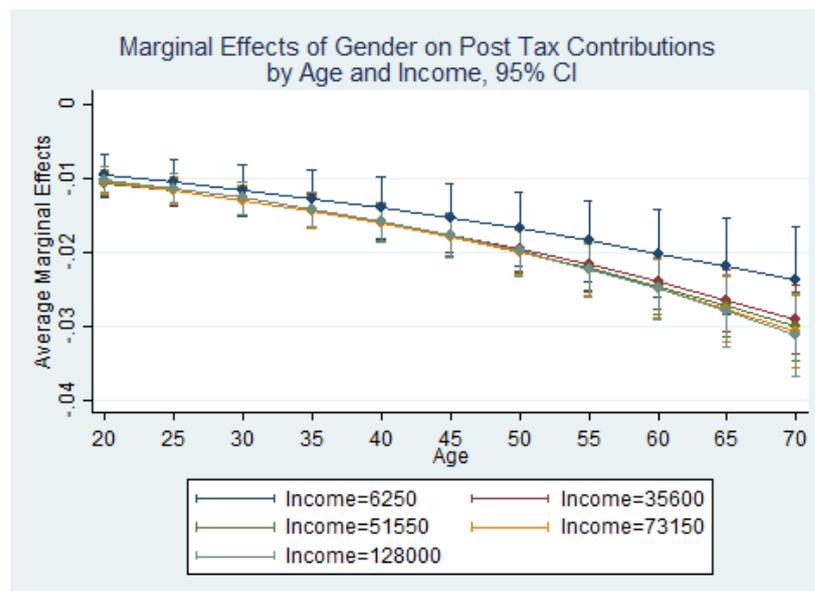
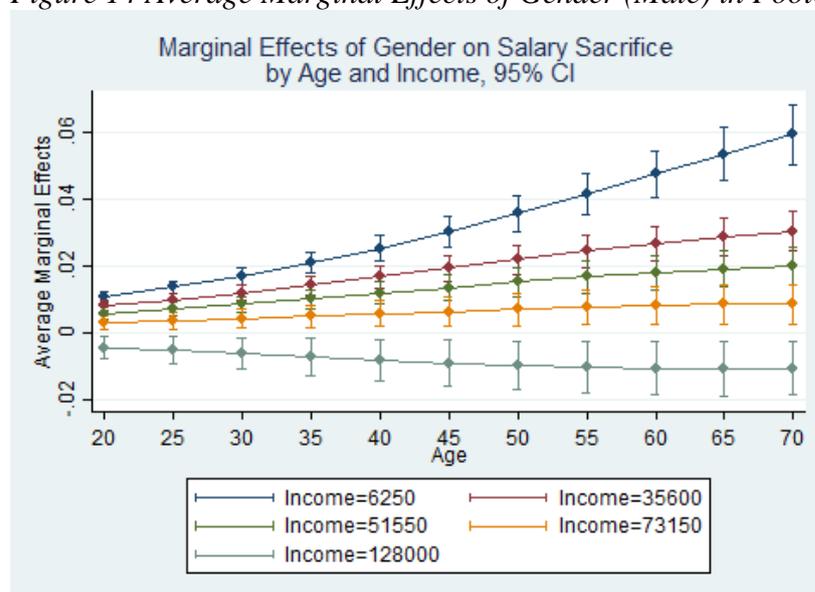
	Salary Sacrifice			Post-tax Contributions		
	AME	s.e.		AME	s.e.	
Age	0.0066	0.0001	***	0.0020	0.0001	***
Male	0.0077	0.0017	***	-0.0159	0.0011	***
Income	0.7645	0.0101	***	-0.2261	0.0045	***
DB/DC						
DB	0.0599	0.0084	***	-0.0037	0.0043	
Mixed	0.0028	0.0032		-0.0113	0.0030	***
Tenure	0.0064	0.0001	***	0.0049	0.0001	***
Fund level SS participation rate	0.0064	0.0000	***	-0.0007	0.0000	***
Fund level PT participation rate	-0.0011	0.0001	***	0.0048	0.0001	***
Financial year						
2003	-0.0407	0.0010	***	0.0119	0.0006	***
2004	-0.0437	0.0013	***	0.0126	0.0008	***
2005	-0.0454	0.0014	***	0.0127	0.0009	***
2006	-0.0469	0.0015	***	0.0113	0.0010	***
2007	-0.0487	0.0016	***	0.0083	0.0011	***
2008	-0.0637	0.0017	***	0.0019	0.0012	
2009	-0.0814	0.0018	***	-0.0104	0.0013	***
2010	-0.0868	0.0019	***	-0.0172	0.0014	***
2011	-0.0939	0.0020	***	-0.0257	0.0015	***
N	1111992			1111992		
McFadden's Pseudo R ²	0.2269			0.1997		
Log-likelihood	-437818			-258022		

