



School of Risk and Actuarial Studies
UNSW Business School
University of New South Wales

Perceived Value of Using Superannuation for Purchasing a Family Home

Ruizhu LI

Under the supervision of:

Dr. Kevin LIU

AND

Dr. Ralph STEVENS

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
BACHELOR OF COMMERCE (HONOURS IN ACTUARIAL STUDIES)

DECLARATION

I hereby declare that this submission is my own work and to the best of my knowledge it contains no materials previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at UNSW or any other educational institution, except where due acknowledgment is made in the thesis. Any contribution made to the research by others, with whom I have worked at UNSW or elsewhere, is explicitly acknowledged in the thesis.

I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from others in the project's design and conception or in style, presentation and linguistic expression is acknowledged.

Signed:

Date:

ABSTRACT

Family home and superannuation savings represent the two largest household assets in Australia. This thesis aims to investigate the perceived value of using superannuation assets for purchasing a family home, as well as the factors that determine the valuation heterogeneity among different individuals. Furthermore, this thesis examines whether people will become more actively involved with superannuation if superannuation assets are allowed for housing purposes. A lab experiment is implemented to a sample of 143 students. Overall, it is found that most subjects do value the option of using superannuation to finance their family home (half of the subjects values using \$30,000 from the superannuation account for the purchase of a family home at \$2,751, 30% of the subject values it \$5,000 and 10% values it at \$10,000). This indicated that subjects are liquidity constraint and are willing to forgo substantial amounts of money in order to ease this. The subjects value using superannuation to finance their family home more for reducing the outstanding mortgage amount and earlier purchasing a family home than for purchasing a more expensive family home. This implies that the subjects, in general, do not use the additional liquidity provided by using superannuation to finance their family home to consume more housing (e.g. purchase a more expensive home) but they use it to earlier have access to the housing market or to be more prudent. This indicates that the allowing people to use superannuation for housing would ease the constraints due to the unaffordable housing market.

Subjects in the experiment do value the commitment feature of the superannuation saving plan. Using a between subject analysis, emphasizing the commitment feature increases voluntary contribution levels by, on average, 0.76%. The option to use superannuation savings for purchasing a family home increases the engagement with superannuation. This results in, on average, a 1.45% higher voluntary contribution level.

The findings suggest that using superannuation for purchasing a family home could potentially increase involvement with superannuation, and ease the financial constraints for first home buyers without leading to individuals purchasing more expensive houses.

ACKNOWLEDGEMENTS

Firstly, I would like to express my gratitude and appreciation for my supervisors Dr. Ralph Stevens and Dr. Kevin Liu. Their kindness, wisdom, patience and support has helped me immensely through a very challenging honours year. I have learnt a lot under their guidance and their encouragement has given me the confidence to complete this honours year.

I would like to thank all the staff from the School of Risk and Actuarial Studies and CEPAR. The School of Actuarial Studies have provided me with a wonderful environment for me to learn over the 4 years I have spent at UNSW. Valuable feedback and comments from the staff during the course of the year has assisted my research immensely. I would also like to thank Prof. Dr. Andreas Ortmann and Prof. Dr. Ben Greiner for their advice on my thesis.

I would like to thank the UNSW Honours Scholarship, APRA's Brian Gray Scholarship, CIFR Honours Scholarship and the CEPAR Honours Scholarship for their financial support. Their financial support has allowed me to be committed to my studies in my honours year. In addition, I would like to thank the UNSW Business School for granting me an ASB Lab scholarship and giving me access to the ASB Lab.

I would like thank my parents Hao Li and Feng Liu for raising me and always being there to support me. I am lucky to have the opportunity to share the experience with my fellow honours, Shahin Elliin, William Li, Estelle Liu and Clement Yeung. I want to thank the current PhD students, Mengyi Xu, Ann Vu, Xinda Yang, Vincent Tu, David Bell, Yajing Xu for their useful advices throughout the year. Finally I would like to thank my friends who have supported me throughout the year.

CONTENTS

Declaration	i
Abstract	ii
Acknowledgements	iv
Table of contents	v
List of figures	viii
List of tables	ix
1 Introduction	1
1.1 Topic	1
1.2 Motivation	2
1.3 Research questions	3
1.4 Thesis outline	4
2 Literature Review	5
2.1 Institutional setting and current landscape	5
2.1.1 International comparison of legislation	6
2.2 Factors influencing individuals' choice	9
2.2.1 Life-cycle models	9
2.2.2 Life-cycle models incorporating housing wealth	10
2.2.3 Determinants of home ownership	10
2.2.4 Financial literacy and numeracy	12
2.3 Superannuation involvement and defaults	13

2.3.1	Increasing choice to exercise	13
2.3.2	Low level of superannuation engagement	15
2.4	Experimental design	18
2.4.1	Eliciting willingness to pay	18
2.4.2	Eliciting risk and time preference	20
2.4.3	Financial incentives	23
2.4.4	Information presentation	24
2.4.5	External Validation	24
3	Hypotheses	26
3.1	The perceived value	26
3.2	Determinants of the perceived value	27
3.3	Superannuation engagement	27
4	Experiment	29
4.1	Stage 1: Main experiment	30
4.1.1	Task 1: Superannuation involvement under the current regulatory framework	30
4.1.2	Task 2: Perceived value of using superannuation for purchasing a family home	33
4.1.3	Task 3: Superannuation involvement under the treatment regulatory framework	38
4.1.4	Task 4: Escalation option	38
4.1.5	Control group	39
4.2	Stage 2: Personal and demographic characteristics	40
5	Model	42
5.1	Non-parametric test	42
5.1.1	Pearson's chi-squared test	42
5.1.2	Binomial test	43
5.1.3	Wilcoxon Matched Pairs Test	43
5.2	Regression test	43
5.2.1	Heckman's two-stage regression	44
5.2.2	Backward (Step-Down) Selection	45
5.2.3	Factor analysis	46
6	Results	48
6.1	Perceived value	49
6.2	Determinants of the perceived value	56
6.3	Impact on the involvement with superannuation	61

6.4	Escalation option	67
6.5	Comparison with the control groups	71
7	Conclusion	73
7.1	Contributions of thesis	73
7.2	Limitations of research and area for further research	75
A	Experiment Handout	76
B	Experiment Script	81
C	Java and HTML code to record click on additional information about voluntary contribution	87
D	Java and HTML code to record click on additional information about 5 investment profiles	89
E	Java code to enable iMPL	92
	Bibliography	I

LIST OF FIGURES

2.1	Singapore pre-retirement withdrawals	8
2.2	Main reasons for not making any voluntary contributions (SEARS 2007) . .	15
2.3	Effective consent rates	17
4.1	Screenshot of the experiment: option button for voluntary contribution . .	32
4.2	Screenshot of the experiment: option buttons for investment profiles	34
4.3	Screenshot of the experiment: illustration of the iMPL	36
4.4	Screenshot of the experiment: illustration of refining choices	37
4.5	Screenshot of the experiment: questions on financial planning and consump- tion behaviour	41
4.6	Screenshot of the experiment: questions on perception of superannuation system, home ownership and mortgage	41
6.1	CDF of the withdrawal amounts for each treatment, the highest amount and the whole sample	51
6.2	of the level of contributions under the current and treatment setting	66

LIST OF TABLES

2.1	Super System Review Projections of size	6
4.1	The tasks undertaken by different groups	40
5.1	List of variables for factor analysis	47
6.1	Summary statistics of the subjects in the treatment and control groups . . .	49
6.2	Contingency table for the perceived values across four treatments	52
6.3	Medians of the payment amount under each treatment, the highest payment amount and the full sample	53
6.4	Wilcoxon matched pair test for the values under each pair of treatment . .	53
6.5	The number of subjects placing the highest, 2nd highest, 3rd highest and lowest value for each of the 4 treatments	54
6.6	The number of subjects preferred one treatment over another	55
6.7	Binomial test and Means difference test on the pairs of treatment	55
6.8	Heckman's two-stage model on perceived values	58
6.9	Heckman's two-stage model on contribution and investment profiles	63
6.10	Results of the escalation option	68
6.11	Escalation option independent sample t test	68
6.12	Heckman's two-stage regression for contribution level of the escalation option	68
6.13	Comparison between treatment group and control groups	72

CHAPTER 1

INTRODUCTION

1.1 Topic

Australia is currently experiencing severe deterioration of housing affordability. According to Cox and Pavletich (2011), factoring in the household earnings, all of the 39 Australian housing markets studied were classified as either “severely” or “seriously” unaffordable. The survey shows that the average median house price to annual household income ratio for all Australian housing markets is 5.6, while the ratio is 6.5 for the large capital cities.

In addition to the problem with housing unaffordability, the Australian government has also been trying to increase people’s interest in superannuation, which is relatively low at the moment. Experience has shown that it is rather challenging to improve people’s interest in superannuation (Chew, 2010). Following the introduction of the Superannuation Guarantee in 1992, both the accumulated amount of superannuation assets and the percentage of Australians who own a superannuation account have grown substantially. Yet, although the coverage of superannuation now extends to more than 90% of the workforce, most Australians still find superannuation confusing and complicated (Chew, 2010). According to Torkar (2008) many fund members still have low levels of superannuation involvement, a relatively poor understanding of superannuation, and are in general uncertain about whether they have saved sufficient money for their retirement.

This thesis investigates the potential of using superannuation to purchase a family home. The expectation is that this will not only enhance housing affordability, but also increase

the overall level of superannuation involvement. It determines the amount people are willing to pay for having the option of using superannuation for housing, as well as the determinants that explain the heterogeneity for this value.

1.2 Motivation

Family homes and superannuation assets represent the two largest household assets in Australia (HILDA, 2013). The main purpose of this thesis is to investigate the perceived value of using superannuation to buy a family home, given the continuous decline in housing affordability combined with increases in superannuation account balances.

Homeownership confers a number of benefits to individuals and communities due to the unique bundle of features associated with homeownership. Accruing financial wealth through house price appreciation is regarded as the main financial benefit of owning a home. In addition to the long-term investment potential brought by home ownership, housing equity may also be used to provide the means to finance further training or education (Rohe et al., 2013). Some evidence also indicates that owning a home has a positive influence on the physical (Macintyre et al., 1998; Robert and House, 1996; Nettleton and Burrows, 1998) and psychological (Rossi and Weber, 1996; Rohe and Basolo, 1997; Balfour and Smith, 1996) health of home owners. In addition to an improvement to physical and psychological health, Dietz and Haurin (2003) conduct a survey and find that children of homeowners are likely to perform higher on academic achievement tests and have fewer behavioural problems in school. They also find that after controlling for personal characteristics and socioeconomic status, political activity (e.g. voting) as well as participation in civic organisations is higher among homeowners than renters.

Home ownership has many positive features, however purchasing one's first home has become more difficult in Australia. As a result of the property price rally, Australia has experienced unprecedented deterioration of housing affordability after the 1980s. The dwelling price to income ratio is around 4.1 times based on averages and about 6.6 times using medians (Fox and Finlay, 2013). According to the 9th Annual Demographia International Housing Affordability Survey (Cox and Pavletich, 2011),¹ all major metropolitan markets in Australia are severely unaffordable. The survey reveals that Sydney and Melbourne are among the ten most unaffordable cities in the world (alongside Hong Kong, London and San Francisco). Adelaide, Brisbane and Perth are also well above the severely unaffordable threshold.

The long-term decline in housing affordability implies that it is increasingly challenging

¹The survey covers 325 metropolitan markets in Australia, Canada, Hong Kong, Ireland, New Zealand, the United Kingdom and the United States.

for Australians, especially young people, to purchase their first family home. Bureau of Statistics figures show Australian first time buyers made up a record low 12.3 per cent of owner-occupied home loan commitments in November 2013 (Fox and Finlay, 2013). According to RBA head of financial stability, Luci Ellis, quite a few people who are trying to buy their first family home may feel “squeezed out”.² APRA has already applied three measures to calm hot property markets in 2003-04: verbal warnings about the issue; collecting additional information to observe which banks are lending aggressively; and seeking assurances on lending standards from bank boards. Recently, APRA has ruled out capping loan-to-valuation ratios, which would make it harder to get a loan with a small deposit. In consequence, this would adversely impact first home buyers, who are not the source of the rising demand for homes.³

On the other hand, the superannuation assets owned by Australian people have been growing significantly over the past decades, from A\$154 billion in 1992 to over A\$1.67 trillion in 2013 (APRA, 2014a). The compulsory nature of the Superannuation Guarantee and the scheduled increase in compulsory contribution rate (from 9.5% to 12% by July 2025), highlights the economic significance of superannuation to Australians.

Given the low housing affordability, the increase in superannuation assets implies that it has the potential to be used to finance the purchase of a family home. However, under the current SIS Act, superannuation assets are prohibited from being used for purchasing a family home.⁴ However, in many other countries, such as Singapore (Choon, 2013), Switzerland (Kemeny, 2005), and Canada (Carter, 1997), pension savings can be used to finance a down payment for purchasing a residential property for own use. The motivation of this study is to investigate the perceived value of using superannuation assets to purchase a family home. The results of this study have strong practical implications for policy development in the superannuation industry.

1.3 Research questions

This thesis aims to address three research questions. The first research question is: What is an individual’s perceived value of using superannuation for purchasing a family home

²Refer to Luci Ellis’s address to the CITI Residential Housing Conference on 15th May 2014, Retrieved from <http://www.rba.gov.au/speeches/2014/sp-so-150514.html>

³Eyers, J. (2014). Regulator rules out limit on low-deposit home loans [online] 10th October, retrieved from: <http://www.smh.com.au/business/banking-and-finance/regulator-rules-out-limit-on-lowdeposit-home-loans-20141010-114c67.html> [Accessed: 28th Oct 2014]

⁴The sole purpose test requires that all regulated superannuation funds are established and maintained for the sole purpose of providing benefits to members upon their retirement, or to a member’s beneficiaries in the event of their death. That is, the members or any other related party must not use, or in any way derive a current day benefit from, the assets of the fund.

and which type of possible benefits are more valuable? This thesis distinguishes three types of benefits of using superannuation for housing, namely the ability to purchase a family home, the ability to purchase a more expensive family home, or having a lower loan to value ratio (i.e. a lower outstanding mortgage). The second research question aims to determine the factors that explain heterogeneity among individuals when assigning perceived values of using superannuation for purchasing a family home. The third research question is related to superannuation involvement. In particular, will people's involvement with superannuation increase if they are given the option of using superannuation to pay for the down payment when purchasing their first family home?

1.4 Thesis outline

This thesis is structured as follows. Chapter 2 provides a review of relevant literature on the institutional setting of the superannuation system, superannuation engagement, factors influencing individual's choices and experimental design. Chapter 3 discusses the purposes and hypotheses of this thesis. Chapter 4 describes the design of the lab experiment conducted in the ASB Lab on 23rd September 2014. Chapter 5 describes the methods used to analyse the data obtained from the experiment. Chapter 6 presents results of the analysis of the data from the lab experiment. Chapter 7 concludes the thesis with the policy implications research contribution, limitations of the research and directions for future study.

CHAPTER 2

LITERATURE REVIEW

This chapter provides a review of a wide range of literature related to this thesis. The chapter is divided into four sections. The first section covers the background on the institutional setting of the pension system in Australia. It also discusses the institutional setting in other countries where pension funds are allowed to be used to finance the down payment on a family home. The second section reviews individual's optimal asset allocation in a life cycle model framework. In particular, the role of housing from a theoretical point of view. Moreover, it assists in justifying the choices of the determinants of individual's investment decisions in relation to purchasing a residential property as well as how those factors change as one ages. The third section explores the current issue with a low level of superannuation involvement as well as the potential problems resulting from that. Given that the proposed methodology to answer the research question is a lab experiment, the last section gives an overview of a number of papers on experimental design. The section compares different methods and the most suitable method for the research questions in this thesis has been adopted in the lab experiment.

2.1 Institutional setting and current landscape

The current Australian retirement income system is built on a three pillar approach, namely the government provided means tested Age Pension (pillar 1), compulsory occupational superannuation savings through the superannuation guarantee (SG) (pillar 2), and voluntary superannuation and other long term savings (pillar 3).

Since the introduction of the SG in 1992, superannuation has been playing an increasing role in financing retirement in Australia. The superannuation system now covers more than 90% of the workforce (ABS, 2000-2013), which represents the highest private pension coverage among other comparable economies for private retirement savings (OECD, 2007).

In addition to the growth in the superannuation coverage, the level of mandatory employer contribution has also gradually increased. Effective from 1 July 2014, the superannuation guarantee rate increased to 9.5% (from the 9.25% that applied to the 2013/2014 year). This rate will increase to 10% from July 2021 and eventually to 12% by 1 July 2025.

Consequently, the funds under management held by the superannuation sector have grown and are expected to grow much faster than the economy. According to the latest APRA Quarterly Superannuation Performance report (APRA, 2014b), superannuation assets totalled \$1.85 trillion at the end of the June 2014 quarter. Over the 12 months to June 2014 there was a 15.3 per cent increase in total superannuation assets. As indicated by Table 2.1 below, the superannuation assets had been equivalent to 47 per cent of GDP in 1996, were 90 per cent of GDP in 2009 and were expected to reach 130 per cent of GDP by 2035.

Table 2.1: Super System Review Projections of size

	1996	2006	2035 Nominal	2035 Current
Overall industry scale	\$245b	\$1100b	\$6100b	\$3200b
Ratio of accumulation to post retirement assets		4:1	3:1	3:1
Biggest fund		\$41b	\$350b	\$187b
Number of large funds	4734	447	74	74
Average large APRA fund	\$0.04b	\$1.5b	\$53b	\$28b
Average accumulated member balance	\$15,000	\$70,000	\$335,000	\$180,000
Proportion of GDP	47%	90%	130%	130%

2.1.1 International comparison of legislation

The compulsory nature of the Superannuation Guarantee and the scheduled increase in the compulsory contribution rate highlight the economic significance of superannuation to Australians. This also implies that superannuation has the potential to assist the financing of a family home. However, as discussed in Chapter 1, under the current legislation, superannuation assets are prohibited to be used to acquire a family home. This is not the case for some other countries, such as Switzerland, Singapore and United States, where citizens can access their pension savings for housing.

2.1.1.1 Switzerland

Similar to Australia, the Swiss pension system is also built on a three pillar architecture, comprising state pensions (pillar 1), occupational benefits insurance (pillar 2) and private pensions (pillar 3). In Switzerland, an individual may draw on either pillar 2 or pillar 3 pension assets before retirement for the purpose of acquiring a property for personal use. Under the Swiss Federal Law, there are two options for using pension assets when obtaining residential property: pledging the claim to pension benefits (borrowed capital) or withdrawing pension assets in advance (own capital). As opposed to withdrawing pension savings, pledging allows the pension fund member to preserve his accumulated benefit, while increasing the amount that they are able to borrow. There is a minimum withdrawal amount of CHF 20,000, except when savings are deposited in a vested benefits account. In addition to that, the law specifies that early withdrawals pre retirement can only be made once every five years. If the purchased property is sold later on, or if the pension fund member moves out of the property, the amount withdrawn must be repaid.

Despite the fact that the Swiss are traditionally a nation of renters,¹ the rate of home ownership has picked up speed, from 34.6% in 2000 to 40% in 2010. This might be partially explained by the availability of the option to use pension assets to acquire a family home.

2.1.1.2 Singapore

In the case of Singapore, Singaporeans could draw on their Central Provident Fund (CPF)² to acquire their own family home. CPF members are able to purchase their residential properties with the help of the two schemes implemented by the government: Residential Properties Schemes (RPS) and the Public Housing Scheme (PHS).³ These schemes allow Singaporeans to borrow against saving in their CPF account to finance the purchase of their family home, and to pay monthly mortgage repayments. Similar to Switzerland, when the property is sold, Singaporeans need to repay the amount borrowed from the CPF back to the CPF account with interest. However, if the proceeds from the sale are insufficient to pay back the loan amount with interest, then the shortfall does not need to

¹The current tax system in Switzerland does not favour homeowners, and the rental market is also highly regulated. Moreover, no social stigma is attached to renting in Switzerland (Kakpo and Cattacin, 2011).

²Singapore's is a fully funded comprehensive pension plan, whose benefits encompass health care, homeownership, health care, asset enhancement and family protection.