Note: * p<.05; ** p<.01; *** p<.001

As indicated in the previous section, gender differences are also significant. In terms of salary sacrifice, males are more likely to make such arrangements whereas the opposite is true for post-tax contributions. Contrary to the observation that the gender differential is larger in salary sacrifice, the differential is stronger in post-tax contributions after controlling for income levels. As expected, participation decisions are highly correlated with member income. Income increase has a positive influence on salary sacrifice decisions which can be attributed to both capacity to make contributions and the increase in tax advantage with income given higher marginal tax rates. However, income has a negative impact on post-tax contribution decisions as observed in the previous section. Tenure has a positive correlation to voluntary contribution decisions, and has a similar magnitude for both types of decisions.

To further investigate the magnitude of correlation between voluntary contribution decisions and demographic and socio-economic factors, Figure 14 plots AME for gender (males) at different age and income levels. Though the overall gender differential is positive for salary sacrifice, it is negative for members in the highest income quintiles and older ages, suggesting that females are slightly more likely to make salary sacrifice when older and are at higher income levels. For both types of voluntary contributions, a growing gender differential can be found over age bands. In addition, the differential is distinct ive for members of different income levels when making salary sacrifice decisions. For post-tax contributions, however, only the lowest income quintile members are different.

Figure 14 Average Marginal Effects of Gender (Male) in Pooled Logit Regression



A possible peer influence in the decision making process is also significant as indicated by coefficients of fund level participation in voluntary contributions. The average marginal effects imply an increased likelihood where a higher proportion of fellow sub-plan members participate. The likelihood of participating is higher if the average participation for same type of contribution in the sub-plan is higher. We are unable to distinguish whether this is due to employer level factors (eg. availability of salary sacrifice) with employee level factors (eg. discussion among peers). To investigate the influence of past year's decisions on current year's participation, we estimate the same logit models with lagged specifications. The average marginal effects are presented in Table 4. Compared to with the standard specification, the coefficients in the lagged specification for the same variables have a much lower magnitude, but the significance level of the variables remains.

Table 4 Average Marginal Effects in Lagged Logit Regression Analysis

This table presents the average marginal effects for the likelihood of participating in salary sacrifice and separately for the likelihood of participating in post-tax contributions with lagged specifications for income, participation and sub-plan participation rate. Values can be interpreted as the impact of a unit change whereas income can be viewed as the semi-elasticity. The model estimated allows for age-squared and for an interaction between gender, income and age.

	Salary Sacrifice			Post-tax Contributions		
	AME	s.e.		AME	s.e.	
Age	0.0013	0.0000	***	0.0004	0.0000	***
Male	0.0049	0.0004	***	-0.0043	0.0003	***
Income^	0.0318	0.0038	***	-0.0790	0.0023	***
DB/DC						
DB	0.0028	0.0015		0.0021	0.0009	*
Mixed	-0.0091	0.0010	***	-0.0034	0.0009	***
Tenure	0.0005	0.0000	***	0.0007	0.0000	***
Fund level SS participation rate^	0.0006	0.0000	***	-0.0002	0.0000	***
Fund level PT participation rate^	-0.0006	0.0000	***	0.0001	0.0000	***
Participated last year	0.2086	0.0008	***	0.1141	0.0006	***
Financial year						
2004	0.0081	0.0010	***	0.0116	0.0006	***
2005	-0.0008	0.0010		0.0095	0.0006	***
2006	0.0067	0.0010	***	0.0107	0.0006	***
2007	0.0154	0.0010	***	-0.0023	0.0007	***
2008	-0.0125	0.0010	***	-0.0004	0.0006	
2009	-0.0269	0.0010	***	-0.0041	0.0007	***
2010	-0.0136	0.0010	***	-0.0018	0.0007	**
2011	-0.0247	0.0010	***	-0.0023	0.0007	***
N	816399			816399		
McFadden's Pseudo R ²	0.7217			0.7433		
Log-likelihood	-123339			-64327		