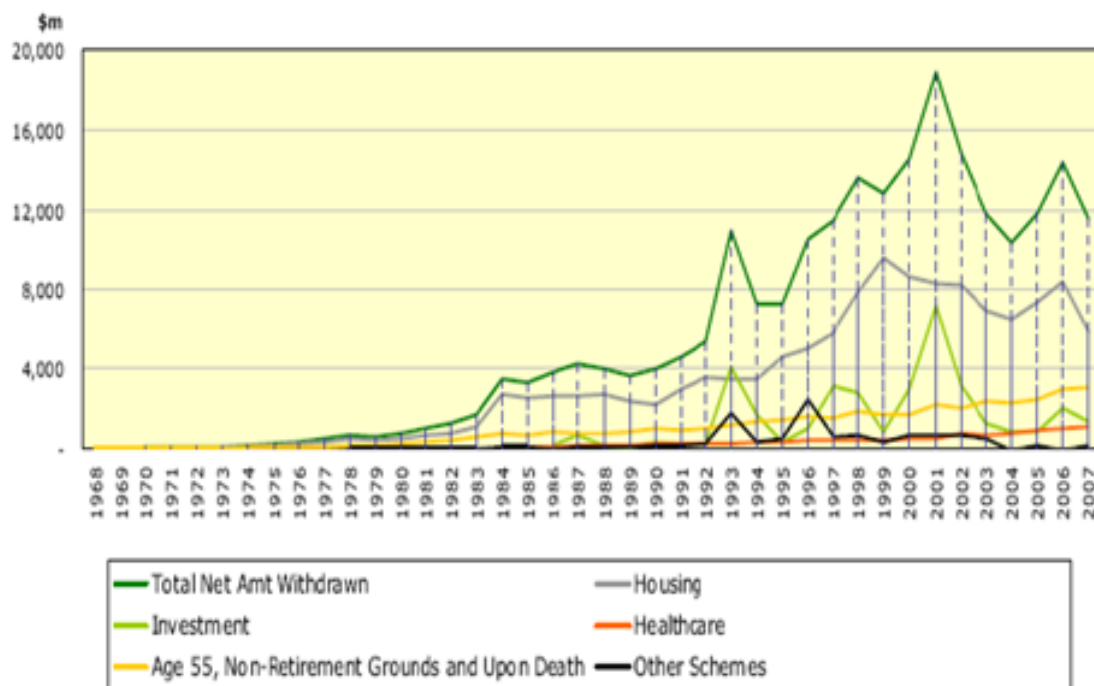
³The Public Housing Scheme (PHS) and Residential Properties Scheme (RPS) for private properties were implemented in 1968 and 1981 respectively. Workers could use their CPF savings to purchase flats built by the Housing and Development Board (HDB) under the Public Housing Scheme (PHS) or a private property under the Residential Properties Scheme (RPS).

be repaid. However, unlike Switzerland, there are no restrictions on the number of times CPF funds can be used to purchase a property.

Moreover, the CPF Board offers the members an additional insurance scheme: the Home Protection Scheme (HPS). This is a mortgage reducing insurance which insures CPF members against losing their property should they become deceased or incapacitated before they have fully repaid the mortgage. For CPF members purchasing public residential property under the PHS, HPS covers the term of loan or up to age 65, whichever is earlier.

CPF savings are used by many Singaporeans as a means to finance their family home. Board (2009) finds that a total of S\$5.9 billion was withdrawn from the CPF account for the purpose of homeownership in 2007. At the end of 2007, 1.29 million and 226,000 members used their CPF savings to purchase public housing apartments and private residential properties, respectively (Board, 2007). Figure 2.1 displays the pre-retirement withdrawals for housing, health care and investment from 1968 to 2007. As can be seen from the figure, housing accounts were the main source of withdrawal, which supports the potential of introducing a similar option which allows people to access their superannuation fund for housing in Australia. Moreover, Singapore has a home ownership rate of over 90 per cent. According to Hateley and Tan (2003), this was achieved mainly via the deployment of CPF resources.

Figure 2.1: Singapore pre-retirement withdrawals



Source: CPFB, CPF Trends: CPF Contributions and Withdrawals

2.1.1.3 United States

In the United States, 401(k) plans are used to allow workers to be taxed favourably, and to save and invest part of their paycheck for retirement. One of the features of 401(k) plans is that participants are allowed to borrow a proportion of their account balance and repay this loan amount with interest over time. Beshears et al. (2011) find that just under one-fifth of 401(k) participants have a loan amount outstanding at any given point of time. Although 401(k) loans can essentially be used for anything, it is classified as either general purpose or for home purchase under federal law. According to Beshears et al. (2011) 95% of loans are of the general purpose type, although such loans can also be used for either new home expenses or the down payment when purchasing a home. Lusardi and Mitchell (2011) surveyed around 900 401(k) plan participants about their use of loans proceeds. Among those survey respondents, 19% report that the proceeds were used for home purchases and 32% for home repairs or improvements.

2.2 Factors influencing individuals' choice

2.2.1 Life-cycle models

Life-cycle models have a venerable history in the economics profession, with roots in the infinite horizon models of Ramsey (1928) and Friedman (1957) and the finite horizon models of Fisher (1930) and Modigliani and Brumberg (1954). These models aspire to interpret various aspects of behaviour with regards to the intertemporal allocation of money, effort and time (Browning and Crossley, 2001). The modern version of life-cycle models also provides a guide to model many life-cycle choices such as saving, human capital, education, consumption, marriage and fertility. Life-cycle models form the theoretical basis for the analysis of people's life cycle decisions as well as the determinants that explain the heterogeneity among those decisions.

Regarding the life-cycle models of portfolio allocation, Cocco et al. (2005) find that the presence of labour income increases the demand for stocks early in the life cycle. This is because labour income is normally perceived as a closer representation for safe assets than for risky assets, and its value decreases as an individual ages. Consequently, if it is assumed that there is a constant asset allocation for a given risk tolerance for each individual, investors would generally shift the portfolio composition towards more safe assets, such as treasury bills, as one reaches retirement. The findings in Cocco et al. (2005) also imply that investors are anticipated to reduce their proportional stock holdings when aging. This result might have an implication on housing wealth, given housing is also

viewed as a type of risky asset, and thus a substitution for equity investment.

Furthermore, Gomes and Michaelides (2005) find that an individual's risk preference also plays an important role in explaining their investment behaviour. They observe that stock market participation rates are in general an increasing function of risk aversion, with a fixed cost for entry in the stock market included in their model. In other words, more prudent individuals are the ones participating in the stock market from early on. This is because they have accumulated more wealth and are thus more willing to pay the entry cost. Thus, it may be worthwhile to look into the risk preference of individuals when reviewing their decisions when they are offered the option of using superannuation to invest in a residential property for their own use.

2.2.2 Life-cycle models incorporating housing wealth

In life cycle models where housing wealth is also incorporated, the findings are that investment in housing exerts an important impact on the portfolio choice among risk-free assets and risky assets. For example, Cocco et al. (2005) observe that for individuals who have lower financial net-worth or are in the early stage of their life, the existence of owner-occupied housing and the associated house price risk decreases their liquid assets, and thus the benefits to participate in the equity market. Kraft and Munk (2011) have derived explicit solutions to life-cycle utility maximisation problems incorporating the rental and ownership of residential real estate, stock and bond investment and perishable consumption. According to their results, young individuals prefer to rent their home as they want little exposure to house price risk. Later in life, the individual should purchase a family home, as the desired housing investment gradually increases and eventually exceeds desired consumption. Preferences will shift back to rental in the final years of the individual's life. To conclude, the perceived value of housing wealth changes across one's life span, and it serves as an important role in determining the optimal asset allocation throughout one's life.

2.2.3 Determinants of home ownership

In addition to the role housing wealth plays in determining the allocation of assets during one's life cycle, it is also worthwhile to investigate the factors determining the empirical probability of home ownership. It has been established that the housing affordability and the relative price of owner occupied and rental housing are the important factors determining home ownership rate (Hendershott et al., 2009). Studies of the homeownership propensities (e.g., Linneman and Wachter, 1989; Bostic and Surette, 2001; and Diaz-Serrano, 2005) have shown the importance of family income in determining home

ownership. This is reflected by the greater ability to secure sufficient mortgage financing for individuals with higher income. Carliner (1974) finds that an increase in income of \$1,000 will increase the propensity of home ownership by 2%. The study also finds that a household decides whether to rent or to own a house based on both income and the relative cost of rental and owner occupied housing. However, Carliner (1974) suggests that there are two more important determinants of home ownership, which are the type of housing desired and the stability of the household's demand for housing.

More recently, literature has developed which parameterises the effect of mortgage lending constraints on the rate of home ownership. Rosenthal (2002) reviews the literature and explains the rationale behind imposing such constraints using Stiglitz and Weiss (1981) as the theoretical foundation. Further, Rosenthal (2002) suggests that wealth constraints (down payment) limit access to home ownership with much greater frequency compared to the income constraints. Wachter et al. (1996) and Quercia et al. (2003) further conclude that wealth constraint is an important impediment to owning a family home especially for certain groups in the population, including low-income, minority households and younger families. Barakova et al. (2003) test for the role of wealth and credit quality based constraints in restricting access to home ownership based on data from the Survey of Consumer Finances (SCF)⁴ from 1989, 1995, and 1998. Their results show that due to the increased availability of low down payment mortgages during the 1990s, the impact of the wealth constraint declined substantially. The credit quality based constraints have become more significant barriers, mostly reflecting the increasing number of individuals with impaired credit quality.

Three studies focused on the United States housing industry have concluded that the likelihood of home ownership also has a positive correlation with age and family size. These studies are Maisel (1965) for four West Coast cities, Kain and Quigley (1972) for St. Lou and Carliner (1974) for the entire country. Moreover, Carliner (1974) suggests that marital status also affects one's decision of owning a family home. This conclusion is consistent with the findings of Hendershott et al. (2009), which show that both past and current marital status affects the affordability of owner housing based on an analysis of Australian datasets. According to Hendershott et al. (2009), their conclusion is justified by the fact that wealth is normally lost upon divorce and couple households usually accumulate greater wealth than singles owing largely to economies of scale in housing consumption.

To conclude, factors that affect the likelihood of whether individuals opt to own a home include family income, the relative cost of owning and renting housing, wealth and credit quality based constraints, age, family size and marital status (both current and past).

⁴The SCF is a survey of U.S. households conducted by the Survey Research Center at the University of Michigan. The survey provides various detailed information on U.S. households' housing and demographic characteristics, assets and liabilities, income and use of financial services.

2.2.4 Financial literacy and numeracy

Another key determinant that explains individuals' decisions is financial literacy (Lusardi et al., 2010). According to Lai et al. (2012), the financial knowledge of an individual influences his or her risk preference and error propensity. A higher level of financial competence and numeracy skills improves decision making in retirement planning. In contrast, individuals who are less knowledgeable in sophisticated financial concepts generally have a higher degree of risk acceptance, which might be due to a lack of understanding of the underlying risk of investment portfolios. In addition, Ameriks et al. (2003) find that a high propensity to plan for retirement, resulting from a relatively high level of financial knowledge, is normally associated with a greater amount of wealth accumulation. This result is also evident from Lusardi and Mitchell (2006), which compares the net wealth of the early baby boomer cohort in 2004 with another cohort of the same age (51-56) at an earlier year (1992). They find that, even after controlling for many sociodemographic factors, financial and institutional knowledge is strongly correlated with an individual's propensity to plan for retirement, which shares a strong relationship with personal wealth itself. Moreover, the presence of financial illiteracy in older populations suggests that these groups may be particularly vulnerable to irrational investment decisions (Lusardi and Mitchell, 2011).

Whereas the impact of financial literacy on individual's decisions has been widely investigated for older individuals, the study of Lusardi et al. (2010) also indicates that the financial knowledge of young people is potentially inadequate in dealing with the complexity of the financial products. Nowadays, individuals are faced with more responsibility for advanced financial decisions. Unfortunately, there is no evidence that individuals are more capable in making those decisions. Agnew (2013) indicates that the young, female, the least educated, those not in the labour force and those not employed, are the groups that are perceived to be most at risk of making sub-optimal investment decisions due to a lack of financial competency. A number of papers (e.g., Bateman et al., 2012; Agnew et al., 2013a; Agnew et al., 2013b; and Bateman, Eckert, Geweke, Louviere, Satchell and Thorp, 2014) examine the financial competency of Australians. Their results suggest a wide dispersion in financial literacy which compares poorly internationally. Agnew (2013) also finds that the mandatory retirement saving system introduced by the Australian government 25 years ago has had no clear positive impact on improving Australians' financial literacy over time, nor has it motivated people to actively prepare for retirement. In addition, the knowledge of the superannuation system specifically is limited, which impacts individuals' willingness and ability to develop retirement saving plans. Furthermore, Fernandes et al. (2014) recently find when one control psychological traits that have not been included in previous research, the partial effects of financial literacy diminish substantially.

This finding suggests that the prior study on financial literacy may be subject to serious limitations.

2.3 Superannuation involvement and defaults

This section reviews the current level of superannuation involvement and a range of superannuation related decisions that are left to individuals to make. It also discusses reasons and potential problems associated with fund members sticking with defaults and not making active decisions. It is worthwhile to explore the current issue with superannuation involvement, considering part of the motivation behind introducing the option of using superannuation for housing is its potential to increase people's active superannuation decision making.

2.3.1 Increasing choice to exercise

The introduction of the award-based superannuation system, and later the Superannuation Guarantee arrangement, has resulted in a gradual shift away from the defined benefit schemes toward the defined contribution schemes. This shift has led to an increase in the investment risk and responsibility that is increasingly borne by fund members. In 1982–1983, 82% of fund members were in a defined benefit fund, but by 2006, 97% of fund members were covered under either the defined contribution scheme or a mix of the defined contribution and the defined benefit scheme (APRA, 2007). The Choice of Fund policy⁵ is one of the most recent examples designed to increase the choice available to fund members. This meant that an additional 4.8 million employees were able to choose their superannuation fund (Parliamentary Joint Committee on Corporations and Financial Services, 2007; ATO, 2005), which brought the percentage of workforce who are able to choose their fund to at least 80 per cent. This is also reflected by a steady increase in the number of funds offering investment choice, with 80.1 per cent of funds with greater than \$100 million in assets offering member investment choice as at June 2006 (APRA, 2007). Modern retail funds offer an average of 97 investment choices, while industry funds, public sector funds and corporate funds have around 10.8 and 6 investment options per fund respectively (APRA, 2007). Sy (2008) suggests that this shift embodies the assumption that increasing number of choices will lead to more competition, and in turn cheaper products with better returns, so that fund members can choose to better match their return and risk preferences.

⁵Choice of Fund started to apply from July 2005 for federal awards and it applied from July 2006 for state awards.

Moreover, self-managed super funds (SMSFs) also provide a means to save for retirement like the other types of superannuation funds. The difference between an SMSF and other types of funds is that the members of the SMSF need to make all the choices and run the fund for their own benefit. In the Australian market, 30.24% of all superannuation assets are currently in SMSFs, which represents the largest sector by total assets under management. Between 2003 and 2013, the number of member accounts for SMSFs has also increased by 7.1 per cent annually, which is the highest growth rate compared with other types of superannuation funds (APRA, 2014a).

These developments have led to a shift of the responsibility for making superannuation decisions towards fund members. It should be noted that while several government agencies assume the responsibility to enforce legal standards to protect the benefits of fund members (the Australian Prudential Regulation Authority (APRA) regulates the operation of fund; the Australian Securities and Investments Commission (ASIC) controls the conduct of fund under company law; the Australian Taxation Office (ATO) supervises employer contributions, self-managed superannuation funds, and superannuation tax), none of the government agencies guarantee superannuation earnings or capital. Such conditions highlight the importance of an individual's ability to make well-informed decisions about retirement savings.

The types of choices available to superannuation members in the Australian system include voluntary contribution decisions, choice of fund, choice of investment portfolio, and choice of income stream or lump sum withdrawal. Altogether there are three types of voluntary contribution that are available to fund members. The first type of voluntary contribution is salary sacrifice. This is a pre-arrangement with the employer where employees voluntarily forgo part of their taxable income in exchange for the employer contributing the equivalent amount into the employee's superannuation account. The second type is personal contributions. Such contributions can be made directly to the fund on an irregular basis or deducted from after-tax salary periodically. Moreover, for an individual making a \$1,000 personal contribution and earning \$33,516 or less, he/she is also eligible to receive a maximum \$500 government co-contribution. The third type of voluntary contribution is spousal contributions, and the contributions are made into a spouse's account on behalf of the contributor. All three types of voluntary contribution are taxed concessional (ABS, 2009), which offers a direct tax advantage and thus an incentive for individuals, especially those with higher marginal tax rates, to make voluntary contributions for their retirement savings.

In addition to the voluntary contribution decisions, fund members also need to decide their investment portfolio, which involves choosing from a range of various investment types in major asset classes (for example, fixed interest, Australian shares and international shares),

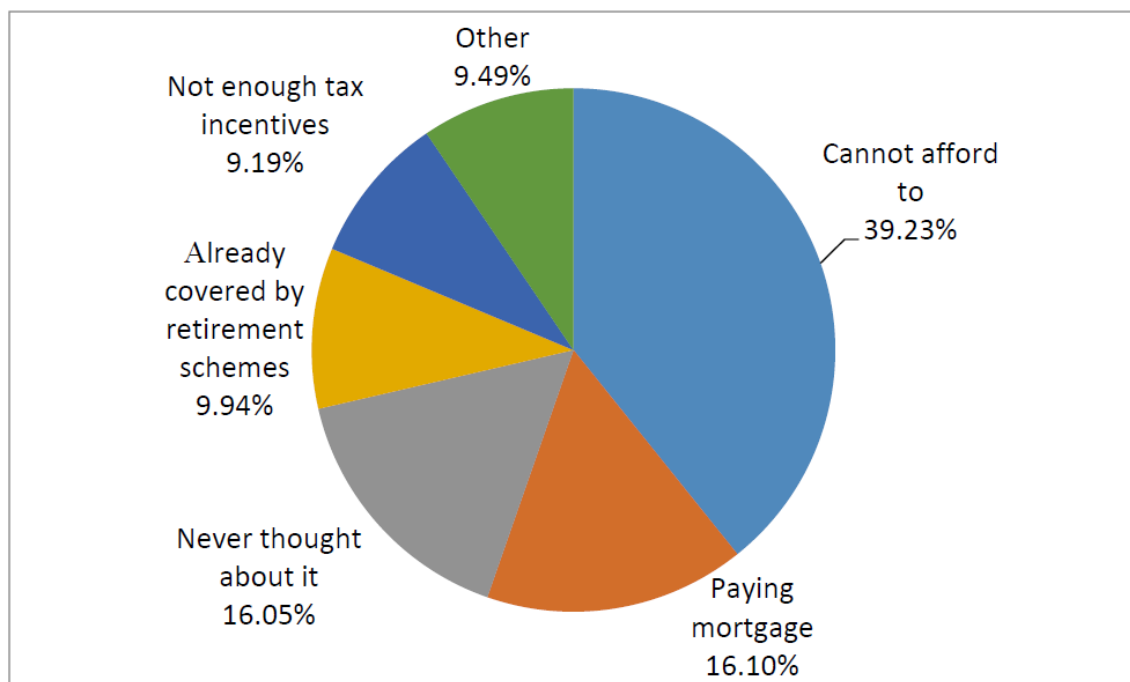
combinations of asset classes (for example, growth, stable or balanced) and sometimes other options (for example, individual shares listed on the Australian Stock Exchange).

2.3.2 Low level of superannuation engagement

Although that there are extensive choices available to individuals, as mentioned in Section 2.3.1, the level of superannuation engagement is relatively low (Chew, 2010). For instance, the participation rate in voluntary contributions has declined at an annual rate of 2.5% from half of employees participating in voluntary contributions in 1993, to less than a quarter in 2007 (ABS, 1994-1995; ABS, 2001; ABS, 2009).

In the 2007 survey of employment, retirement and superannuation (SEARS),⁶ subjects were asked why they did not participate in voluntary contribution. The main reasons are summarised in Figure 2.2.

Figure 2.2: Main reasons for not making any voluntary contributions (SEARS 2007)



As one can observe from the pie chart, the second biggest reason is that many people have “never thought about it”. Agnew et al. (2013b) surveyed employees close to their retirement and observed that over half do not have any retirement plans. Further, Croy et al. (2010a), Croy et al. (2010b), and Croy et al. (2012) have also developed a strong

⁶SEARS is a survey produced by the Australian Bureau of Statistics (ABS) which has been undertaken in both 2000 and 2007. These surveys provide detailed information on demographics, employment and contribution decisions.

correlation between voluntary contributions and retirement planning based on their survey results from members of four superannuation funds. One of the main reasons behind the hypothesis that allowing people to use superannuation for housing can increase involvement is that people are more inclined to think about superannuation decisions once they are associated with housing.

Another reason, which is not examined in this survey, but is increasingly identified elsewhere, is the level of financial literacy which may create a challenge for people to make complex financial decisions such as retirement saving decisions. This will be discussed in more details in Section 2.2.4.

In addition to the low participation rate of voluntary contributions, most of the members still do not elect to choose their fund or investment strategy (Bateman, Deetlefs, Dobrescu, Newell, Ortmann and Thorp, 2014). For instance, it is observed that fewer members have switched funds than before the “Choice of Fund” legislation was passed (Bateman, Deetlefs, Dobrescu, Newell, Ortmann and Thorp, 2014). The Parliamentary Joint Committee on Corporations and Financial Services (2007) also shows that 46.3% of all superannuation fund assets were in the default investment option at June 2007. Moreover, it found that only 20% of the 80% of fund members in the default strategy were there because they had an active preference for the default option.

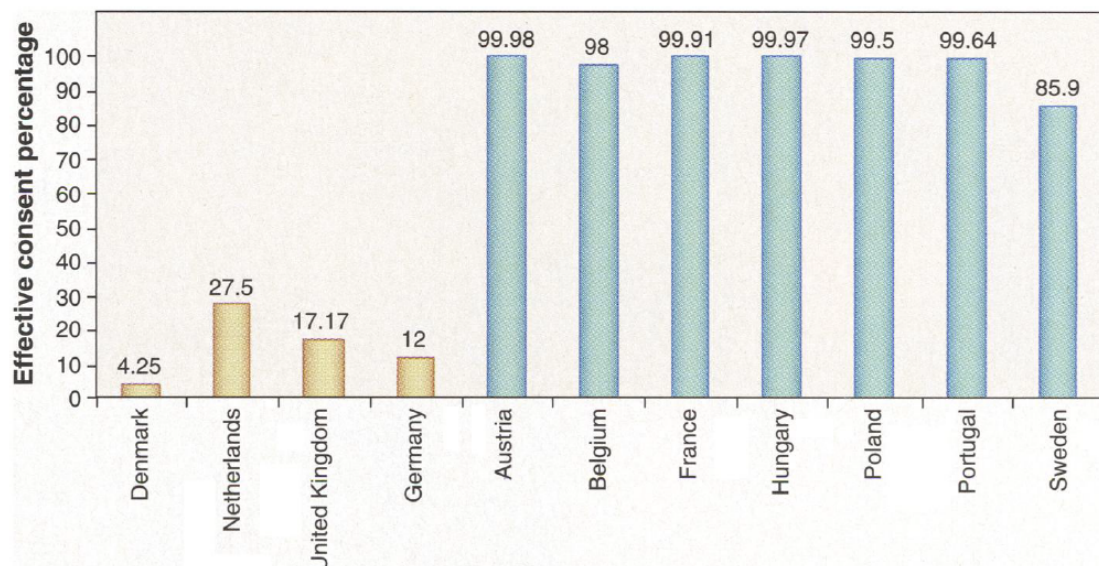
2.3.2.1 Pros and cons of defaults

As mentioned in Section 2.3.2, despite now being offered a range of choices in investment options, the majority of fund members’ funds are still placed in their default investment strategy, which is normally the ‘balanced’ option determined by the fund’s trustee. Defaults can influence choices in the following three ways, explaining why people have the tendency to stick with defaults. First, individuals might consider defaults to be suggestions by the policy-maker, and this a recommended action (McKenzie et al., 2006). Second, defaults normally represent the status quo, which is perceived as a reference point by decision makers. Any change from that status quo is perceived as a loss due to cognitive bias (Tversky and Kahneman, 1991). Finally, making an active decision normally involves effort, while it is effortless to accept the default (Baron and Ritov, 1994). Physical effort such as filling in a form may also increase acceptance of the default (Samuelson and Zeckhauser, 1988). The high proportion of members who fail to make active investment decisions highlights the need to investigate the issue of sticking to the default options.

The idea that governments can influence an individual’s behavior through the use of defaults is often referred to as “libertarian paternalism” (Sunstein and Thaler, 2003; Thaler and Sunstein, 2003; Thaler and Sunstein, 2008). Defaults are considered a powerful tool

by many behaviouralists (e.g., Johnson and Goldstein, 2003; Fellner and Sutter, 2009; O'Donoghue and Rabin, 2003; Thaler and Sunstein, 2003) as they are used to nudge individuals into making "correct" decisions. Some proponents of libertarian paternalism suggest that carefully designed defaults can increase the overall welfare even more than increasing individuals' knowledge about the choices they make (Sunstein and Thaler, 2003; Benartzi and Thaler, 2007). The positive effect of defaults on people's choice has been recognized in a range of domains, including health club memberships (DellaVigna and Malmendier, 2006), pension design (Choi et al., 2002), health care (Halpern et al., 2007), insurance (Johnson et al., 1993), and organ donation (Johnson and Goldstein, 2003; Abadie and Gay, 2006). For example, Johnson and Goldstein (2003) examine the effective consent rate to become an organ donor across European countries, that is the number of people who had not opted out (in presumed consent countries) or the number of people who had opted in (in explicit consent countries). They argue that defaults are expected to make little or no difference if preferences regarding organ donation are strong. However, as can be seen in Figure 2.3, defaults appear to exert a large impact: the six opt-out countries (blue) had significantly higher rates than the four opt-in countries (gold). Nevertheless, it should be noted that despite the fact that a change in the default setting could bring additional thousands of donors, defaults can also result in two kinds of misclassification; people who become organ donors against their wishes or unidentified willing donors.

Figure 2.3: Effective consent rates



Effective consent rates, by country. Explicit consent (opt-in, gold) and presumed consent (opt-out, blue).

As illustrated in the case of organ donation, although defaults could potentially bring sig-

nificant benefits, there are also some shortfalls associated with defaults. Quite a few other papers have also pointed out a number of negative externalities resulted from defaults (e.g. Agnew, 2013; Choi et al., 2002). For example, according to Agnew (2013), defaults that are not designed properly could result in suboptimal investment choices. This conclusion is also consistent with Choi et al. (2002) finding that default contributions to a particular stock may result in insufficient diversification. Studies on employer-sponsored savings plans have shown that automatic enrolment does not always improve welfare. For instance, while participation rates in employer-sponsored savings plans increase as a result of automatic enrolment defaults, poorly designed defaults, such as those with excessively conservative investment portfolios or low saving rates, can reduce welfare. This is because employees fail to adjust the defaults to match their preferences and needs later on (Choi et al., 2002; Choi et al., 2004; Choi et al., 2005; Beshears et al., 2009). At another extreme, Beshears et al. (2010) investigate the situation where the default savings rate is set to be extremely high, and conclude that the selected default rate reduces the welfare of all employees. In addition to that, Glaeser (2006) points out that those who choose default options are likely to bring biases and thus lead individuals to suboptimal choices. Moreover, Brown et al. (2012) examine the active versus passive decision makers when they are faced with a choice between a defined contribution and defined benefit scheme. They observe that respondents who are in the default are significantly more likely to regret their selection compared to active choosers.

2.4 Experimental design

This section reviews a wide range of papers on experimental mechanism and procedure, which includes the elicitation of willingness to pay, risk preference and time preference, the use of financial incentives, the presentation of information, and the external validity of the experiment.

2.4.1 Eliciting willingness to pay

This section investigates three most common approaches to measure an individual's willingness to pay (WTP) as well as the strengths and weakness of each approach.

2.4.1.1 Eliciting willingness to pay using demand revealing auctions

Demand revealing auctions are one of the most common methods to elicit willingness to pay for a good or service. Experimental economists have employed this method to study

the amount people are willing to pay for consumer products (e.g., Bohm et al., 1997; Hoffman et al., 1993; List and Lucking-Reiley, 2000; List and Shogren, 1998; Plott and Zeiler, 2005), food safety (e.g., Buzby et al., 1998; Fox et al., 1998), and lotteries (Grether and Plott, 1979).

There are different forms of demand revealing auctions. One of them is known as Vickrey auctions (Vickrey, 1961). The Vickrey auction takes place in a sealed form, where a participant submits an offer price containing information regarding his or her WTP in a closed envelope. If the participant has the highest bid, he or she wins the auction. However, the purchase price the participant needs to pay is determined by the second highest bid. With this elicitation mechanism the subjects are incentivised to truthfully reveal their valuation, because they must purchase the product if their bid wins the auction (Wertenbroch and Skiera, 2002).

Another form of demand revealing auction is the BDM procedure developed by Becker et al. (1964). In a BDM auction, every participant submits a bid simultaneously. The experimenter then randomly draws a sale price from a distribution of prices. The participants who have a greater bid price than the sale price purchase the product but only pay an amount equal to the sale price. Wertenbroch and Skiera (2002) tested the BDM auction together with a Vickrey auction for its ability to forecast WTP in a field experiment. Participants are asked to rate how satisfied they are with their purchase, which serves as a measurement of the validity of the two methods. Wertenbroch and Skiera (2002) found that both the buyers and the non-buyers are satisfied with the outcome of the BDM auction. This indicates that the BDM mechanism does not suffer from the overbidding bias, while such bias is found in some Vickrey auctions. Moreover, Noussair et al. (2004) also compare the BDM auction with the Vickrey auction to assess which method converges to the optimal strategy, (that is, bidding the true value), more quickly. They found that participants learned the optimal bidding strategy more quickly under the Vickrey auction. This is possibly due to the fact that deviation from the best bidding strategy cost much more under the Vickrey auction compared to the BDM auction. In conclusion, a BDM auction could lead to unbiased results, whereas there might be a bias under the Vickrey auction. However, given that deviations from the optimum are more costly under the Vickrey auction than the BDM auction, preferences revealed by the subjects becomes increasingly accurate as participants learn faster in repeated choices. The order of experiments is also critical in eliciting willingness to pay since the Vickrey bias reduces in repeated experiments.

2.4.1.2 Eliciting willingness to pay using the Multiple Price List

In addition to demand revealing auctions, another procedure that has been widely used to elicit willingness to pay is the multiple price list (MPL). The MPL is a relatively straightforward method to elicit values from a subject, where subjects are confronted with a range of ordered prices and asked to indicate “yes” or “no” for each price. The MPL design has been adopted in the following three general areas: eliciting willingness to pay (e.g. Kahneman et al., 1990), eliciting risk attitudes (e.g. Binswanger, 1980; Binswanger, 1981; Murnighan et al., 1988, Beck, 1988, Gonzalez and Wu, 1999, Holt and Laury, 2002), and eliciting individual discount rates (e.g. Coller and Williams, 1999, Harrison et al., 2002, Coller et al., 2001).

Andersen et al. (2009) examine a number of features of the MPL elicitation mechanism, and conclude that MPL has the following attractions. First, MPL is easy to implement and explain to subjects because subjects are only required to indicate “yes” or “no” for each corresponding price. Moreover, it is also relatively easy for participants to realise that truthful revelation is their optimal strategy, which can be hard to achieve for some other methods. However, Andersen et al. (2009) suggest that the MPL could imply potentially inconsistent preferences, since participants are allowed to switch from row to row as they like. This problem can be resolved by adopting the iterative MPL (iMPL), which allows more refined elicitation of the true preferences, and yet retains the transparency of the incentives of the basic MPL. The iMPL format extends the basic MPL format by first asking the participant to simply choose the row at which he wants to switch at. Assuming monotonicity of the subject’s underlying preferences, the remaining choices will then be automatically filled in. This first extension of the MPL format is also known as the switch MPL (sMPL) format. The second extension is to then allow the individual to make choices from refined options within the option last chosen. Thus, iMPL could improve the precision of the values elicited, given that MPL only elicits interval valuations rather than point responses.

2.4.2 Eliciting risk and time preference

An individual’s risk and time attitude is also ubiquitous in decision-making. The time and risk parameters are also crucial inputs into many economic models. For example, theories of risk such as subjective expected utility (Savage, 1954) and prospect theory (Kahneman and Tversky, 1979) leave risk attitude as a free parameter, since individuals may have different preferences toward it. Thus, assessing the risk preferences of individuals may help in explaining why different values are assigned on the option of using superannuation to purchase a family home. This section reviews the most common approaches to elicit risk

and time preference with a focus on risk preference, given most of the existing literature is focused on risk preferences, with fewer papers discussing the elicitation of time preferences. The strengths and weaknesses of each individual approach are also discussed.

2.4.2.1 Eliciting risk preference using a simple game

The Balloon Analogue Risk Task (BART) (Lejuez et al., 2002) is a computerised approach to elicit risk attitude, where an individual's risk preference is modelled through the real-world risk behaviour of balancing the potential for loss versus rewards. In the task, the participant is presented with a sequence of choices of receiving additional rewards via pumping more air into the balloon by clicking a button. Each click leads the balloon to inflate incrementally. This confers greater potential reward, but also greater risk of losing the accumulated money if the balloon explodes. The participant could choose to cash-out before the balloon explodes at any point of time. The accumulated amount of money is then deposited into his or her permanent account. A new balloon appears after the participant chooses to cash-out or if the balloon explodes, and the participant faces the same scenario with the next balloon. The subjects are never informed of the breakpoints of the balloons; the absence of this information allows the experimenter to assess participants' initial response as well as their changes in responding to the task as they gain more experience regarding the contingencies of the task.

One advantage of using the BART to assess risk attitude is that its context is easy for subjects to understand. This method has been used across a range of subfields (e.g. neuroscience (Fecteau et al., 2007), drug addiction (Bornoalova et al., 2005) and psychopathology (Hunt et al., 2005)) to elicit risk attitude. However, it remains unclear whether an individual's propensity for risk elicited using this approach could be extended to other domains, financial decision-making in particular. In addition to that, it is concluded that the score is more reliable in studies where 30 balloons are used. Thus, this method may not be ideal if there is a time constraint.

2.4.2.2 Eliciting risk preference using revealed preferences

The method discussed above has the advantage of being relatively easy for participants to grasp. However, a more complicated approach to elicit individual risk preference involves presenting respondents with a series of choices between gambles, known as the multiple price list (MPL) method. An early incentivised adoption of this method can be found in Binswanger (1981), where the MPL method is used to assess risk preference of farmers in rural India. Holt and Laury (2002) popularised the MPL method in an influential paper, where the risk parameters of a utility function are estimated using the MPL method. The

prevalent use of the Holt–Laury risk elicitation measure allows comparison between risk attitude across a wide range of contexts and environments.

In this task, a participant is presented with a list of 10 choices between paired gambles. The two gambles for each decision are stacked in rows, with the gamble in the left column labeled Option A and the gamble in the right column labeled Option B. The participant is then required to choose, for each decision row, which gamble he or she prefers to play by selecting either Option A or B. The payoffs of gambles in both options remain constant, and the associated probability is the only thing that changes across decision rows. In terms of the first decision row, the probability of getting the high payoff is only 1/10 for either option, and the expected payoff of Option A is \$1.17 higher than that of Option B. Thus, only an extremely risk-seeking person would prefer Option B over Option A in the first decision row. The probability of the high payoff gradually increases as you move down the rows, and the choice is between \$2.00 and \$3.85 with certainty for decision 10. If the individual understands the task and prefers more money, he or she should select Option B for the last decision row. Apart from the most risk-seeking participants, all individuals should share the pattern of choosing Option A in the first decision row, and switching over to Option B at some point before decision 10. This switch point is then used as the measure of the individual’s risk preference.

One advantage of the MPL method is that it could be easily incentivised, which ensures that the elicited risk preferences truthfully reflect respondents’ underlying preference toward risk. This is achieved by informing the participants that after they have made all their choices, one decision will be selected at random and played to determine their earnings for the task.

2.4.2.3 Eliciting risk and time preference using self-reports

A questionnaire is one of the most commonly used approaches to elicit risk and time preferences depending on the respondents’ self-reported willingness to take risk. A sample question to elicit risk preference using questionnaires comes in the following form: “On a 10-point scale, rate your willingness to take risks in general”, where 1 stands for completely unwilling and 10 stands for completely willing. This approach implicitly makes the assumption that there is a single risk preference influencing individuals’ behaviours across all domains. Nevertheless, there is a large amount of evidence pointing out that the elicited risk preference using questionnaires is highly dependent on the specific domain where the elicitation occurs. For instance, the risk preference amongst female tournament bridge players varies substantially depending on whether it is in the financial or bridge domain (Dreber et al., 2011). Maccrimmon and Wehrung (1990) show that the propensity

for risk of company managers varies substantially between the domains of recreational and financial decision-making.

To capture this variation, Weber et al. (2002) introduce the domain-specific risk-taking (DOSPERT) scale. The full DOSPERT scale is composed of 40 items in five distinct domains of risk taking: financial decisions (separately for gambling versus investing), health/safety, recreational, social, and ethical decisions. For each item, subjects are asked to rate on a 5-point scale how likely they are to engage in domain-specific risky activities, such as *co-signing a new car loan for a friend* (financial), *driving home after you've had three drinks in the last two hours* (health/safety), *trying bungee jumping* (recreational), *cheating on an exam* (ethical), and *speaking your mind about an unpopular issue at a social occasion* (social).

Chuang and Schechter (2013) conduct an extensive cross-disciplinary review of the literature regarding the stability of experimentally-measured preferences over time. They also examine the correlation between the preference parameters as measured by both survey questions and experiments with the real world outcomes. Their results suggest that survey measures of preferences are more stable than the experiment measures, especially in low-education settings. This is in line with results found by Dohmen et al. (2011) and Lonnqvist et al. (2014) that survey measures of risk aversion may be more correlated with real world outcomes and more stable over time than experimental measures of risk aversion.

2.4.3 Financial incentives

It has been long established that financial incentives play an important role in experiments (e.g., Holt and Laury, 2002; Camerer and Hogarth, 1999; and Libby and Marlys, 1992). Financial incentives have become a convention which are strictly enforced among economists on the widely shared belief that experimental participants do not work for free and work more effectively and persistently if their payment is based on their performance (e.g., Smith and Walker, 1976; Smith and Walker, 1982; Smith and Walker, 1993). Camerer and Hogarth (1999) review 74 experiments involving no, low, or high financial incentives based on performance. They conclude that the presence and magnitude of financial incentive does influence average performance in many experiments. This is particularly the case for judgement tasks where performance is improved with increased effort. Prototypical experiments of this nature are recall tasks (where paying attention improves performance), probability matching tasks (where keeping track of past trials helps), and clerical tasks (e.g., building things or coding words) which are so mundane that a performance based financial incentive induces persistent effort. However, Camerer and Hogarth (1999) also

point out that incentives do not matter in many other tasks, presumably due to the fact that there is sufficient intrinsic motivation to deliver good performance, or additional diligence does not matter because the task itself is too complicated and hard. In some other tasks financial incentives can actually hurt, if increased incentives cause participants to over learn a heuristic, to exert "too much effort" (choking in sports), or to overreact to feedback. In the sort of experiments that are of most interest to economists, like trading in markets and choosing between risky gambles, the overwhelming observation is that increased financial incentives do not substantially change average performance, although the variance of responses is often observed to decline.

2.4.4 Information presentation

Moreover, the presentation of information could also exert an influence on an individual's decisions. Lai et al. (2012) find that presentations based on frequency of returns above or below thresholds, have higher variability in error propensity than presentations based on probability of returns above or below thresholds. Moreover, graphical presentations may better suit individuals with a low level of financial literacy, while presentation using probabilities may better suit individuals with more sophisticated financial knowledge. Thus information presentation can be an important factor when it comes to designing an experiment. However, based on the test result of two corresponding interventions -educating investors and improving disclosure of the financial information- Choi et al. (2009) found that although financial education and better disclosure may be helpful in terms of reducing error propensity, their effect on asset allocation is likely to be modest.

2.4.5 External Validation

2.4.5.1 External validity of willingness to pay

It is ideal to use actual choices rather than hypothetical choices to infer WTP. But under those cases where there is limited revealed preference information, researchers have to estimate WTP based on stated preferences resulting from hypothetical choices. One of the main concerns is to what extent do stated WTP elicited using hypothetical choices correspond to real economic choices. Carson et al. (1996) suggest that values from hypothetical choice and revealed preference studies match fairly well. However, there is also strong counter evidence. For instance, Cummings et al. (1997) find that hypothetical responses could substantially overestimate WTP by comparing hypothetical and real WTP in their lab experiment. To remove this bias, the following two basic methods have evolved.

Cummings and Taylor (1999) develop a cheap talk approach. With this method, a cheap talk script precedes the task of eliciting participants' willingness to pay. Cheap talk scripts include a detailed discussion about the nature of hypothetical bias. Participants are told what hypothetical bias is and why it could occur. After the participants have heard the cheap talk script, they are asked to adjust their response to willingness to pay questions for hypothetical bias.

Concurrently a second method to mitigating hypothetical bias was introduced. This method is based on participants' certainty about their willingness to pay. There are two different versions of this approach. In the first version a scale is adopted to assess the certainty in hypothetical willingness to pay responses. For example, Champ et al. (1997) assessed the degree of certainty of the hypothetical donation responses on a ten point scale from very uncertain to very certain. In the second version, a follow-up question with two degrees of certainty is used to divide hypothetical willingness to pay responses. For example, Johannesson et al. (1998) divide yes responses to purchase a box of chocolates into "absolutely sure" and "fairly sure".

Blumenschein et al. (2008) directly compare the certainty approach with the cheap talk approach in a field experiment with real payments. They find that the certainty approach is more effective in mitigating hypothetical bias compared with the cheap talk approach.

CHAPTER 3

HYPOTHESES

As stated in Section 1.3, this thesis aims to address the following three research questions. The first research question is: What is an individual's perceived value of using superannuation for purchasing a family home and which type of possible benefits are more valuable? This thesis distinguishes three types of benefits from using superannuation for housing, namely the ability to purchase a family home, the ability to purchase a more expensive family home, or having a lower loan to value ratio (i.e., a lower outstanding mortgage). The second research question aims to determine the factors that explain heterogeneity among individuals when assigning perceived values of using superannuation for purchasing a family home. The third research question is related to superannuation involvement. In particular, will people's involvement with superannuation increase if they are given the option of using superannuation to pay for the down payment when purchasing their first family home?.

This chapter lists the corresponding hypotheses that this thesis aims to test via the lab experiment.

3.1 The perceived value

Regarding the first research question, that is what is an individual's perceived value of using superannuation for purchasing a family home and which type of possible benefits is more valuable. It is hypothesised that there is a stochastic dominance order in the value of possible benefits.