Note: * p<.05; ** p<.01; *** p<.001, ^ lagged for one year

The average marginal effects for previous year voluntary contribution participation indicators are both large and significant. The probability of making salary sacrifice and post-tax contributions this year is 20% and 11% higher if one made contributions last year, respectively. This indicates a strong persistence in retirement saving decisions, which is also observed in the US literature (Feenberg & Skinner 1989; Skinner 1991; Enis 2010).

In addition, knowing the past year behaviours substantially increase the explanatory power of the models. In the standard specification, both logit regressions only explain approximately 20% of the variation of the decisions. In the lagged specification, including previous year's voluntary contribution behaviour increase the explanatory power of the model by 50%. This is due in part to the previous decisions included in the model, but also due to past year's decisions acting as an indicator of unobserved information such as job characteristics.

Separately investigating salary sacrifice and post-tax contributions decisions fails to account for the potential correlation between the two decisions and their interactions. In fact, both are retirement saving options in the same system, thus are expected to be highly correlated. To tease out such influences, we estimate a pooled bivariate probit model on the two specifications and report the results in Tables 4 and 5 in Appendix.

The overall estimation results have similar magnitudes and significance levels as examined separately, thus leaving the previous findings the same for individual variables. In the standard specification, the estimated ρ ($=-0.288$) is negative and significant, indicating that the two types of voluntary contributions are weak substitutes. This is also reflected in the lagged specification. The AME for previous year's participation in the other type of voluntary contribution is negative and significant. Teasing out the correlation between the two types of decisions in the lagged specification, the ρ is estimated to be 0.022 and significant at 5% level. The positive ρ suggests that controlling for the correlation in decisions (i.e., the substitution effects), the saving decisions are weakly driven by some unobserved factors such as saving tastes.

One issue with the pooled regression in a longitudinal setting is that it fails to account for the serial correlation in the unobservables. Thus, we further examine the voluntary contribution decisions using a panel random effects logit model. Table 5 presents the

estimation results in terms of average marginal effects. The AMEs are of similar magnitude and significance levels to the pooled logit model except for the coefficients on the fund level participation rate. Instead of a negative correlation between one type of contribution and average participation of the other type at fund level, the correlation is slightly positive.

Table 5 Average Marginal Effects in Panel Random Effects Logit Regression Analysis

This table presents the average marginal effects for the likelihood of participating in salary sacrifice and separately for the likelihood of participating in post-tax contributions using a panel random effects logit specification. Values can be interpreted as the impact of a unit change whereas income can be viewed as the semi-elasticity. The model estimated allows for age-squared and for an interaction between gender, income and age.

	Salary Sacrifice			Post-tax Contributions		
	AME	s.e.		AME	s.e.	
Age	0.0037	0.0001	***	0.0003	0.0000	***
Male	0.0108	0.0007	***	-0.0028	0.0001	***
Income	0.2087	0.0033	***	-0.0022	0.0005	***
DB/DC						
DB	0.0738	0.0040	***	0.0029	0.0005	***
Mixed	0.0139	0.0012	***	0.0020	0.0003	***
Tenure	0.0035	0.0001	***	0.0006	0.0000	***
Fund level SS participation rate	0.0036	0.0000	***	0.0000	0.0000	
Fund level PT participation rate	0.0002	0.0000	***	0.0008	0.0000	***
Rho	0.9260	0.0004	***	0.9066	0.0005	***
sigma_u	6.4173	0.0198	***	5.6509	0.0157	***
N	1111992			1111992		
Log-likelihood	-227263			-126249		
Measures of intra-class manifest association in random-effects logit [^]						
		95% CI	95% CI		95% CI	95% CI
Marginal prob.	0.1280	0.1266	0.1293	0.0434	0.0427	0.0442
Joint prob.	0.0966	0.0953	0.0979	0.0279	0.0273	0.0286
Odds ratio	82.52	81.84	83.21	109.68	109.43	109.94
Pearson's r	0.7189	0.7168	0.7209	0.6273	0.6245	0.6301
Yule's Q	0.9761	0.9759	0.9762	0.9819	0.9819	0.9820