3.2 Determinants of the perceived value

The following is the second set of hypotheses that correspond to the second research question with regards to the determinants of the perceived value:

H2a Factors that exert a positive effect on the valuation of the option include: expected personal income, greater perceived value of home ownership, higher financial literacy, numeracy and institutional knowledge;

H2b Males assign a lower value on the option;

H2c Risk preference and time preference of an individual affects the valuation.

The idea behind these hypotheses is that there are two categories of factors that could explain the heterogeneity among the perceived value of the option. The first category contains variables such as age, income, risk preference and time preference, which are the variables that according to life-cycle theory should have an influence for a rational person on making financial decisions (Browning and Crossley, 2001; Epstein and Zin, 1989; and Lai et al., 2012). Moreover, since people have bounded rationality, the second category of factors include perception of home ownership, superannuation and mortgage, gender¹, financial literacy, numeracy and institutional knowledge, all of which are categorised as non-rational factors. The importance of financial literacy and numeracy in explaining financial decisions is also evidenced in a number of well-known journals (Lusardi et al., 2010; Rooija et al., 2011; and Lusardi and Mitchell, 2006).

3.3 Superannuation engagement

The next category of hypotheses with regard to the third research question is that having access to the option will increase the level of involvement with superannuation. This is evidenced in Waggle and Johnson (2003), where the authors include house value in their asset allocation models and conclude home ownership has an impact on an individual's engagement in making financial decisions.

The following hypotheses are then tested based on the change in response made by participants from task 1 to task 3 in stage 1:

Access to the option results in more deviations from default:

H3a: Higher average likert scale score self-reports for how likely the respondent thinks they will make active superannuation choices;

¹There is a small but growing literature indicating that men are typically more overconfident than women. (e.g., Bengtsson et al., 2005; Barber and Odean, 2001; and Huang and Kisgen, 2013)

H3b: Higher propensity to increase contributions to the superannuation account;

H3c: Higher propensity to make active portfolio choices.

H3d: Access to the option results in higher propensity to require more information.

Bateman, Deetlefs, Dobrescu, Newell, Ortmann and Thorp (2014) find that non-default activity is not a reliable proxy for the level of member engagement with superannuation, which justifies the hypothesis H3d as higher engagement does not necessarily imply more action taken by the individual. Thus, a higher propensity to seek additional information is also considered as an indication of higher engagement with superannuation.

CHAPTER 4

EXPERIMENT

As discussed in Section 1.2, under the current SIS act, Australians are forbidden to use superannuation assets to purchase a residential property for their own use. Thus, to gain an understanding on the perceived value of using superannuation for purchasing a family home, a lab experiment is conducted¹. An experiment allows subjects to be placed under hypothetical scenarios where they are then prompted to evaluate the option of using superannuation for purchasing a family home.

This experiment is funded by the ASB Lab through the Small Project Grants (SPG). There were 5 sessions conducted on the 23rd September 2014 in the ASB Lab at UNSW. Each session had between 27 and 31 subjects. Before the formal experiment, a pilot run was also conducted on the 17th September with around 10 participants.

The experiment was conducted on campus, this subject pool mainly consisted of university students. This group of subjects is relevant to the study since they are near first time non-casual employment and potentially near future home buyers. The data shows that almost half of the participants already had a superannuation account, which benefits the experiment as they had already been exposed to superannuation decisions.

All the information, including the instructions and the background knowledge, was read out to the subjects during the experiment (provided in Appendix 1). A summary of the key information was also provided to the subjects as a handout (provided in Appendix 2).

¹The complete experiment can be accessed at LINK: http://asb.qualtrics.com/SE/?SID=SV_2fLzyDSYxC0snK5

This allowed them to have reference material in front of them so that they were able to refer to while making decisions.

There were two stages to the experiment. The first stage was the main experiment, while the personal and demographic information was collected in the second stage.

4.1 Stage 1: Main experiment

The first stage of the experiment consisted of the following three main tasks. The first task was to assess subjects' level of involvement with superannuation by asking them to make superannuation decisions under the current regulatory framework. The second task was to assess participants' perceived value of using superannuation for purchasing a family home. The third task was to assess subjects' level of involvement by asking them to make the same decisions as in task 1 under the treatment regulatory framework. Thus, the two sets of responses in task 1 and task 3 can be compared to assess whether subjects' involvement with superannuation increases as a result of having the option of using superannuation to finance a family home. The fourth task aimed to test if making voluntary contributions into superannuation was emphasised as a method to save automatically, would subjects be more inclined to make additional contributions.

4.1.1 Task 1: Superannuation involvement under the current regulatory framework

In the first task, participants were asked to make superannuation choices in a setting where they were not able to use superannuation wealth for their house purchase. At the beginning of this task, relevant background information on superannuation was read out to the participants. The information was designed to provide subjects with sufficient, but not greater than necessary, knowledge to make informed decisions in task 1. To motivate subjects to pay attention to this background information, they were informed that their payment for task 1 depends on, and only depends on, their comprehension of the background information. After that, the subjects were asked to imagine that they had obtained their first job after graduation. They had a meeting with the HR department on their first day, where they were provided with the voluntary contribution application form and the member investment choice form which allows them to make voluntary contributions or choose an alternative investment portfolio respectively. In task 1, the questions used to elicit their level of involvement with superannuation were:

Q1: *How likely do you think you will be to fill in the voluntary contribution application form or the member investment choice form provided by the HR officer allowing you*

to make voluntary contributions or choose an alternative investment portfolio?

Subjects answered this question on a five point likert scale ranging from extremely unlikely to extremely likely.

Q2: *Your employer will contribute the equivalent of 9.5% of your gross salary (as the legally required compulsory contributions) into your superannuation account. You could also choose to make additional voluntary contributions into your superannuation account. This will increase your superannuation savings and reduce your take home pay. Please indicate which of the following two statements would apply:*

I am comfortable staying with the 9.5% employer contribution.

I would like to make additional voluntary contributions on top of the 9.5% employer contribution.

Q3: *Now you have made a decision about the percentage of your salary that you would like to contribute to your super fund. In addition, you can also choose an investment portfolio from the 5 premixed portfolios by filling out a form. If you do not make a choice, your superannuation saving will be automatically invested in the Balanced portfolio. Please indicate which of the following two statements would apply:*

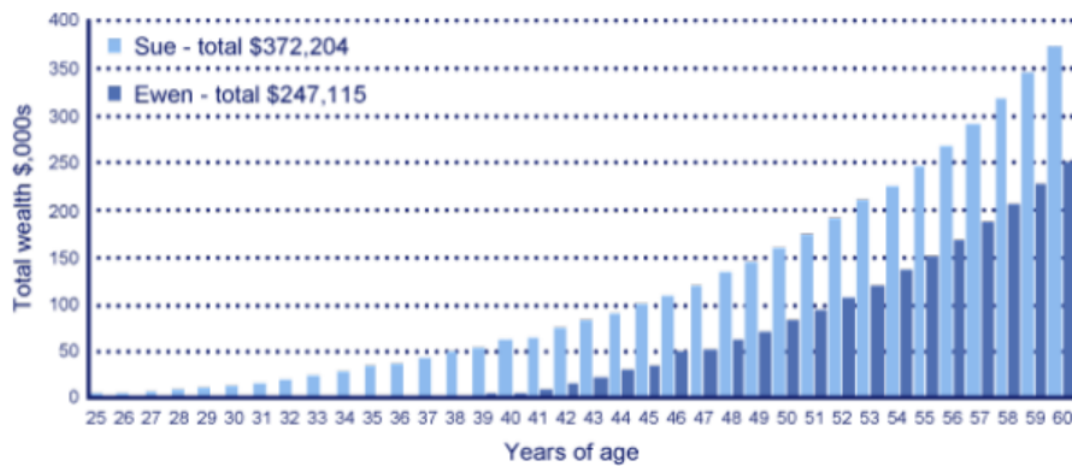
I do not want to choose my own investment portfolio.

I want to choose my own investment portfolio by filling out the form.

On the screen where subjects were asked to make the contribution decision, they were presented with an option button which revealed more information on how voluntary savings might impact retirement wealth (see Appendix 3 for code relating to recording each of the option buttons clicked). A screenshot of the option button in the experiment is provided in Figure 4.1. It was up to the participants to decide whether or not to click the button, which served as an indicator of the participant's involvement in making contribution decisions. Moreover, if the subject indicated that he was willing to make additional voluntary contributions, he would then be presented with a follow-up question asking him to put down the exact additional percentage of salary he was willing to contribute on top of the 9.5% employer contribution.

Figure 4.1: Screenshot of the experiment: option button for voluntary contribution

	SUE	EWAN
Starts investing at age	25	40
Invests until age	60	60
Investment timeframe	35 years	20 years
Investment per year	\$2,000 p.a.	\$5,000 p.a.
Total amount invested	\$72,000	\$105,000
Investment value at age 60	\$372,204	\$247,115



Data assumes an investment return of 8% p.a. No allowance has been made for taxation or investment fees and charges. Lower investment returns and/or periods of market volatility, and the factoring in of taxation or investment fees and charges would affect the analysis and could change the comparison.

This example is for illustrative purposes only and does not relate to any of UniSuper's investment options.

Figures are in today's dollars and have not been adjusted to reflect the likely impact of future inflation.

Similarly, when making the investment choice the subjects were presented with five option buttons which revealed more information on the risk profile and expected return of each of the five investment profiles (see Appendix 4 for code relating to recording whether the subject clicks each button). All the additional information is extracted from the website of UniSuper. A screenshot of the option button in the experiment is provided in Figure 4.2. Along with the variable recording, whether the subject sought information on voluntary contribution serves as another indicator of the subject's involvement in making investment decisions. Similarly to the contribution level, when the subject indicated that he wanted to choose his own investment portfolio, he was then presented with a follow-up question

asking him to select the investment profile he would like to invest in.

After the participant had made all the choices, they were asked three comprehension questions which tested their ability to recall and understand the background information provided to them at the beginning of the task. This comprehension test was used for two purposes. First, the number of questions each individual answered correctly could be used as a control variate. Second, before the background information was read out to subjects, they were informed that their payment for task 1 depended on, and only depended on, their comprehension of the background information. Therefore, the second purpose of the comprehension test was to motivate subjects to pay attention to the background information. A timer feature was added to the three comprehension questions, which required the participants to answer all the questions within 60 seconds. This was to prevent subjects from seeking correct answers from the handout when answering the comprehension questions. By setting a timer, only those subjects who had developed a clear understanding about the background information before answering the comprehension questions were rewarded.

4.1.2 Task 2: Perceived value of using superannuation for purchasing a family home

The second task was to assess participants' perceived value of using superannuation for purchasing a family home. Before subjects proceeded to task 2, they were asked to wait until everyone had completed task 1, so that instructions for task 2 could be read out to the whole group. The subjects were asked to imagine that they had already accumulated a certain amount of money in their superannuation and personal savings accounts after a number of years of hard work, and they were currently looking for their first home purchase in/around Sydney. They are told that their total required savings were 15% of the purchase price, including 10% as the down payment as well as 5% for other costs associated with buying a property, such as taxes, legal fees and insurance. These percentages were adopted based on the actual required down payment and expenses as a percentage of purchase prices in reality. To help participants make informed choices, information from official listings of houses was provided on possible accommodation options for those prices. In particular, for each property price, the possible location and property type a buyer could obtain (see Appendix 1 for more details). In addition to that, the handout also includes typical fortnightly mortgage repayments based on quotes from a bank² Following that, the subjects were introduced to the option of using superannuation savings for the down payment of their first family home as well as the associated benefits as a result of exercising

²Quotes are obtained from the NAB: <http://www.nab.com.au/personal/loans/home-loans/loan-calculators/loan-repayments-calculator> accessed on September 2014.

Figure 4.2: Screenshot of the experiment: option buttons for investment profiles

INVESTMENT DETAILS FOR OUR CAPITAL STABLE OPTION	
Description of option/Type of investor	Invests in a diversified portfolio, comprising largely defensive assets such as bonds and cash, and with some growth assets such as shares and property investments. Suitable for members with a medium risk tolerance who are comfortable with a medium level of expected returns.
Investment return objective	To achieve returns (after Fund taxes and investment expenses, before deducting account-based fees) that are at least 2.0% p.a. more than inflation (CPI) over the suggested time frame.*
Strategic asset allocation and ranges	<p>Property 6.5% (0% - 19%) International Shares 8.5% (0% - 21%) Australian Shares 15% (2.5% - 27.5%) Cash and Fixed Interest 70% (57.5% - 82.5%) Growth 30% (17.5% - 42.5%) Defensive 70% (57.5% - 82.5%)</p>
Minimum suggested timeframe for investment	Five years
Expected frequency of negative annual return	Two in 20 years
Summary risk level	Medium
INVESTMENT DETAILS FOR OUR CONSERVATIVE BALANCED OPTION	
Description of option/Type of investor	Invests in a diversified portfolio, comprising defensive assets such as bonds and cash, and growth assets such as shares and property investments. Suitable for members with a medium to high risk tolerance and who are seeking a medium to high level of expected returns.
Investment return objective	To achieve returns (after Fund taxes and investment expenses, before deducting account-based fees) that are at least 2.5% p.a. more than inflation (CPI) over the suggested time frame.*
Strategic asset allocation and ranges	<p>Property 10.5% (0% - 23%) International Shares 16% (3.5% - 28.5%) Australian Shares 23.5% (11% - 36%) Cash & Fixed Interest 50% (37.5% - 62.5%) Growth 50% (37.5% - 62.5%) Defensive 50% (37.5% - 62.5%)</p>
Minimum suggested timeframe for investment	Four years
Expected frequency of negative annual return	Three in 20 years
Summary risk level	Medium to high
BALANCED (MYSUPER) OPTION	
Return target	CPI + 4.8% per annum over 10 years (after fees, costs and fund taxes) for a member who has a constant \$50,000 balance and who does not incur any activity based fees
Minimum suggested time frame (in years) for investment	Ten years
Investment strategy	To invest in a diversified portfolio comprising mainly growth assets such as Australian and international shares, property, infrastructure and private equity, and with some bonds investments.
Strategic asset allocation (%)	<p>Property 9% (0% - 21.5%) Infrastructure and Private Equity 5% (0% - 17.5%) International Shares 20% (7.5% - 32.5%) Australian Shares 36% (23.5% - 48.5%) Cash & Fixed Interest 30% (17.5% - 42.5%) Growth 70% (57.5% - 82.5%) Defensive 30% (17.5% - 42.5%)</p>
Expected frequency of negative annual return	Four in 20 years
Summary risk level	High
INVESTMENT DETAILS FOR OUR GROWTH OPTION	
Description of option/Type of investor	Invests in a diversified portfolio, comprising mainly growth assets, such as Australian and international shares, property, infrastructure and private equity and with some bonds investments. Suitable for members with a high risk tolerance and who are seeking a high level of expected returns.
Investment return objective	To achieve returns (after Fund taxes and investment expenses, before deducting account-based fees) that are at least 4.0% p.a. more than inflation (CPI) over the suggested time frame.*
Strategic asset allocation and ranges	<p>Infrastructure and Private Equity 5% (0% - 17.5%) Property 10% (0% - 22.5%) Australian Shares 44% (31.5% - 56.5%) International Shares 26% (13.5% - 38.5%) Cash & Fixed Interest 15% (2.5% - 27.5%) Growth 85% (72.5% - 97.5%) Defensive 15% (2.5% - 27.5%)</p>
Minimum suggested timeframe for investment	Seven years
Expected frequency of negative annual return	Four in 20 years
Summary risk level	High
INVESTMENT DETAILS FOR OUR HIGH GROWTH OPTION	
Description of option/Type of investor	Invests in a diversified portfolio comprising growth assets such as Australian and international shares, property, infrastructure and private equity. Suitable for members with a high risk tolerance and who are seeking a high level of expected returns.
Investment return objective	To achieve returns (after Fund taxes and investment expense, before deducting account-based fees) that are at least 5.0% p.a. more than inflation (CPI) over the suggested time frame.*
Strategic asset allocation and ranges	<p>Infrastructure and Private Equity 5% (0% - 17.5%) Property 10.5% (0% - 23%) International Shares 27% (14.5% - 39.5%) Australian Shares 57.5% (45% - 70%) Growth 100%</p>
Minimum suggested timeframe for investment	Seven years
Expected frequency of	Five in 20 years

the option, namely being able to:

Benefit 1: purchase a more expensive family home;

Benefit 2: reduce the outstanding mortgage, and

Benefit 3: purchase a family home earlier.

Correspondingly, the subjects were placed under the following four quantitative measure treatments where Treatment 1 (T1) and Treatment 2 (T2) were associated with the first benefit, Treatment 3 (T3) was associated with the second benefit, and Treatment 4 (T4) was associated with the third benefit:

Treatment 1 (T1): purchase a \$700,000 home using superannuation savings to finance the gap of \$30,000 vs. purchase a \$500,000 home using personal savings;

Treatment 2 (T2): purchase a \$500,000 home using superannuation savings to finance the gap of \$30,000 vs. purchase a \$300,000 home using personal savings;

Treatment 3 (T3): purchase a \$500,000 home while using superannuation savings to reduce the mortgage amount by \$30,000 vs. purchase a \$500,000 home using personal savings;

Treatment 4 (T4): purchase a home using superannuation savings to finance the gap of \$30,000 vs. keep renting.

Under each treatment, the participants were asked to select the amount they were willing to withdraw from their superannuation account to finance the gap of \$30,000 (T1, T2, and T4) or reduce the mortgage by \$30,000 (T3) using the iterative multiple price list (iMPL) format. As explained in Section 2.4.1.2, the iMPL format extends the basic MPL format by first asking the participant to simply choose the row at which he wants to switch using sMPL instead of basic MPL. Then, the individual was asked to make choices from refined options within the option last chosen. The main advantage of using the iMPL format is that it is relatively transparent to subjects and provides simple incentives for truthful revelations. Furthermore, the iMPL format could improve the precision of the values elicited, given that the MPL only elicits interval valuations rather than point responses. Figure 4.3 is a screenshot of the question under Treatment 1.

As can be seen from the figure, the left column on the table is a list of the amount to be withdrawn from the superannuation account. In this step, switching MPL is used to prevent irrational switching. The design of the question in the experiment is so that the subject only needs to click on the choice where they want to switch from Choice A to Choice B, and the rest of the tables will be filled in automatically (see Appendix 5 for the code in Qualtrics). For example, when the participant clicks choice A for \$32,500, then all

Figure 4.3: Screenshot of the experiment: illustration of the iMPL

	Choice A	Choice B
House Value:	\$700,000 home	\$500,000 home
Super used for down payment of mortgage:	\$30,000	
Outstanding mortgage:	\$630,000	\$450,000
LTV ratio	90%	90%
Fortnightly mortgage repayments (Interest only)	\$1,280	\$914

	Choice A	Choice B
\$20,000	<input type="radio"/>	<input type="radio"/>
\$25,000	<input type="radio"/>	<input type="radio"/>
\$27,500	<input type="radio"/>	<input type="radio"/>
\$30,000	<input type="radio"/>	<input type="radio"/>
\$32,500	<input checked="" type="radio"/>	<input type="radio"/>
\$35,000	<input type="radio"/>	<input type="radio"/>
\$40,000	<input type="radio"/>	<input type="radio"/>

the rows above will be filled in choice A and all the rows below will be filled in choice B.

When the subject clicks on choice A for the amount \$32,500, this indicates that he is willing to give up \$32,500 in his superannuation account in order to receive this additional \$30,000. This also implies that he is willing to forego an additional \$2,500 (\$32,500-\$30,000) in order to use the option. In other words, being able to access his superannuation savings to supplement the financing of the property is worth \$2,500 to him.

When the subject clicks on choice A for the amount of \$27,500, this indicates he is willing to give up \$27,500 in his superannuation account in order to receive this additional \$30,000. This also implies that keeping his superannuation savings in his super account instead of accessing it to supplement the financing of the property is worth \$2,500 to him. In other words, he is only willing to exercise the option if he is paid at least \$2,500.

Following that, subjects were asked to refine the value within the option last chosen. This helps to address the problem with interval responses (Andersen et al., 2009) as discussed in Section 2.4.1.2. Figure 4.4 is a screenshot of the refining question under Treatment 1. Under treatment 1 where subjects are faced with a choice between purchasing a \$700,000 home using superannuation savings to finance the gap of \$30,000 and purchasing a \$500,000 home using personal savings, individuals who assign a value lower than \$30,000 are prompted to answer a follow-up question. The question is: *In case you have enough savings for the down payment for either home, which home would you prefer to buy?*

Figure 4.4: Screenshot of the experiment: illustration of refining choices

Now, please refine the choice you just made. This will give us a clearer idea on how much this option which allows you to use your superannuation savings to finance the gap of **\$30,000** in the down payment for a **\$700,000** home is worth to you.

	Choice A: purchase a \$700,000 home using superannuation account to finance the gap of \$30,000	Choice B: purchase a \$500,000 home using personal savings
30001	<input type="radio"/>	<input type="radio"/>
30500	<input type="radio"/>	<input checked="" type="radio"/>
31000	<input type="radio"/>	<input checked="" type="radio"/>
31500	<input type="radio"/>	<input checked="" type="radio"/>
32000	<input type="radio"/>	<input checked="" type="radio"/>
32499	<input type="radio"/>	<input checked="" type="radio"/>

Similarly, for individuals who assign a value lower than \$30,000 under treatment 2 where they are faced with a choice between purchasing a \$500,000 home using superannuation savings to finance the gap of \$30,000 and purchasing a \$300,000 home using personal savings, they need to indicate their preferred home in case they have enough savings for the down payment for either one.

A demonstrative example of this task was explained to the participants before they started making any choices for the four treatments. This was to help them to fully understand the choice they needed to make as well as how the iMPL format works. Randomisation of treatments is also used to control for potential learning effect, and thus eliminates bias between treatments. The order of the treatments presented to each subject is also recorded, thus it can be assessed whether the order of presentation would affect the perceived value (see Appendix 5 for the Qualtrics code).

After the participants had undertaken all of the four treatments, the experiment continued with the following follow-up question: “*Are you probably sure or definitely sure that you would buy the option of using superannuation for housing now at the price of \$X?*” for each treatment. As described in Section 2.4.5.1, this helps to identify whether subjects have overstated their true WTP.

To incentivise subjects to reveal their true perceived value of using superannuation to purchase a family home, they were informed before the task that one of their willingness to pay values under one of the quantitative treatments will be randomly selected and their payment is proportional to the simulated net value of assets after 5 years:

Value of family home - outstanding mortgage + superannuation assets - $I_o \times \text{difference}(\text{mortgage payment/rent with/out option}) - I_o \times \text{Price}$,

where I_o is an indicator equals to one when taking up the option. A hybrid model which combines hedonic and repeat-sales models (Shao et al., 2013) is used to simulate the net value of the family home after 5 years. The return on superannuation assets is bootstrapped from its empirical distribution. Mortgage costs and rent were provided in the hypothetical scenario. The subject will not get paid if the simulated net value of assets is negative. A performance based payment is adopted for this task, because it is becoming a widely accepted belief that experimental participants usually work more effectively if their payment is based on their performance as discussed in Section 2.4.3.

4.1.3 Task 3: Superannuation involvement under the treatment regulatory framework

The third task tested subjects' superannuation decision at the start of their employment under the hypothetical regulatory framework where they are given the option of using superannuation assets to purchase a family home. Before subjects proceeded to this task, they were also asked to wait until everyone had completed task 2, so that instructions for task 3 could be read out to the whole group. The questions were exactly the same as those asked in the first task but with the option of using superannuation for housing. The additional information on superannuation contribution and investment options was also the same as those provided in task 1.

The following is a part of the information that is read out at the beginning of task 3:

As mentioned previously, there are restrictions on withdrawing your money from super accounts. In the current regulatory framework, you are typically allowed to withdraw only after you reach age 60, which is why super is usually referred to as a long-term investment for retirement. However, in the next set of questions you are placed in a setting where you are given the option of using savings from your super account to pay for the down payment of your first family home. This means that you are ALSO allowed to withdraw your money from your super account before retirement at age 60 for the purpose of purchasing your first family home.

This assists the subjects to clearly differentiate the current setting where superannuation can not be used for housing from the treatment setting where superannuation can be used for purchasing a family home.

4.1.4 Task 4: Escalation option

Task 4 aims to test if making voluntary contributions into superannuation is emphasised as a method to save automatically, will subjects be more inclined to make additional contributions. This is assessed by asking the subjects the following question:

The super fund has a new option where your contribution rises automatically each time your pay increases. The contribution increase is equal to half of your wage increase up to a maximum increase of 1% a year. There is a 15% cap on the contribution limits. You would be able to exit the escalator option at any time earlier if your preferred contribution level is reached. Please indicate which of the following two statements would apply:

I would like to opt for this new option

I do not want to opt for this new option

Furthermore, half of the randomly selected participants were presented with the following statement as an additional part of the questions itself: *You need to be aware that once this money goes into your super account, you will only be able to get it back when you retire or when you purchase your first home. Given that the money you contribute is locked away, making voluntary contributions can also be considered as a simple, automatic and smart way to save.* These words explicitly state that making voluntary contribution allows subjects to enter into an arrangement where they will be making automatic savings for their retirement. Another commitment feature specific to this plan is the automatic voluntary contributions arrangement. This might help them to fulfill their plan to save for retirement that would otherwise be difficult due to intra-personal conflict stemming, for example, from a lack of self-control. Moreover, it emphasise that the contribution are *not* liquid. Thus any contributions made can't be accessed, except for the intended (housing and retirement) purpose.

4.1.5 Control group

Participants were split into two groups (treatment and control), where the control group was subdivided into another two groups (control group 1 and 2). As mentioned at the beginning of this chapter, there were altogether 5 sessions. Among those 5 sessions, 3 sessions were used for the treatment group, while 2 sessions were used for the control group 1 and control group 2 respectively. This division gave sufficient samples in each control group, while ensuring that the treatment group had the majority of subjects given that this was the group of interest. Control group 1 did not undertake task 1, while the treatment group undertook all three tasks. Comparing these two groups allows checking how previously answered questions on the involvement effects the involvement questions in the hypothetical scenario. Moreover, control group 2 undertook task 3 instead of task 1. Comparing these two groups allows the checking of how some experience with the option effects the involvement questions in the hypothetical scenario. Table 4.1 provides a clear illustration of the tasks as well as the order of the task undertaken by different group of subjects.

Task	Treatment	Control 1	Control 2
1) super decision current regulations	1 st Task		
2) determine the perceived value	2 nd Task	1 st Task	2 nd Task
3) super decision treatment setting	3 rd Task	2 nd Task	1 st Task
4) escalation option	4 th Task	3 rd Task	3 rd Task

Table 4.1: The tasks undertaken by different groups

4.2 Stage 2: Personal and demographic characteristics

The second stage of the experiment aimed to collect a range of personal and demographic characteristics. As mentioned in Section 3.2, these are all factors that are hypothesised to exert an impact on the perceived value of using superannuation for purchasing a family home. The information collected includes age, gender, expected future salary, risk preference, time preference, financial planning and consumption behaviour, perception about superannuation, home ownership, and mortgage.

Risk preference and time preference of the subjects is elicited using two survey type questions based on Dohmen et al. (2011) and Vischer et al. (2013) respectively. For example, to elicit the risk preference, the subject was asked to indicate their general riskiness. The exact wording of the question is: *How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?*. The answers are coded on an 11-point scale, with “0” referring to “not at all willing” and “10” to “very willing”. Furthermore, the exact wording of the time preference question was: *Are you generally an impatient person, or someone who always shows great patience?*. Similar to the risk preference question, the answers are coded on an 11-point scale, with “0” referring to “very impatient” and “10” to “very patient”. To elicit participants’ financial literacy, numeracy, and institutional knowledge, they were required to answer three sets of questions based on Lusardi et al. (2010) and Bateman et al. (2010). Furthermore, to minimise careless responding when answering the financial literacy, numeracy and institutional knowledge test, a recall quiz was incorporated in the experiment. In particular, the participants were presented with two questions which asked them to recall whether they have previously answered one particular question.

Figure 4.5 is a screenshot of the questions used to gain an understanding on participants’ financial planning and consumption behaviour. As one can see from the figure, the first two questions relate to financial planning behaviour, while the remaining two questions relate to consumption behaviour. Figure 4.6 is a screenshot of the questions used to elicit participants’ perceptions on the superannuation system, home ownership and mortgage. Among this set of questions, the first three relate to the superannuation system, the third and fourth questions relate to home ownership, and the remaining three relate to

mortgages.

Figure 4.5: Screenshot of the experiment: questions on financial planning and consumption behaviour

To what extent do you agree or disagree with the following statement:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I find it important to spend a great deal of time on developing a financial plan when I am faced with long term financial decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I make a plan for my expenditures, I am able to stick to it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am impulsive and tend to buy things even when I can't really afford them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am prepared to spend now and let the future take care of itself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 4.6: Screenshot of the experiment: questions on perception of superannuation system, home ownership and mortgage

To what extent do you agree or disagree with the following statement:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Mandatory saving for retirement unnecessarily restricts individual's choice.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The superannuation system is very reliable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The cost of superannuation saving is high.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is essential to have my own family home.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Returns in housing market are higher than that in the equity market.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is easy for me to afford my future family home.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would not feel comfortable having a large mortgage as I would worry about being able to meet my mortgage payments in the future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
With regards to mortgages, I think it is best to borrow as much as the bank will let me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

CHAPTER 5

MODEL

This chapter explains the statistical tests proposed given the proposed research questions and the experimental design in Chapter 4.

5.1 Non-parametric test

As indicated in Section 4.1.2, for some subjects, the amount they are willing to give up in exchange for the \$30,000 is not completely observed. For example, if the figure the subject is willing to give up is below \$20,000, that data become unobserved, and thus left censored, since it is outside the range of the multiple price list. Due to the fact that the data is left censored, non-parametric tests are performed.

5.1.1 Pearson's chi-squared test

Pearson's chi-squared test is a statistical test applied to sets of categorical data to evaluate how likely it is that any observed difference between the sets arose by chance. It is the most widely used of many chi-squared tests (e.g., Yates, likelihood ratio, Portmanteau test in time series, etc.) – statistical procedures whose results are evaluated by reference to the chi-squared distribution (Plackett, 1983). It tests a null hypothesis stating that the frequency distribution of certain events observed in a sample is consistent with a particular theoretical distribution.

5.1.1.1 Pearson's chi-squared test

Mood's median test is one of the special case of Pearson's chi-squared test. It is a non-parametric test that tests the null hypothesis that the medians of the populations from which two or more samples are drawn are identical. The data in each sample are assigned to two groups, one consisting of data whose values are higher than the median value in the two groups combined, and the other consisting of data whose values are at the median or below. A Pearson's chi-squared test is then used to determine whether the observed frequencies in each sample differ from expected frequencies derived from a distribution combining the two groups.

5.1.2 Binomial test

A one sample Binomial test allows us to test whether the proportion of successes on a two-level categorical dependent variable significantly differs from a hypothesized value. It tests a null hypothesis stating that that two categories are equally likely to occur (such as a coin toss). For large samples, the Binomial distribution is well approximated by the Gaussian distribution, and these are used as the basis for alternative tests that are much quicker to compute, for example, the Pearson's chi-squared test. However, for small samples these approximations break down, and there is no alternative to the Binomial test.

5.1.3 Wilcoxon Matched Pairs Test

The Wilcoxon signed-rank test is a non-parametric statistical hypothesis test used when comparing two related samples, matched samples, or repeated measurements on a single sample to assess whether their population mean ranks differ (i.e. it is a paired difference test). It can be used as an alternative to the paired Student's t-test, t-test for matched pairs, or the t-test for dependent samples when the population cannot be assumed to be normally distributed. It tests a null hypothesis stating that median difference between the pairs is zero.

5.2 Regression test

As mentioned in Section 3.1, a range of background information is collected in the second stage to determine whether these factors are statistically significant in explaining the perceived value of the option. This is assess using Heckman's two-stage regression analysis combined with the Factor analysis.

5.2.1 Heckman's two-stage regression

The perceived value of using superannuation for purchasing a family home is assessed by eliciting the amount the participant is willing to withdraw from his superannuation account to finance a gap of \$30,000. As indicated in Figure 4.3, this is choice A (see Section 4.1.2 for more details). If the participant select choice B for all the decisions, no value is observed for the amount of withdrawal from superannuation account to finance the purchase of a family home (choice A). In other words, the perceived value of using superannuation for purchasing a family home is observed only for subjects who select choice A at least once. Given the decision on which choice to select is made by the individual subject, those who select choice B for all the decisions constitute a self-selected sample and not a random sample. Therefore, Heckman's two-stage regression (Heckman, 1979) is adopted to account for information on those subjects who have no observed value on their perceived value of using superannuation for housing purpose.

Heckman's two-stage regression is specified by:

Stage 1: selection equation

$$z = \gamma\omega + \mu \quad \mu \sim N(0, \sigma_1^2) \quad z^* = \begin{cases} 1 & \text{if } z > 0 \\ 0 & \text{if } z = 0. \end{cases} \quad (5.1)$$

Stage 2: regression equation

$$y = \alpha + \beta x + \varepsilon \quad \varepsilon \sim N(0, \sigma_2^2) \quad (5.2)$$

where z^* is an indicator and y is the midpoint of the elicited amount given up from superannuation account to finance a gap of \$30,000. The amount y is observed if and only if $z = 1$. The error terms, μ and ε , are assumed to be bivariate and normally distributed with correlation coefficient ρ . γ and β are the parameter vectors under investigation.

The selection equation is estimated by maximum likelihood as an independent probit model to determine the decision to choose choice A using information from the whole sample of subjects. A vector of inverse Mills ratios (LAMBDA) can be generated from the parameter estimates (Greene, 2003).

The inverse Mill's ratio is given by:

$$\lambda = \phi\left(\frac{\gamma\omega}{\sigma_1}\right) / \Phi\left(\frac{\gamma\omega}{\sigma_1}\right) \quad (5.3)$$

The perceived value of using superannuation for purchasing a family home, y , is observed only when the selection equation equals 1 (i.e. select choice A at least once) and is then regressed on the explanatory variables, x , and the vector of inverse Mills ratios from the selection equation by ordinary least squares. Therefore, the second stage performs the regression with the LAMBDA term included as an extra explanatory variable, removing the part of the error term correlated with the explanatory variable and avoiding the bias. Sample selection bias has been corrected by the selection equation, which determines whether an observation makes it into the non random sample. C are the control variables, such as whether subject is in the treatment or control group and whether it is the 1st, 2nd 3rd or 4th treatment faced by the subject.

5.2.1.1 Ordered probit model

Ordered probit model is used as a generalisation of the probit model (that is, the first stage of Heckman's two-stage regression model). It is used under the scenarios where there are more than two outcomes. The regression is:

$$y^* = X\beta + \epsilon, \quad (5.4)$$

where y^* is the unobserved dependent variable. The variable y is:

$$y = \begin{cases} 1, & y^* \leq \mu_1; \\ \cdots, & \\ 4, & \mu_3 < y^* \leq \mu_4; \\ 5, & y^* > \mu_4. \end{cases} \quad (5.5)$$

where μ are the threshold levels for each outcome.

5.2.2 Backward (Step-Down) Selection

Following the Heckman's two-stage regression, the next object is to finding the subset of regressor (independent) variables that are statistically significant. The objective is to include as few variables as possible because each irrelevant regressor decreases the precision of the estimated coefficients and predicted values. Also, the presence of extra variables increases the complexity of data collection and model maintenance. The goal of variable selection becomes one of parsimony: achieve a balance between simplicity (as few regressors as possible) and fit (as many regressors as needed).

The backward selection model is adopted. The model starts with all candidate variables in the model, which is the results from the Heckman's two-stage regression. At each

step, the variable that is the least significant is removed. This process continues until no nonsignificant variables remain. The significance level at which variables can be removed from the model is set to be 0.10.

5.2.3 Factor analysis

Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors. For example, in the experiment, participants are asked several questions to assess five factors, which are financial planning, consumption, perception on superannuation, home ownership and mortgage. Table 5.1 lists all the questions used to elicit these five factors. Each question represents a variable identified by a variable ID. Factor analysis is then performed on the twelve variables (questions) to reduce and summarise them into the five factors.

The result of the factor analysis is summarised below:

$$\text{Financial planning} = 0.864*V1+0.747*V2$$

$$\text{Consumption} = 0.840*V3+0.805*V4$$

$$\text{Perception on superannuation} = 0.780*V7$$

$$\text{Perception on home ownership} = 0.771*V9+0.786*V10$$

$$\text{Perception on mortgage} = -0.757*V11 + 0.727*V12$$

Table 5.1: List of variables for factor analysis

Variable ID	Question
V1	I find it important to spend a great deal of time on developing a financial plan when I am faced with long term financial decisions.
V2	When I make a plan for my expenditures, I am able to stick to it.
V3	I am impulsive and tend to buy things even when I can't really afford them.
V4	I am prepared to spend now and let the future take care of itself.
V5	Mandatory saving for retirement unnecessarily restricts individual's choice.
V6	The superannuation system is very reliable.
V7	The cost of superannuation saving is high.
V8	It is essential to have my own family home.
V9	Returns in housing market are higher than that in the equity market.
V10	It is easy for me to afford my future family home.
V11	I would not feel comfortable having a large mortgage as I would worry about being able to meet my mortgage payments in the future.
V12	With regards to mortgages, I think it is best to borrow as much as the bank will let me.

CHAPTER 6

RESULTS

This chapter presents results of the analysis of the data from the lab experiment. This chapter is divided into the following five sections. Section 6.1 presents results in relation to the first research question: What is an individual's perceived value of using superannuation for purchasing a family home and which type of possible benefits is more valuable? Section 6.2 determines the factors that explain heterogeneity among individuals when assigning perceived values of using superannuation for purchasing a family home. This is the result to the second research question. Section 6.3 presents the result to the third research question: Will people's involvement with superannuation increase if they are given the option of using superannuation to pay for the down payment when purchasing their first family home? Moreover, all subjects in the experiment are randomly presented with an escalation option with or without the emphasis on voluntary contribution's potential benefit of being a commitment device. They are then asked to indicate whether they would like to opt for this escalation option. Section 6.4 shows the difference in responses between the two groups of subjects. Finally, Section 6.5 compares the response of the treatment group with that of control group 1 and control group 2.

The experiment has a total of 143 subjects, which are subdivided into three groups, namely treatment group, control group 1 and control group 2. Table 6.1 summarises the number of subjects, proportion of female, median age, proportion of subjects from the Business School, and proportion of subjects with a superannuation account for each group. As one can see from the table, there are 90 subjects in the treatment group, 28 subjects in control group 1 and 25 subjects in control group 2. For each group of subjects, their median

age as well as the proportion of them from the Business School is similar. However, the proportion of female subjects in control group 1 (36%) is substantially lower than that of the other two groups (52% for the treatment group and 64% for control group 2). The proportion of subjects with a superannuation account in control group 1 (48%) is higher than that of the other two groups (43% for the treatment group and 32% for control group 2).

Table 6.1: Summary statistics of the subjects in the treatment and control groups

	No. of subjects	Pct of female	Median age	Pct from Business School	Pct with a superannuation account
Treatment group	90	52%	20	56%	43%
Control group 1	28	36%	21.5	61%	48%
Control group 2	25	64%	21	60%	32%

This table provides the summary statistics for the treatment and the two control groups. Both control groups did not do Task 1 “super decisions current regulations”, control group 1 did do Task 3 “super decisions treatment setting” after Task 2 “determine the perceived value”, control group 2 did do Task 3 “super decisions treatment setting” before Task 2 “determine the perceived value”.

6.1 Perceived value

This section presents results to the first research question, that is what an individual’s perceived value of using superannuation for purchasing a family home is and which type of benefits is valued the most. As mentioned in Section 4.1.2, the option of using superannuation savings for the down payment of a family home has three potential benefits, namely being able to purchase a more expensive family home, reduce the outstanding mortgage amount, or purchase a family home earlier. In order to elicit and compare the value of each type of benefit, all subjects are placed under the following 4 treatments where Treatment 1 (T1) and Treatment 2 (T2) are associated with the first benefit, Treatment 3 (T3) is associated with the second benefit, and Treatment 4 (T4) is associated with the third benefit:

T1: purchase a \$700,000 home using superannuation savings to finance the gap \$30,000 vs purchase a \$500,000 home using personal savings;

T2: purchase a \$500,000 home using superannuation savings to finance the gap \$30,000 vs purchase a \$300,000 home using personal savings;

T3: purchase a \$500,000 home while using superannuation savings to reduce the mortgage amount by \$30,000 vs purchase a \$500,000 home using personal savings;

T4: purchase a home using superannuation savings to finance the gap \$30,000 vs

keep renting.

Figure 6.1 presents the cumulative distribution function (CDF) of the amounts the subjects are willing to give up from their superannuation account to finance the gap of \$30,000. From the figure we observe that the maximum amount is substantially higher than the individual treatment, which means the potential high value individuals place on the option of using superannuation for housing. Moreover, as one can observe from the figure, treatment 3, that is associated with using superannuation assets to reduce the outstanding mortgage, also seems to obtain a higher perceived value than the other treatments. This is especially the case when treatment 3 is compared with treatment 1 and treatment 2, which are two treatments associated with the benefit of being able to purchase a more expensive home.