Note: * p<.05; ** p<.01; *** p<.001

[^] Evaluated at median linear predictor

More interestingly, the estimated ρ in both regressions are quite high (over 90%), implying that a majority of the variations in the participation decisions is explained by panel factors that are not included in the model (such as unobserved characteristics, past decisions). In addition, we estimate the intra-class manifest association at median linear predictor level. The probabilities of a member at the median level participating in salary sacrifice and post-tax contribution in a year is 12.80% and 4.34%

respectively. The joint probabilities are 9.66% and 2.79% for participation in any two years respectively.

As reflected in the lagged specifications in the pooled models, the likelihood of repeated participation is extremely high. Pearson's r statistics further suggests that past year contribution decisions explains 50% and 40% unexplained variations in the panel model for salary sacrifice and post-tax contributions.

In summary, using a number of estimation models, we identify a positive participation pattern by age as observed in population surveys. Gender differential in voluntary contributions is more pronounced in this database in contrast to prior surveys which suggest no significant gender differences in voluntary savings. While income is positively correlated with salary sacrifice arrangements, as often found in surveys, the negative correlation with post-tax contributions is somewhat surprising but suggests the strong influence of capacity and/or tax incentives. Further, based on longitudinal contribution records, econometric models also identified the importance of the knowledge of previous contribution decisions in facilitating the prediction of current decisions. Participation is sticky.

5. Conclusion

Private savings for retirement has been an important component in financing consumption after retirement. Some countries such as the U.S. adopt a voluntary approach where workers are encouraged to save through tax advantaged retirement saving vehicles. Australia has taken a different approach. Workers receive a compulsory employer contribution set aside in the superannuation funds for access in retirement. Moreover, the majority of workers are covered by full or part Age Pension which provides income protection to the retirees, subject to means testing. Thus, the need for voluntary savings for retirement may not have appeared as urgent.

Following a series of financial market events, policy debates on superannuation and the age pension changes, voluntary savings has become an important factor to ensure the adequacy of retirement savings. While research on determinants of retirement savings has been widely discussed in the US literature, studies in the Australian context are limited and where available has focused on cross-sectional population surveys, or a single superannuation fund due to data availability.

This paper examines Mercer Super Trust database which provides contribution records for 181 sub-plans for a time span of ten years. The longitudinal nature of the database has provided an opportunity for understanding patterns in voluntary contribution participation over time. The results suggest a positive age pattern that is consistent with population surveys and behaviour patterns under different institutional settings. A significant gender differential is observed where males are more likely to make salary sacrifice arrangements and the opposite for post-tax contributions. This difference becomes more distinctive when members move to older age groups or higher income groups especially for salary sacrifice arrangements. Income as an important factor identified in both theoretical models and empirical literature is also found to be positively correlated with salary sacrifice arrangements, however, it surprisingly does not hold for post-tax contribution participation.

The contribution records also exhibit a declining trend in participation in voluntary contributions. This pattern is largely due to the substantially lower participation rate among the new members and early leavers in the sub-plans. Separately tracking member cohorts, results show an increasing trend in voluntary contributions before 2007/08 and a decline afterwards. In addition to observing general trends in participation, the longitudinal data allows us to identify the relation between decisions across types of voluntary contributions and across time. Through regression analysis, the importance of the knowledge of previous contribution behaviours is well established, hence suggests the importance of using longitudinal dataset in the analysis of voluntary contributions. The regression results also indicate that some unobserved characteristic are driving both the decisions of salary sacrifice and post-tax contributions and that salary sacrifice and post-tax contributions are weak substitutes.