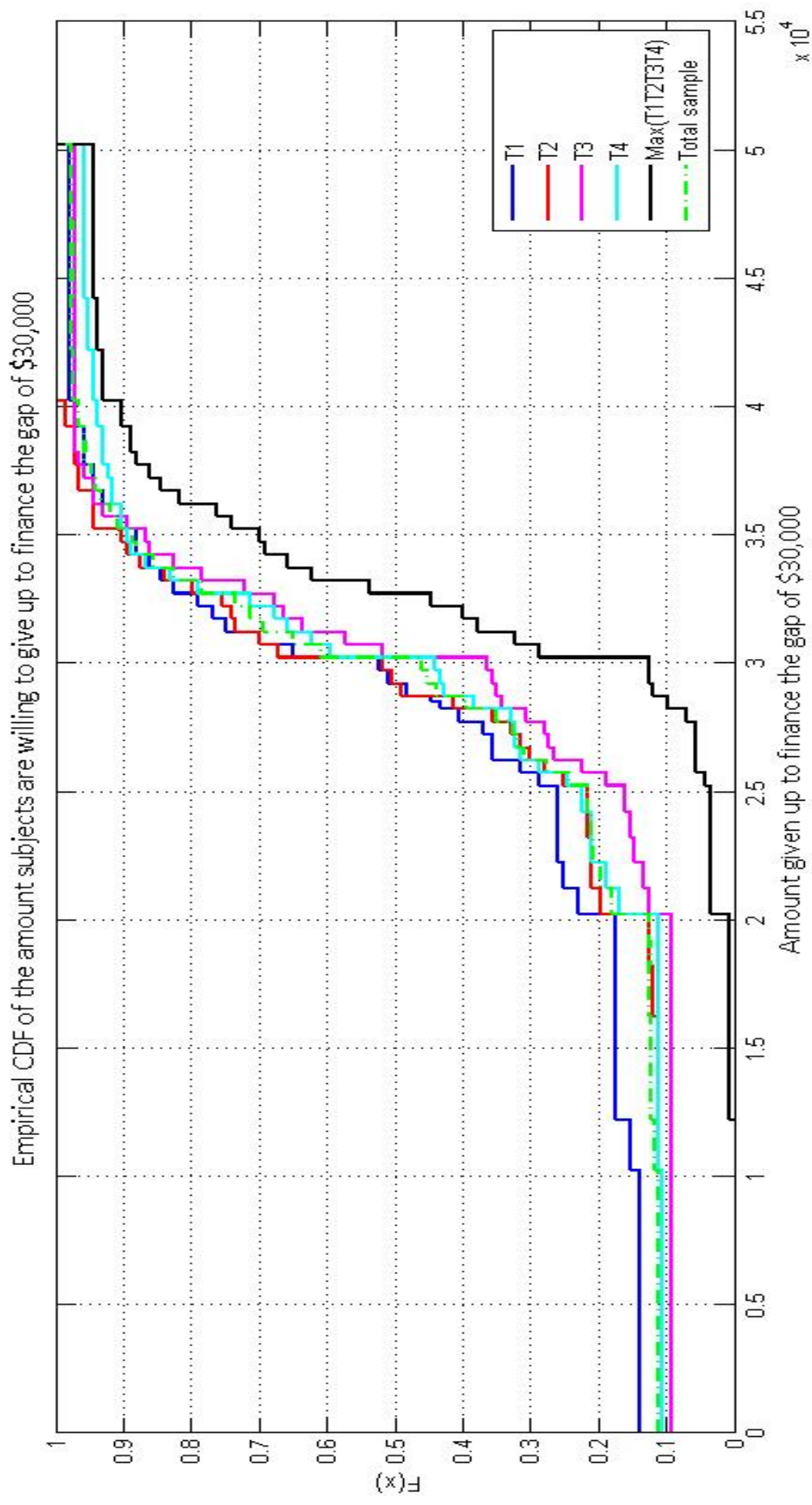


Figure 6.1: CDF of the withdrawal amounts for each treatment, the highest amount and the whole sample

To determine whether the distributions of the perceived value under each treatment are equal, non-parametric tests are used. Non-parametric tests are proposed due to the fact that the data is left censored. For some subjects, the amount they are willing to give up in exchange for the \$30,000 is not completely observed, if the figure is under \$20,000.

Table 6.2 is the contingency table for the perceived value across four treatments. From the table we observe that, treatment 3 has the highest number of subjects (69) above the median of the whole sample, followed by 58 subjects for treatment 4, and 50 subjects for treatment 1. Treatment 2 has the least number of subjects (47) above the median. A Pearson chi-square test is then used to test the null hypothesis that all medians are equal. This results in a χ^2 -test statistics (3 df) of 8.512 with a significance level 0.037. Given that the significance level is less than a nominal level of α of 0.05, the null hypothesis is rejected. Thus, it can be concluded that the median is unequal across the four treatments.

Table 6.2: Contingency table for the perceived values across four treatments

		T1	T2	T3	T4
Perceived value	> Median	50	47	69	58
	\leq Median	93	96	74	85

This table represent the number of subject whom perceived value is higher/lower than the overall mean for each treatment. The overall median is \$30,251 with a total number of 143 subjects under each treatment. The treatments are T1: purchase a \$700,000 home using superannuation savings to finance the gap \$30,000 vs purchase a \$500,000 home using personal savings; T2: purchase a \$500,000 home using superannuation savings to finance the gap \$30,000 vs purchase a \$300,000 home using personal savings; T3: purchase a \$500,000 home while using superannuation savings to reduce the mortgage amount by \$30,000 vs purchase a \$500,000 home using personal savings; T4: purchase a home using superannuation savings to finance the gap \$30,000 vs keep renting.

Given that the medians appear to be different across the treatments, Table 6.3 provides the medians for the amount elicited under each treatment separately. The table also includes the medians of the highest payment among the four treatments as well as the medians of the full sample. As one can observe from the table, both treatment 3 and treatment 4 have the highest median value (\$30,251) among the four treatments as opposed to (\$29,250) for treatment 1 and treatment 2. The median for the highest payment is (\$32,751).

A Wilcoxon matched pair test is then used to compare each pair of treatment to determine whether there is a statistically significant difference between one treatment and another. Table 6.4 presents the test statistics and the level of significance for each pair of treatment. As one can see from the table, there is a statistically significant difference between pair 2 (Treatment 1 and Treatment 3), as well as pair 4 (Treatment 2 and Treatment 3).

Moreover, the difference between Treatment 1 and Treatment 4 is almost statistically significant at a 10% significance level. From this we conclude that the distributions of the perceived value of using superannuation for purchasing a family home under Treatment 1 and Treatment 2 are different from those under Treatment 3 and Treatment 4.

Table 6.3: Medians of the payment amount under each treatment, the highest payment amount and the full sample

	Median	90% CI for Median	
		Lower Bound	Upper Bound
T1	29,250	28,250	30,251
T2	29,250	28,750	30,251
T3	30,251	30,251	30,750
T4	30,251	29,250	30,251
Max{T1,...,T4}	32,751	32,250	33,250
Full sample	30,251	30,249	30,251

This table presents the median as well as the 90% confidence interval of the median amount subjects are willing to give up in exchange for \$30,000 from their superannuation account for housing purpose. T1 refers to the amount elicited under treatment 1, while T2, T3 and T4 refer to the median amounts elicited under Treatment 2, treatment 3 and treatment 4 respectively. Max{T1,...,T4} selects the maximum amount an individual is willing to give up among four treatments. Full sample include all the amounts elicited under all four treatments. The number of observations is 143 for T1, T2, T3, T4 and Max{T1,...,T4}. For the full sample, the number of observations is 572.

Table 6.4: Wilcoxon matched pair test for the values under each pair of treatment

		Median of the differences	Wilcoxon Signed Ranks Test Stat	Sig. (2-tailed)
Pair 1	T1 - T2	0	-0.148	.882
Pair 2	T1 - T3	0	-2.768	.006
Pair 3	T1 - T4	0	-1.554	.120
Pair 4	T2 - T3	-500	-1.914	.056
Pair 5	T2 - T4	0	-0.415	.678
Pair 6	T3 - T4	0	-0.967	.222

This table presents the Wilcoxon matched pair test for each pair of the values. The first column is the median of the difference between each pair. The second column is the Wilcoxon signed rank test statistic with its corresponding level of significance in the third column.

Given that the distributions and medians are different between some of the treatments, we investigate that whether there is statistically significant evidence to suggest that one treatments is preferred over the others. Table 6.5 displays the number and the fraction of subjects that place the highest, second highest, third highest and the lowest value on each of the four treatments. For example, the table shows that 31% of the subjects value the potential benefit associated with treatment 1 (using superannuation to purchase a \$700,000 home the most), 37% value this benefit the second highest, 33% value it the

third highest and 42% think this benefit is of the least value compared to the other three treatments.

Table 6.5: The number of subjects placing the highest, 2nd highest, 3rd highest and lowest value for each of the 4 treatments

	Fraction highest WTP	Fraction 2 nd highest WTP	Fraction 3 rd highest WTP	Fraction lowest WTP
T1	31 (22%)	37 (26%)	33 (23%)	42 (29%)
T2	30 (21%)	31 (22%)	37 (26%)	45 (31%)
T3	45 (31%)	44 (31%)	30 (21%)	24 (17%)
T4	37 (26%)	31 (22%)	43 (30%)	32 (22%)

This table presents for each treatment the number of subjects who ranked the treatment highest up to lowest. Each cell displays the number of subjects with the percentage in parenthesis. For example, the first cell shows that there are 31 subjects who have placed the highest value on treatment 1, which represents 22% of the total sample size ($n = 143$).

The Pearson chi-square test is used to assess whether the observed frequencies are statistically significant from the expected frequencies. In this case, it tests a null hypothesis stating that the frequency distribution of each event observed (that is, value Treatment 1/Treatment 2/Treatment 3/Treatment 4 the highest/2nd highest/3rd highest/lowest) is consistent with a particular theoretical distribution. The Pearson chi-square returns a test statistic of 17.594 (9 df) with a significance level of 0.040. Given that the significance level is less than a nominal level of α of 0.05, it can be concluded that the proportions of subjects placing the highest, 2nd highest, 3rd highest and lowest value for each of the four treatments are not equal. In other words, participants do have a preference among the four treatments.

To determine which treatment is the one most preferred, Table 6.6 displays summary statistics on the number of subjects who prefer one treatment over another. Individuals who assign an equal value on two treatments are divided equally and add back to each group, so that the fraction of subjects prefer treatment x over treatment y plus the fraction of subjects prefer treatment y over treatment x is 100%.

Table 6.6: The number of subjects preferred one treatment over another

x over y	$y = T1$	$y = T2$	$y = T3$	$y = T4$
$x = T1$		68 (48%)	84 (59%)	77 (54%)
$x = T2$	75 (52%)		91 (64%)	74 (52%)
$x = T3$	59 (41%)	52 (36%)		65 (45%)
$x = T4$	66 (46%)	69 (48%)	78 (55%)	

This table presents for pair of treatments the number of subjects who preferred treatment x over treatment y . Each cell displays the number of subjects preferred one treatment over another with the percentage in parenthesis. All cells on the diagonal are blank. For example, the second cell on the first row shows that there are 68 subjects who preferred treatment 1 over treatment 2, which represents 48% of the total sample size ($n=143$).

Table 6.7 presents the result of an Binomial test on the proportion of prefer one treatment over another treatment for each pair of treatment. The observed proportion of subjects who prefer Treatment x over Treatment y , which is summarised in Table 6.6, is then compared against a test proportion of 0.5. The null hypothesis is that the observed proportion is equal to the test proportion. If there is no difference between the preference on treatments, there should be no statistically significant difference between the observed proportion and the test proportion. From the table we observe that the proportion of subjects prefer Treatment 3 over Treatment 1 as well as the proportion of subjects prefer Treatment 3 over Treatment 2 are both statistically significant. Before reaching to the conclusion that subjects view Treatment 3 more valuable than Treatment 1 and Treatment 2, a means comparison test is conducted on the rank of each treatment to confirm this conclusion.

Table 6.7: Binomial test and Means difference test on the pairs of treatment

	Binomial test Exact Sig. (2-tailed)	Paired mean difference	Sig. (2-tailed)
Pair 1 T1 - T2	.616	-.077	.605
Pair 2 T1 - T3	.044	.259	.082
Pair 3 T1 - T4	.403	.098	.504
Pair 4 T2 - T3	.001	.336	.022
Pair 5 T2 - T4	.738	-.161	.247
Pair 6 T3 - T4	.316	.175	.236

This table presents the Binomial test and Means difference test for each pair of treatments. The first column presents the level of significance of the Binomial test. The second column of the table displays the mean difference of the rank between the pair. For example, a paired mean difference between treatment 1 and treatment 2 indicates that the rank of treatment 1 is on average 0.77 higher than treatment 2. The forth column displays the level of significance of each pair of mean difference.

To perform the means test, for each subject, the four figures elicited from each treatment are ranked from the highest to the lowest. The treatment with the highest amount assigned

is recorded to be 1, the one with the second highest amount to be 2, the one with the third highest amount to be 3 and the treatment with the lowest amount is recorded to be 4. If both Treatment 1 and Treatment 2 have the highest figure, both are recorded as 1. The second and third columns of Table 6.7 compares the means between each pair of treatment. As indicated by the table, the mean of the rank of treatment 3 is significantly higher than that of treatment 1 and treatment 2. In other words, subjects on average value the benefit of being able to reduce the outstanding mortgage more than the benefit of being able to purchase a more expensive home. This result is consistent with the Binomial test performed previously. Thus it can be concluded that the benefit of being able to reduce the outstanding mortgage has a perceived value which is significantly higher than the perceived values of the other benefits.

6.2 Determinants of the perceived value

As illustrated in Section 5.2.1, Heckman's two-stage regression is adopted to determine the factors that explain the heterogeneity among the perceived value. Table 6.8 presents the results of each stage. The first stage, that is the selection equation, is estimated by maximum likelihood as an independent probit model to determine the decision to select the option using information from all subjects. The first column shows the result. The second stage, that is the regression equation, performs a regression with the estimated expected error (inverse Mills ratios) included as an additional explanatory variable. This additional variable is denoted as LAMBDA. The second column of Table 6.8 presents the result of the full regression model where all the factors that are hypothesised to affect individual's willingness to pay are incorporated. Furthermore, as illustrated in Section 5.2.2, the backward selection is used where the variable that is the least significant is removed at each step until no nonsignificant variable remains. The result is shown in the third column.

From the third column of Table 6.8 we observe that the factors that are statistically significant are Treatment Indicator 3, Treatment Indicator 4, Indicator of preferring a \$500,000 over a \$300,000 home, likelihood of choose investment profile under the treatment setting, perception about financial planning, perception on home ownership, gender and LAMBDA. From the table we observe that for all subjects, the value elicited under treatment 3 and treatment 4 are statistically higher than the average. In particular, the

amount subjects are willing to give in exchange for \$30,000 to reduce their outstanding mortgage (T3) is \$1,761 higher on average with a significance level of 0.004. Moreover, the amount subjects are willing to give in exchange for \$30,000 to purchase a home instead of keep renting is \$1,331 higher on average with a significance level of 0.030. As expected, people who indicate that they would prefer a \$500,000 home over a \$700,000 in case they have enough savings for the down payment for either home has a statistically significant lower value in comparison with the others. Both Likelihood_T and Likelihood_T*Treatment are variables of statistical significance. This indicates for subjects in the control group, one unit increase in their general likelihood of making changes increase the value by \$681. This implies that an increase in the level of involvement with superannuation will result in a higher perceived value of the option of suing superannuation for housing purpose. Moreover, for individuals in the treatment group, one unit increase in their general likelihood of making changes decrease the value by \$350. Furthermore, for subjects who indicate that they want to select their own investment profile in the treatment group, the elicited value is \$2,427 higher than those who are in the control groups. In addition to the level of superannuation involvement, the variable financial planning is also another significant determinants. This means for those individuals who have poor financial planning, the values elicited from them are \$729 lower. A greater perceived value placed on home ownership is shown to increase the value by \$639. This result is also within expectation, considering that individuals who value home ownership should be more willing to forgo a higher amount to exchange for additional cash from their superannuation account for housing purpose. As indicated by the table, another interesting result is that the average amount male are willing to give up is \$965 lower than female. This is consistent with the existing literature indicating that men are typically more overconfident than women. (e.g., Bengtsson et al., 2005; Barber and Odean, 2001; and Huang and Kisgen, 2013). Given the over-confidence of males, they are more inclined to believe that they are able to purchase a family home using personal savings as opposed to withdraw money from their superannuation, which justifies a lower value assigned by male.

As mentioned in Section 6.1, the option of using superannuation savings for the down payment of a family home has three potential benefits, whose perceived value are elicited under four treatments. Although, for each individual, the perceived value they place on each treatment differs, it is the highest amount they are willing to pay represent the perceived value of using superannuation for housing purpose. The fourth and fifth column

of Table 6.8 presents a full regression and a reduced regression model for the highest perceived value amounts. Heckman's two-stage regression is not required for the highest payment data because they are non censored. As one can tell from Table 6.8, similar to the model on full subjects, both variables *Prefer_500K* and *Likelihood_T*Treatment* are determinants of statistical significance. As expected, people who indicate that they would prefer a \$500,000 home over a \$700,000 in case they have enough savings for the down payment for either home has a statistically significant lower value in comparison with the others. For individuals in the treatment group, one unit increase in their general likelihood of making changes will result in a reduction of the value by \$476. Unlike the model on full subjects, a regression analysis on the highest payment results in two other new factors that are not statistically significant in the previous full sample model. The first variable is *Order*. That is, if the order of the treatment increase by 1, the elicited value will increase by \$1,149. *Order* effect being significant in the highest amount regression could be a result of learning. Whereas in earlier treatments subjects might stick to the center of the multiple price list, in later they deviate more from this median. Therefore, when the maximum is obtained in a later round, it is more likely to be higher. The second variable is *numeracy*. That is, when determining the highest amount they are willing to forgo for the option of using superannuation for purchasing a family home, individuals who are better with numbers tend to assign a higher amount.

Table 6.8: Heckman's two-stage model on perceived values

	All subjects			Highest Payment	
	Selection	Full	Reduced	Full	Reduced
Constant	4.174	28,459	28,177	31,580	29,328
	0.008	.000	.000	.000	.000
Control_Group_1	4.035	-3,904		-5,341	
	0.091	.293		.404	
Control_Group_2	3.204	-5,827		-6,146	
	.157	.095		.327	
Order	-.345	-67		1,192	1,149
	.010	.822		.015	.005
T1	-.203	-314		-1,014	
	.608	.669		.414	
T2	-.102				
	.806				

continued on next page

	All subjects			Highest Payment	
	Selection	Full	Reduced	Full	Reduced
T3	.175	1,752	1,761	-758	
	.681	.016	.004	.490	
T4		1,198	1,331	822	
		.092	.030	.461	
Prefer_500K	-.172	-2,030	-2,225	-2,837	-2,274
	.674	.006	.000	.060	.038
Prefer_300K	-.934	-2,419		-287	
	.071	.064		.886	
Certainty	.854	612		529	
	.010	.375		.634	
Select_contribution	-.398	-485		-959	
	.587	.629		.627	
Select_profile	.657	2,687		3,054	
	.417	.047		.225	
Select_contribution*Treatment	.359	912		595	
	.688	.497		.821	
Select_profile*Treatment	-1.115	-3,377		-2,137	
	.264	.055		.497	
Likelihood_T	-.672	1,253	681	1,997	
	.097	.031	.020	.051	
Contribute_T	.467	-503		-3,746	
	.466	.639		.070	
Investment_T	.251	654		-1,780	
	.782	.613		.485	
Likelihood_T*Treatment	.902	-1,894	-1,031	-2,921	-476
	.055	.018	.000	.035	.040
Contribute_T*Treatment	-.638	527		3,204	
	.421	.707		.232	
Investment_T*Treatment	1.003	2,863	2,472	4,164	
	.347	.123	.009	.207	
Comprehension	-.395	98		740	
	.191	.831		.397	
Financial_Literacy	.212	382		-466	
	.359	.412		.570	
Numeracy	-.133	13		1,090	1,095

continued on next page

	All subjects			Highest Payment	
	Selection	Full	Reduced	Full	Reduced
Institutional Knowledge	.560	.976		.186	.090
	-.098	376		593	
	.654	.305		.390	
Risk Preference	-.053	-.247		-.310	
	.613	.179		.354	
Time Preference	-.021	-.96		-.112	
	.808	.504		.688	
Financial Plan	-.203	-.571	-.729	-.717	
	.219	.072	.006	.202	
Consumption	-.184	21		347	
	.308	.946		.543	
Super	-.029	255		324	
	.869	.406		.588	
Housing	-.020	689	639	437	
	.916	0.024	0.015	0.463	
Mortgage	.034	-.340		1	
	.834	.222		.162	
Expected Salary	.000	0		0	
	.313	.511		.907	
Gender	-.313	-1,544	-.965	-1,626	
	.384	.014	.062	.185	
Age	-.042	3		-.13	
	.277	.964		.919	
Super member	-.716	-1,234		-1,022	
	.059	.106		.401	
LAMBDA		1,418	629		
		.052	.034		

The table compares regression results for all subjects data and the highest payment data. control group 1 is an indicator variable which takes the value 1 if the individual is in control group 1 and 0 if the individual is not in control group 2. Similarly, the variable control group 2 takes 1 is the subject is in control group 2, otherwise the value is 0. Order variable records the order of the treatment displayed. It is a variable takes values from 1 to 4, where 1 indicates the treatment is the first one displayed, 2 indicates the second, 3 the third and 4 the forth. T1 is an indicator variables which takes the value 1 if the amount elicited is under the setting of treatment 1, otherwise, the value is 0. Similar to T1, variables T2, T3 and T4 are all indicator variables which are assigned to be 1 if the value recorded is under the corresponding treatment and 0 otherwise. Prefer.500K is an indicator variable which

takes the value 1 if the individual indicates he or she prefers a \$500,000 home to a \$700,000 home. If not, the variable is set to be 0. Similar to *Prefer_500k*, the variable *Prefer_300k* takes the value 1 if the subject shows an indication of preference of a \$300,000 home over a \$500,000 home. *Certainty* is a variable which takes the value 1 if the subject states that he is absolutely certain about the amount he selects to forgo from the superannuation account in exchange for \$30,000. The variable is 0 if the subject states that he is only probably certain about his decision. The variable *Select_contribution* takes the value of 1 if the subject click on the option button on contribution under either the current setting or the treatment setting. If not, the value is 0. Similarly, the variable *Select_profile* takes the value of 1 if any of the 5 option buttons on investment profile is selected. *Likelihood.T* is a variable which records the response to the question *How likely do you think you will fill in the voluntary contribution application form or the member investment choice form provided by the HR officer allowing you to make voluntary contributions or choose an alternative investment portfolio?* under the treatment setting, where 1 represents very unlikely, 2 represents unlikely, 3 represents undecided, 4 represents likely and 5 represents very likely. *Contribute.T* and *Investment.T* are two variables recording the responses to the contribution decision question and the investment profile decision under the treatment setting. For those two variables, 1 mean that the individual wants to make voluntary contribution and select the investment profile respectively. For those individuals who indicate they want to stay with the defaults, the value is set to be 0. Variables *Comprehension*, *Financial_Literacy*, *Numeracy*, and *Institutional Knowledge* are the number of correct answers of the corresponding test. Risk preference are the coded responses recorded to the question: *How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?*, where "0" refers to "not at all willing" and "10" to "very willing". Similarly, time preference are the coded responses recorded to the questions *Are you generally an impatient person, or someone who always shows great patience?* with "0" referring to "very impatient" and "10" to "very patient". *Financial Plan*, *Consumption*, *Super*, *Housing* and *Mortgage* are variables obtained from the factor analysis. *Expected salary* is the amount entered by each individual regarding their expected salary 5 years after graduation. *Gender* is an indicator variable which takes the value 1 if the subject is male and 0 if the subject is female. *Age* is a variable entered by the subject themselves which specifies their current age. The variable *Super member* takes the value 1 if the subject is a member of an superannuation fund and 0 if the individual does not have an superannuation account. *LAMBDA* is the variable calculated from the selection model of the Heckman's two-stage regression analysis.