The data facilitates the analysis of trends in voluntary contributions and the analysis provides some new understanding of member behaviours in private retirement savings. Nonetheless, the study also raised a number of puzzles and highlights areas of future work. In particular, the participation pattern identifies a sizably lower participation rate among new members and early leavers. Investigating the underlying reasons for this pattern - be it employer specific, market driven, or policy influenced - would greatly improve the understanding of such patterns. In addition, the innovation in econometric technique can improve the knowledge of hidden relation between current

and past decisions as well as unidentified traits that drives the decision all together. This knowledge could provide value to the making of superannuation policy. Finally, the analysis has not commented on the amount contributed. We will address these issues in future work.

6. References

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Appendix

Table 6 Average Marginal Effects in Bivariate Probit Regression Analysis

	Salary Sacrifice			Post-tax Contributions		
	AME	s.e.		AME	s.e.	
Age	0.0065	0.0001	***	0.0019	0.0001	***
Male	0.0078	0.0016	***	-0.0151	0.0011	***
Income	0.7080	0.0094	***	-0.2117	0.0046	***
DB/DC						
DB	0.0706	0.0095	***	-0.0025	0.0054	
Mixed	0.0022	0.0032		-0.0067	0.0028	*
Tenure	0.0066	0.0001	***	0.0051	0.0001	***
Fund level SS participation rate	0.0066	0.0000	***	-0.0006	0.0000	***
Fund level PT participation rate	-0.0011	0.0001	***	0.0051	0.0001	***
Financial year						
2003	-0.0383	0.0011	***	0.0093	0.0007	***
2004	-0.0408	0.0013	***	0.0108	0.0008	***
2005	-0.0427	0.0014	***	0.0111	0.0009	***
2006	-0.0443	0.0015	***	0.0115	0.0010	***
2007	-0.0456	0.0016	***	0.0083	0.0011	***
2008	-0.0615	0.0017	***	0.0023	0.0012	
2009	-0.0790	0.0018	***	-0.0092	0.0013	***
2010	-0.0837	0.0019	***	-0.0161	0.0014	***
2011	-0.0909	0.0020	***	-0.0236	0.0014	***
rho	-0.2884	0.0055	***			
N	1111992					
Log-likelihood	-690268					

Note: * p<.05; ** p<.01; *** p<.001

Table 7 Average Marginal Effects in Lagged Bivariate Probit Regression Analysis

	Salary Sacrifice			Post-tax Contributions		
	AME	s.e.		AME	s.e.	
Age	0.0014	0.0000	***	0.0005	0.0000	***
Male	0.0046	0.0004	***	-0.0053	0.0003	***
Income^	0.0321	0.0036	***	-0.0626	0.0022	***
DB/DC						
DB	0.0058	0.0017	***	0.0035	0.0009	***
Mixed	-0.0081	0.0010	***	-0.0020	0.0008	*
Tenure	0.0005	0.0000	***	0.0007	0.0000	***
Fund level SS participation rate^	0.0006	0.0000	***	-0.0001	0.0000	***
Fund level PT participation rate^	-0.0005	0.0000	***	0.0001	0.0000	***
Participated last year (SS)	0.2513	0.0008	***	-0.0120	0.0005	***
Participated last year (PT)	-0.0043	0.0008	***	0.1338	0.0007	***
Financial year						
2004	0.0083	0.0010	***	0.0115	0.0006	***
2005	-0.0011	0.0010		0.0099	0.0006	***
2006	0.0060	0.0010	***	0.0114	0.0006	***
2007	0.0148	0.0010	***	0.0002	0.0007	
2008	-0.0125	0.0010	***	0.0005	0.0006	
2009	-0.0267	0.0010	***	-0.0035	0.0007	***
2010	-0.0131	0.0010	***	-0.0020	0.0007	**
2011	-0.0256	0.0010	***	-0.0023	0.0007	***
rho	0.0217	0.0088	*			
N	820905					
Log-likelihood	-187839					

Note: * p<.05; ** p<.01; *** p<.001

^ lagged for one year