6.3 Impact on the involvement with superannuation

This section investigates the impact of the option which allows subjects to use superannuation for housing purpose on individual's involvement with superannuation. The data shows that the number of people who are willing to make voluntary contributions increase from 58 to 76 after being offered the option of using superannuation for housing. This include 11 individuals who previously choose to stick with the default contribution level but indicate they are willing to make voluntary contribution after given the option of using

superannuation for the down payment of their family home.

Table 6.9 presents result of Heckman's two-stage model on the level of contribution and the selection of investment profile. The first three columns represent the analysis on the level of contribution, where the first and second column correspond to the first stage (selection model) and second stage (regression model) of the Heckman's two-stage regression model. The third column is the reduced model for the second stage regression where only statistically significant factors are included. In this case, the first stage regression provides the likelihood of contributing more and the second stage regression provides the information on how much more individuals are willing to contribute. From the reduced model of the table, we observe that the variable *Lafter* is statistically significant with a significance level of 0.001. This indicates that being given the option of using superannuation for purchasing a family home will increase the level of voluntary contribution by 1.45% on average. Moreover, the variable *Investment* is also significant with a positive coefficient of 2.83. This means that for individuals who indicate they are willing to choose their investment profile under the treatment setting, their level of contribution is on average 2.83% higher than those who choose to stay with the balanced investment profile. Other factors that are significant include *Ffinancial_Literacy*, *Numeracy*, *Financial Plan*, *Housing*. Thus, we can conclude that the more advanced financial literacy skill, numeracy skill and financial planning skill the subject possess, the higher is the level of his or her contribution. Furthermore, a higher perceived value on home ownership will also result in an increase in voluntary contribution. This is as expected given that the subjects are told that the contributions can be withdrawn later on for the purpose of housing. Finally, the result also shows that the younger the individual, the higher his or her level of contribution will be.

Column four to column six of Table 6.9 present the result to a Heckman's two-stage regression analysis on the selection of investment profile. The fourth and fifth column correspond to the first stage (selection model) and second stage (regression model) of the Heckman's two-stage regression model. The sixth column is the reduced model for the second stage regression where only statistically significant factors are included. In this case, the first stage regression provides the likelihood of select one's own investment profile and the second stage regression provides the information on what type of investment profile individuals are willing to select. From the reduced model of the table, we observe that

age not only has a significant impact on the level of contribution, but also the selection of investment profile. In particular, the younger the individual is, the more likely he or she will select a risky investment profile.

Table 6.9: Heckman's two-stage model on contribution and investment profiles

	Level of contribution			Selection of investment profile		
	Selection	Full	Reduced	Selection	Full	Reduced
Constant	-7.966	-16.39	-13.59	-5.866		
	0.000	.004	.000	0.069		
Prefer_500K	1.779	0.88	-2,224.56	0.121	-.608	-.708
	0.004	.359	.000	0.851	.025	.002
Prefer_300K	-1.756	-2.20		-1.573	-.653	
	.046	.087		.096	.089	
Select_contribution	.891	-0.36		2.053	.612	.590
	.107	.708		.002	.023	.013
Select_profile	-1.656	-1.14		2.613	.361	
	.032	.311		.001	.302	
Likelihood	1.015	2.21	1.76	.139	-.299	-.252
	.002	0.000	0.000	.708	.033	.035
Contribution				.878	-.033	
				.177	.899	
I_{after}	.237	1.45	1.45	.419	.074	
	.587	.008	.006	.404	.704	
Investment	.939	4.20	2.83			
	.133	.000	.001			
Understanding	.154	0.24		.196	.105	
	.740	.692		.725	.608	
Comprehension	.923	-0.02		-.079	.063	
	.024	.976		.876	.724	
Financial_Literacy	.101	1.20	1.10	.259	-.033	
	.777	.009	.006	.548	.841	
Numeracy	.900	1.37	0.98	-.062	-.214	
	.026	.019	.043	.901	.205	
Institutional Knowledge	.138	-0.48		-.145	-.015	
	.664	.212		.718	.912	
Risk Preference	.466	0.08		.390	.423	.411
	.003	.725		.039	.000	.000
Time Preference	0.066	0.65	0.58	0.296	.000	

continued on next page

	Level of contribution			Selection of investment profile		
	Selection	Full	Reduced	Selection	Full	Reduced
Financial Plan	.634	.000	.000	.087	.996	
	.456	0.64	0.65	.074	.085	
	.055	.058	.030	.794	.426	
Consumption	.580	0.54		.272	-.191	-.209
	.021	.115		.359	.075	.023
	-.097	-0.23		.694	-.022	
Super	.730	.454		.106	.841	
	.748	0.76	0.63	.038	-.047	
	.011	.091	.054	.927	.716	
Mortgage	.092	0.24		.051	-.185	-.166
	.688	.380		.873	.073	.083
	0.000	0.00		0.000	0.00	
Expected Salary	.907	.687		.281	.988	
	-.428	-0.87		1.365	.653	.481
	.403	.170		.057	.003	.014
Gender	-.155	-0.18	-0.14	-.083	-.066	-.069
	.020	.058	.044	.349	.026	.008
	-.289	-0.31		-.494	-.384	
Super member	.561	.653		.433	.099	
		1.33	1.08			
		.000	.000			
μ_1					-1.691	-1.571
					.073	.033
					-.471	-.384
μ_2					.614	.597
					.021	.097
					.982	.893
μ_3					1.738	1.741
					.064	.018
μ_4						

The table comprises Heckman's two-stage regression analysis on both the level of contribution and the selection of investment profile. The first three columns represent the analysis on the level of contribution, while the remaining three columns present the results to the regression analysis on the investment profile. L after is an indicator variable which takes the value of 1 if the contribution is made after treatment and 0 if the contribution is before treatment for the analysis on the level of contribution. When analysing the selection of investment profile (that is, the last three columns), the first stage of Heckman's two-stage model is used to determine the probability of selection. This is followed by an ordered probit model where

the likelihood of the selection of the five investment profiles is modeled. A reduced regression model is also included showing variables which are statistically significant. See footnote of Table 6.8 for the definition of other variables.

Figure 6.2 shows the cumulative distribution function of the level of contributions under the current and the treatment setting. As one can see from the figure, there is a stochastic dominance of the level of contribution under the treatment setting. That is, the cumulative distribution function of the level of contribution under the treatment setting is less than or equal to that under the current setting for all level of contribution. Thus, we can conclude that having access to the option of using superannuation for purchasing a family home increases the level of voluntary contribution as a percentage of salary.

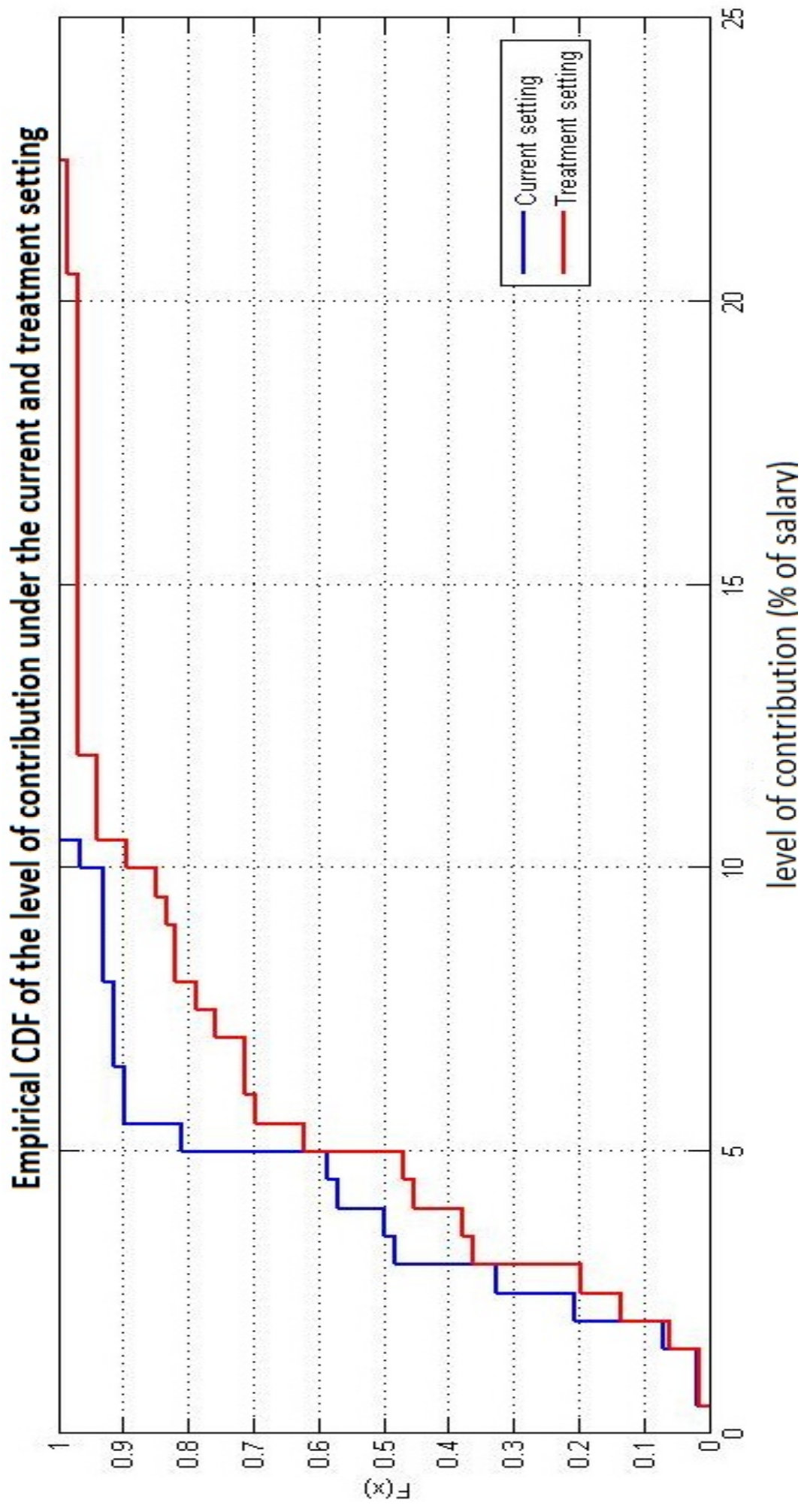


Figure 6.2: of the level of contributions under the current and treatment setting

In conclusion, it is found that most subjects do value the option of using superannuation to finance their family home (half of the subjects values using \$30,000 from the superannuation account for the purchase of a family home at \$2,751, 30% of the subject values it \$5,000 and 10% values it at \$10,000). This indicated that subjects are liquidity constraint and are willing to forgo substantial amounts of money in order to ease this. The subjects value using superannuation to finance their family home more for reducing the outstanding mortgage amount and earlier purchasing a family home than for purchasing a more expensive family home. This implies that the subjects, in general, do not use the additional liquidity provided by using superannuation to finance their family home to consume more housing (e.g. purchase a more expensive home) but they use it to earlier have access to the housing market or to be more prudent. This indicates that the allowing people to use superannuation for housing would ease the constraints due to the unaffordable housing market.

Subjects in the experiment do value the commitment feature of the superannuation saving plan. Using a between subject analysis, emphasizing the commitment feature increases voluntary contribution levels by, on average, 0.76%. The option to use superannuation savings for purchasing a family home increases the engagement with superannuation. This results in, on average, a 1.45% higher voluntary contribution level.

The findings suggest that using superannuation for purchasing a family home could potentially increase involvement with superannuation, and ease the financial constraints for first home buyers without leading to individuals purchasing more expensive houses.

6.4 Escalation option

As illustrated in Section 4.1.5, all subjects are randomly presented with an escalation option with or without the emphasis on voluntary contribution's potential benefit of being a commitment device. As one can tell from Table 6.10, among all subjects, 75 subjects are presented with the option with the statement on commitment device, while the remaining 68 are presented with the option without the statement.

An independent sample t test is conducted to assess whether there is a significant change in the mean between the two groups. Table 6.11 summarises the results from the test. As one can see from the table, the mean of the contribution level for the group with the extra

Table 6.10: Results of the escalation option

	No of subjects	Average contribution
Option with the statement	75	10
Willing to contribute more	60	12
Stay with the default contribution	15	0
Option without the statement	68	9
Willing to contribute more	52	11
Stay with the default contribution	16	0
Full sample	143	9

The table presents the number of subjects that are presented with an escalation option with or without the statement on commitment device. It also displays within each group, the number of subjects who indicate they are willing to opt for this escalation option and the level of their average contribution.

wording on automatic saving is 0.96 higher than that of the group without the wording. This difference in mean is almost statistically significant at a 10% level.

Table 6.11: Escalation option independent sample *t* test

	Mean Difference	<i>t</i> -stat	Sig. (1-tailed)
Contribute	-.0353	-.508	.306
Contribution_level	.9579	1.141	.128

The table compares the mean of the Contribute variable of the group with the statement against that of the group without the statement. The mean of the level of contribution are also compared between these two groups. The table also presents the *t*-statistic with its corresponding level of significance.

Furthermore, a median test is also performed to assess whether the median of the contribution level between the two groups is significantly different. The median test results in a chi-square test statistics of 2.599 with a significance level 0.107. Similar to the means test, the difference between median is almost significant at a 10% significance level.

Table 6.12 presents result of Heckman's two-stage model on the level of contribution of the escalation option. From the reduced model of the table, we observe that the variable With Statement is statistically significant with a significance level of 0.007. This indicates that if the question highlights voluntary contributions as a method to save automatically, subjects will become more inclined to make additional contributions. Their level of contribution will increase by 0.760% on average compared to the subjects who are not presented with the statement.

Table 6.12: Heckman's two-stage regression for contribution level of the escalation option

	All subjects		
	Selection	Full	Reduced
Constant	-2.930	8.726	10.448
	.334	.000	.000
Control_Group_1	32.897	-.790	
	.998	.739	
Control_Group_2	31.499	-.583	
	.998	.797	
With Statement	.124	.661	.760
	.860	.047	.007
Prefer_500K	1.709	.853	
	.066	.068	
Prefer_300K	-3.403	-1.165	
	.005	.137	
Certainty	-1.014	-.199	
	.126	.609	
Select_contribution	1.365	1.196	
	.271	.052	
Select_profile	-2.370	-1.354	-.717
	.356	.070	.069
Select_contribution*Treatment	-1.510	-1.197	
	.335	.148	
Select_profile*Treatment	4.161	1.206	
	.136	.279	
Likelihood_T	-2.151	.412	.361
	.055	.197	.041
Contribute_T	3.153	1.886	1.837
	.017	.012	.002
Investment_T	-22.647	-1.895	-1.602
	.998	.021	.008
Likelihood_T*Treatment	2.843	-.317	
	.020	.501	
Contribute_T*Treatment	-3.778	-1.646	-1.710
	.024	.071	.009
Investment_T*Treatment	21.813	1.991	1.758
	.998	.043	.006
Comprehension	.127	-.341	-.411

continued on next page

	All subjects		
	Selection	Full	Reduced
Financial Literacy	.830	.181	.069
	.195	.328	
Numeracy	.712	.188	
	.389	.078	
Institutional Knowledge	.431	.744	
	-.242	-.241	
Risk Preference	.573	.246	
	.738	.429	.287
Time Preference	.003	.002	.006
	-.288	.051	
Financial Plan	.152	.597	
	.005	-.177	
Consumption	.989	.323	
	.778	.001	
Super	.029	.995	
	-.497	-.081	
Housing	.192	.638	
	.274	-.107	
Mortgage	.431	.575	
	.221	-.431	-.424
Expected Salary	.511	.016	.005
	.000	0.00	
Gender	.766	.954	
	1.454	1.263	1.337
Age	.062	.003	.000
	-.073	-.071	-.077
Super member	.326	.099	.037
	-.610	.073	
LAMBDA	.360	.849	
		.174	.001
		.377	.993

The table comprises Heckman's two-stage regression analysis on the level of contribution under the escalation option. The first and second column correspond to the first stage (selection model) and second stage (regression model) of the Heckman's two-stage regression model respectively. The third column is the reduced model of the second stage regression where only statistically significant factors are included. With Statement is an indicator

variable which takes the value of 1 if the individual is presented with the statement on commitment device and 0 if the question presented to him does not have the statement. See footnote of Table 6.8 for the definition of other variables.

6.5 Comparison with the control groups

As mentioned in Section 4.1.5, participants will be split into two groups (treatment and control), where the control group will be subdivided into another two groups (Control group 1 and 2). Control group 1 will not undertake Task 1, while the treatment group will undertake all three tasks. Comparing these two groups allows to check how previously answering questions on the involvement effects the involvement questions in the hypothetical scenario. Moreover, Control group 2 will undertake Task 3 instead of Task 1. Comparing these two groups allows to check how some experience with the option effects the involvement questions in the hypothetical scenario.

As mentioned in Section 4.1.1, three questions are asked to elicit the superannuation involvement. The first question aims to assess the general likelihood of an individual to deviate from the default contribution or investment choice. The second and third question explicitly ask subjects to make contribution and investment decisions respectively. See Section 4.1.1 for the exact wording of the three questions.

Table 6.13 compares the mean of responses to each question between the treatment group and two control groups using the independent samples t test. As indicated by the table, there is no statistically significant evidence to suggest that the means of the treatment group are different to those of the Control group 1. In other words, previously answering questions on the involvement does not effect the involvement questions in the hypothetical scenario. Similar to the result to the comparison between the treatment group and Control group 1, no statistically significant difference between the means of the treatment group and Control group 2 is found. In conclusion, there is no statistically significant evidence to suggest that some experience with the option effects the involvement questions in the hypothetical scenario.

Table 6.13: Comparison between treatment group and control groups

	Treatment - Control Group 1			Treatment - Control Group 2		
	Mean Difference	<i>t</i> -stat	Sig. (1-tailed)	Mean Difference	<i>t</i> -stat	Sig. (1-tailed)
Likelihood	-.1183	-.608	.272	-.1089	-.535	.297
Contribute	-.0524	-.552	.291	-.0133	-.132	.448
Investment	-.0706	-.884	.190	-.0222	-.252	.401

The first three columns of the table compare the mean of the response to the general likelihood question, contribution contribution and investment question (see Section 4.1.1 for the exact wording of the three questions) between the treatment group and control group 1. It also displays the corresponding *t*-statistic and the level of significance. The last three columns compare the same thing between the treatment group and control group 2. Both control groups did not do Task 1 “super decisions current regulations”, Control group 1 did do Task 3 “super decisions treatment setting” after Task 2 “determine the perceived value”, Control group 2 did do Task 3 “super decisions treatment setting” before Task 2 “determine the perceived value”.

CHAPTER 7

CONCLUSION

7.1 Contributions of thesis

There has been a number of studies dedicated to understanding and finding the optimal portfolio choice and the role housing plays over one's life-cycle. Yang (2009) concludes that once agents have accumulated enough for a down payment of the house and most uncertainty in income has been revealed, they intend to choose to purchase their family home. The same conclusion has also been reached by Cocco (2000), and it is shown that house values significantly exceed the value of liquid assets for young individuals. On the other hand, young people are usually subject to liquidity constraints (Cocco et al., 2005). Cocco et al. (2005) simulate the consumption, income and wealth profiles of 10,000 agents over the life-cycle, and conclude that households are subject to liquidity constraint during, approximately, the first 15 years of their working life. The article also finds that by factoring in the endogenous borrowing constraints, an individual would borrow up to USD 5,000 on average. Bovenberg et al. (2007) also find that it is recommended to borrow to acquire the risk bearing assets at the beginning of one's career in order to obtain the optimal risk exposure. However, because of the high borrowing rate, normally at around 6 per cent, and the lack of wealth accumulation early in the life-cycle, individuals are anticipated to reach retirement with limited wealth (Cocco et al., 2005). To conclude,

there is mixed evidence on the desire to purchase a house early in the life-cycle, while risk aversion and labour income dynamics would play an important role in housing decisions. Moreover, the life-cycle model also suggests that young people are normally liquidity constrained, which would add potential value to the option of using superannuation to purchase a family home.

Moreover, quite a few papers have also investigated the negative externalities that can result from enacting defaults and the possible methods to increase decision making in pension funds (e.g. Agnew, 2013; Choi et al., 2002). For example, according to Agnew (2013), defaults can be an effective tool for guiding savings and investment behaviour, however, defaults that are not designed properly could lead to suboptimal investment choices. For example, default contributions to company stock may lead to insufficient diversification (Choi et al., 2002). Evidence also suggests that active decision-making needs to be encouraged due to the fact that the population is highly heterogeneous and demonstrates a strong propensity to procrastinate (Agnew, 2013). In conclusion, prior research documents the numerous potential pitfalls associated with poorly designed default strategies, and methods could be used to increase active decision making on superannuation investment. However, assuming individuals are now allowed to use superannuation to purchase a family home, there is still room for additional research related to optimal default design and methods to encourage superannuation engagement despite the existence of defaults.

My thesis investigates the option of using superannuation to purchase a family home. As discussed above, while housing wealth and optimal portfolio choice are important issues, and there has been many prior studies examining the optimal asset allocation strategy and the possible methods to increase individual's involvement in pension fund decision making (e.g. Cocco et al., 2005; Kraft and Munk, 2011; Yang, 2009), there has been no studies examining the investment option of using superannuation to finance the purchase of a family home and the potential increase in superannuation engagement as a result of having the option. This project addresses the gap in the literature by conducting a lab experiment to determine the perceived value of using superannuation to purchase a family home and the factors that determine heterogeneity among individuals while they weighing-up between superannuation and housing wealth. Overall, in terms of the perceived value of using superannuation for purchasing a family home, it is found that subjects place the highest value on the benefit of being able to reduce the outstanding mortgage. This is followed by

the benefit of being able to purchase a family home. Subjects value the benefit of being able to purchase a more expensive home the least. Moreover, the results also show that participants are inclined to increase their level of voluntary contribution if superannuation assets are allowed to finance the purchase of a family home. The main insights this thesis provides with regards to the regulatory framework are the following. First, superannuation members might benefit from easing their liquidity constraint by allowing them to use superannuation for purchasing a family home. Generally, superannuation member would use it for intended purposes, e.g. to have earlier access to the housing market or to decrease their loan-to-value ratio of their mortgage. Only few superannuation members would use it to purchase a more expensive family home. Furthermore, allowing superannuation to be used to finance a family home increases involvement with superannuation and voluntary contribution levels. Therefore, allowing superannuation to be used for purchasing a family home might, in the long run, have a positive influence on the superannuation savings pool. Finally, it is shown that subjects value the commitment device which is inherent to superannuation savings.

7.2 Limitations of research and area for further research

Since this experiment is conducted with university students who voluntarily choose to participate, one potential limitation is that this particular subject pool may systematically produce biased results compared with a subject pool that is comprised of the general population. Further research could involve conducting an online experiment with subjects around age of first buying a family home who are faced with financial pressure. Those individuals would provide a better insight in the perceived value of the option of using superannuation for purchasing a family home as they face (when they would like to purchase their first family home) or just faced (when they have bought their first family home) the financial burden of purchasing a first family home in the unaffordable housing market in Sydney. However, since those subjects already would have substantial experience with superannuation, it is difficult to test whether the option of using superannuation to finance a first family home would have increased their involvement with superannuation at the beginning of their employment.

APPENDIX A

EXPERIMENT HANDOUT

Task 1

Not Assessed for
Payment

Two sets of questions:

1. A series of long term financial decisions (additional information)
2. 3 short questions that aim to test your ability to recall and understand the information provided to you.
 - 60 seconds
 - 2 questions will be selected and you will be paid:
 - \$2 for every correct answer,
 - while **losing \$2 for every wrong answer.**
 - You will not be penalized if you fill in don't know.
 - The minimum payment you will get is \$0.

Please note the three questions at the end which your payment is dependent on **ONLY** assess the information I read out. The additional information provided in the questions will **NOT** be assessed for payment.

Background Information

Superannuation
(Super)

- Save for retirement
- Contributions:
 - compulsory contributions made by your employer
 - voluntary contributions made by you
- All the contributions are invested in a mixed of assets (known as investment portfolio). You are entitled to choose the investment portfolio (i.e. asset allocation) for your super savings.
- Restrictions on withdrawing: you are typically not allowed to withdraw until after age 60.



Imagine that you get your first job after graduation and now you need to set up your first superannuation account. On your first day you have a meeting with the HR department. The HR officer tells you that your remuneration includes mandatory superannuation contributions made by your employer. In addition to that, you can also make voluntary contributions into your superannuation account.

You can choose how your super savings are invested by selecting one of the following **five** diversified investment portfolios:

- Capital Stable
- Conservative Balanced
- Balanced
- Growth
- High Growth

Each with its own asset classes,
performance objectives and risk

If you don't select an investment portfolio for your super, your super savings will automatically be invested in the Balanced investment portfolio. The HR officer provides you with two forms:

- Voluntary contribution form: you can make additional voluntary contributions to your super account by filling in this form
- Investment choice form: you can choose your investment portfolio by filling in this form

The HR officer also provides you with some additional information on how voluntary savings might impact your retirement wealth, as well as the past investment performance and risk profile of the five investment portfolios. You will be able to find this information by clicking relevant buttons in the questions.

Task 2



After a number of years of hard work, you are thinking of purchasing your first family home. You have been saving for the initial payment of your family home during those years and you have accumulated a certain amount in your personal bank account.

You are told that:

- You need to pay 10% of the purchase price as the down payment.
- You can borrow the remaining 90% from a bank (mortgage amount).
- In addition to the down payment, there are other costs associated with buying a property, such as taxes, legal fees and insurance. These costs typically represent approximately 5% of the purchase price, and need to be paid along with your down payment as the **initial payment** (i.e. 15% of the purchase price)
- Total required savings are thus 15% of the purchase price.

Looking at the current housing market, you are wondering whether your personal savings are sufficient for the **initial payment** for your preferred family home. During the meeting with your mortgage banker, you are told that:

- a typical loan-to-value (LTV) ratio for first home buyers is 90%
- however, a loan-to-value (LTV) ratio of 80% is generally regarded as a safe mortgage by the bank, since you as a borrower are less likely to be left with residual debt after selling your home in case house prices drop

Now you are **presented with the option of using superannuation savings for the down payment for your first family home**. In other words, by exercising this option, you are allowed to withdraw money from your superannuation account **NOW** if you choose to use your superannuation savings to finance the **initial payment** for your first family home.








In the following task you will be placed under 4 different scenarios which looks at different benefits of having such option:

- Purchase a more expensive family home
- Reduce mortgage
- Purchase a family home earlier

For each scenario, depending on how much value you think such an option is worth given the particular benefit, you need to think about the amount you are willing to give up in your superannuation account for you to exercise the option.

Your payment for this task depends on the net value of your assets 5 years after you purchased your first family home under one of the scenarios. The net value of your assets is determined by:

- Value of your family home
- Superannuation account balance
- Outstanding mortgage and
- Any rent saved/mortgage payment made

Property value	Financial requirements	Typical fortnightly mortgage repayment (interest only)	Sutherland (30 km away from City) Approx. 60 minutes train ride to city	Wolli Creek (8 km away from City) Approx. 30 minutes travel time to city	City
\$700,000	Minimal payments: \$105,000 - Down payment (10% of the property value): \$70,000 - Additional costs (5% of the property value): \$35,000	\$1,280	House with 3 beds, 2 baths, 2 parking 	Apartment with 2 beds, 2 baths, 1 parking 	Apartment with 1 bed, 1 bath, 1 parking 
\$500,000	Minimal payments: \$75,000 - Down payment (10% of the property value): \$50,000 - Additional costs (5% of the property value): \$25,000	\$914	Apartment with 2 beds, 1 bath, 1 parking 	Unit with 1 bed, 1 bath, 1 parking 	No properties available for this price in this area of Sydney
\$300,000	Minimal payments: \$45,000 - Down payment (10% of the property value): \$30,000 - Additional costs (5% of the property value): \$15,000	\$549	Unit with 1 bed, 1 bath, 1 parking 	No properties available for this price in this area of Sydney	

Task 3

Under task 3, you will be asked similar questions as those in task 1. The only difference is that in the next set of questions you are placed in a setting where you are **given the option of using superannuation savings to pay for the down payment of your first family home.**

Task 1 setting:

- **ONLY** for retirement (cannot withdraw the money before 60)

Task 3 setting:

- for retirement (cannot withdraw the money before 60)

AND

- for first family home (can withdraw anytime)

Same as task 1, imagine that on your first day at your first job, the HR officer provides you with the voluntary contribution form and the investment choice form. They also provide you with some additional information on how voluntary savings might impact your retirement wealth, as well as the past investment performance and risk profile of the five investment portfolios. You will find those pieces of information by clicking the button provided in some of the questions below.

APPENDIX B

EXPERIMENT SCRIPT

Script (Treatment group)

Task 1

In the following task you will be presented with two sets of questions.

The first set of question requires you to make a series of long term financial decisions. Some of the questions also provide you with additional information . You will find those information by clicking the buttons in those questions.

The second set contains 3 short questions that aim to test you on your ability to recall and understand the information provided to you just in a minute. Those three question needs to be answered within 60 seconds. Out of the three questions, 2 questions will be selected and you will be paid \$2 for every correct answer, while **losing \$2 for every wrong answer**. You will not be penalized if you fill in don't know, and the minimum payment you will get is \$0 (so there is no negative payment). Your payment for this task **ONLY** depends on the answers you give to those three questions.

Now, I will read out the background information. Please note the three questions at the end which **your payment is dependent on only assess the information I read out. Those additional information provided in the questions will NOT be assessed for payment.**

Background Information

Superannuation is a way to save for your retirement. This is, in part, compulsory. Normally, you will be automatically enrolled in a super fund once you start working. Your employer is legally required to contribute a compulsory percentage of your salary on your behalf, each time you get paid, into a super fund. Moreover, you can also save additional amounts in your super account by making voluntary contributions. Thus, your contributions to your super account consist of voluntary contributions made by you and compulsory contributions made by your employer.

All the contributions including both voluntary and compulsory contributions are invested in a diverse mix of assets, such as cash, bonds and shares. You are entitled to choose the investment for your super savings.

There are restrictions on withdrawing your money from super funds. You are typically not allowed to withdraw until after age 60, which is why super is usually referred to as a long-term investment for retirement.

In this task, you will be presented with questions relating to long term financial decisions at the commencement of your first job after graduation. You might be interested to know that the average starting salary is \$60,000 for UNSW undergraduate students and \$100,000 for UNSW postgraduate students.

Now, imagine that you get your first job after graduation and you need to set up your first superannuation account. On your first day you have a meeting with the HR department. The HR officer tells you that your remuneration includes mandatory superannuation contributions made by your employer. In addition to that, you are also told that you can choose how your super savings are invested by selecting one of the following **five** diversified investment portfolios, each with its own asset classes, performance objectives and risk profile. These five investment portfolios are known as: Capital Stable, Conservative Balanced, Balanced, Growth, and High Growth. **If you don't select an investment portfolio for your super, your super savings will automatically be invested in the Balanced investment portfolio**

The HR officer provides you with two forms: the voluntary contribution form and the investment choice form. You are told that you can use the voluntary contribution form to make additional voluntary contributions to your super account in addition to the mandatory minimum contribution made by your employer. The investment choice form allows you to choose your investment portfolio. The HR officer also provides you with some additional information on how voluntary savings might impact your retirement wealth, as well as the past investment performance and risk profile of the five investment portfolios. You will find those pieces of information by clicking the buttons provided in the questions.

Task 2

After number of years of hard work, you are thinking of purchasing your first family home. You have been saving during those years and you have accumulated a certain amount in your personal bank account.

You are told that you need to pay 10% of the purchase price as the down payment. You can borrow the remaining 90% from a bank. This is known as your mortgage amount. In addition to the down payment, there are other costs associated with buying a property, such as taxes, legal fees and insurance. These costs typically represent approximately 5% of the purchase price, and need to be paid along with your down payment as the initial payment. Your total required savings are thus 15% of the purchase price.

During your home hunting trip, you have gathered the following information:

If you look at the table provided, for a property worth \$700,000, normally you will be looking at a nice house in Sutherland, a two-room apartment in Wolli Creek or a one-room apartment in city. Similarly, for \$500,000, you will be looking at a two-room apartment in Sutherland or a one-room unit in Wolli Creek. There are no properties available for \$500,000 in city. Moreover, for \$300,000, you will be looking at a one-room unit in Sutherland, and there are no properties available for \$300,000 in Wolli Creek or city. For each property value, the table also summaries the corresponding initial payment as well as the typical fortnightly mortgage repayments amount.

Now, let's go back to the previous page.

Looking at the current housing market, you are wondering whether your personal savings are sufficient for the initial payment for your preferred family home. During the meeting with your mortgage banker, you are told that a typical loan-to-value (LTV) ratio for first home buyers is 90%. However, a loan-to-value (LTV) ratio of 80% is generally regarded as a safe mortgage by the bank, since you as a borrower are less likely to be left with residual debt after selling your home in case house prices drop

Now you are **presented with the option of using superannuation savings for the down payment for your first family home**. In other words, by exercising this option, you are allowed to withdraw money from your superannuation account **NOW** if you choose to use your superannuation savings to finance the **initial payment** for your first family home.

In the following task you will be placed under 4 different scenarios which looks at different benefits of having such option, that is being able to purchase a more expensive family home, reduce mortgage, and purchase a family home earlier.

For each scenario, depending on how much value you think such an option is worth given the particular benefit, you need to think about the amount you are willing to give up in your superannuation account for you to exercise the option.

Now if you look at the example on the screen.

The left column on the table is a list of amount to withdraw from your superannuation account.

Considering the case where you are faced with a shortage of \$30,000 for the initial payment for your first family home and you decide to finance this gap using your superannuation savings. If you click on choice A for the amount \$32,500. This indicates that you are willing to give up \$32,500 in your superannuation account in order to receive this additional \$30,000, this implies that you are willing to forego an additional \$2500 ($\$32,500 - \$30,000$) in order to use the option. In other words, being able to access your superannuation savings to supplement the financing of the property is worth \$2500 to you.

Now, if you click on choice A for the amount of \$27,500. This indicates you are willing to give up \$27,500 in your superannuation account in order to receive this additional \$30,000. This implies that keeping your superannuation savings in your super account instead of accessing it to supplement the financing of the property is worth \$2500 to you. In other words, you are only willing to exercise the option if you are paid \$2500.

Your payment for this task depends on the net value of your assets 5 years after you purchased your first family home under the chosen scenario. The net value of your assets is determined by the value of your family home, your superannuation account balance, outstanding mortgage and any rent saved or mortgage payment.

Task 3

Under task 3, you will be asked similar questions as those in task 1. The only difference is that in the next set of questions you are placed in a setting where you are **given the option of using superannuation savings to pay for the down payment of your first family home.**

In other words, in this setting, your superannuation savings not only serves as retirement savings which can only be withdrawn after you reach 60 years old, but also savings for your first family home which you can withdraw the money **anytime** if to finance the initial payment for your first family home.

Same as task 1, imagine that on your first day at your first job, the HR officer provides you with the voluntary contribution form and the investment choice form. They also provide you with some additional information on how voluntary savings might impact your retirement wealth, as well as the past investment performance and risk profile of the five investment portfolios. You will find those pieces of information by clicking the button provided in some of the questions below.

After this task, you will be asked some questions which assess your **general financial competence, numeracy skills as well as your baseline knowledge of the Australian superannuation system.**

APPENDIX C

JAVA AND HTML CODE TO RECORD
CLICK ON ADDITIONAL
INFORMATION ABOUT VOLUNTARY
CONTRIBUTION

Java code to record click on additional information about voluntary contribution

```
Qualtrics.SurveyEngine.addOnload(function()
{
    Qualtrics.SurveyEngine.setEmbeddedData("select0",0);

    this.hideNextButton();return true;

    this.hidePreviousButton();

});
```

HTML code to record click on additional information about voluntary contribution

```
<div style="display: none;"><input onclick="" type="text" value="" /></div>
```

```
<div id="Buttons"><input id="NextButton" name="NextButton"
onclick="Qualtrics.SurveyEngine.navClick(event, 'NextButton')" style="text-align: right;" title="Next"
type="submit" value=" &gt;&gt; " /></div>
```

```
<div style="display: none;"><input onclick="" type="text" value="" /></div>
```

```
<br />
```

Additional information about the voluntary contribution can be found by clicking the buttons below


```
<div id="New2" style="text-align: left;"><input id="1" onclick="$('divID6').toggle();
Qualtrics.SurveyEngine.setEmbeddedData('select0', 1);" type="button" value="Impact of voluntary
contribution on superannuation savings" /></div>
```

```
<div style="text-align: left;">&nbsp;</div>
```

```
<div style="text-align: left;">
```

```
<div id="divID6" style="text-align: left; display: none;"></div>
```

```
<div style="text-align: left;"><em style="color: rgb(0, 0, 0); font-family: arial, helvetica, sans-serif; font-
size: 12px;">Click once for the&nbsp;information to appear and twice to disappear again.</em></div>
```

```
</div>
```

APPENDIX D

JAVA AND HTML CODE TO RECORD
CLICK ON ADDITIONAL
INFORMATION ABOUT 5
INVESTMENT PROFILES

Java code to record click on additional information about 5 investment profiles

```
Qualtrics.SurveyEngine.addOnload(function()  
  
{Qualtrics.SurveyEngine.setEmbeddedData("select1",0);Qualtrics.SurveyEngine.setEmbeddedData("select2",0);Qualtrics.SurveyEngine.setEmbeddedData("select3",0);Qualtrics.SurveyEngine.setEmbeddedData("select4",0);Qualtrics.SurveyEngine.setEmbeddedData("select5",0);  
  
this.enableNextButton(); this.hidePreviousButton();});
```

HTML code to record click on additional information about 5 investment profiles

```
<div style="display: none;"><input onclick="" type="text" value="" /></div>  
  
<div id="Buttons"><input id="NextButton" name="NextButton"  
onclick="Qualtrics.SurveyEngine.navClick(event, 'NextButton')" title="Next" type="submit" value=" "></div><div style="display: none;"><input onclick="" type="text" value="" /></div>  
  
<p><br /><span style="font-size:16px;">Additional information about the premix choices can be found  
by clicking the buttons below</span></p>  
  
<p>&nbsp;</p><div style="text-align: left;">  
  
<div id="New2" style="text-align: left;"><input id="1" onclick="$('divID1').toggle();  
Qualtrics.SurveyEngine.setEmbeddedData('select1', 1);" type="button" value=" Capital stable " /><input  
id="2" onclick="$('divID2').toggle(); Qualtrics.SurveyEngine.setEmbeddedData('select2', 1);"  
type="button" value=" Conservative balanced " /><input id="3" onclick="$('divID3').toggle();  
Qualtrics.SurveyEngine.setEmbeddedData('select3', 1);" type="button" value=" Balanced " /><input  
id="4" onclick="$('divID4').toggle(); Qualtrics.SurveyEngine.setEmbeddedData('select4', 1);"  
type="button" value=" Growth " /><input id="5" onclick="$('divID5').toggle();  
Qualtrics.SurveyEngine.setEmbeddedData('select5', 1);" type="button" value=" High Growth " /></div>  
  
</div><div style="text-align: left;"><br />  
  
<em style="color: rgb(0, 0, 0); font-family: arial, helvetica, sans-serif; font-size: 12px;">Click once for the  
premix option information to appear and twice to disappear again.</em><em style="color: rgb(0,  
0, 0); font-family: arial, helvetica, sans-serif; font-size: 12px;">In case you click multiple options, they will  
be displayed below each other.</em></div>  
  
<div style="text-align: left; display: none;"><span style="font-size:16px;"><input onclick="" type="text"  
value="" /></span></div><div style="text-align: left;">&nbsp;</div>  
  
<div id="divID1" style="text-align: left; display: none;"></div><div style="text-  
align: left;">&nbsp;</div><div style="text-align: left; display: none;"><input onclick="" type="text"  
value="" /></div><div style="text-align: left;">&nbsp;</div>
```

<div id="divID2" style="text-align: left; display: none;"></div>

<div style="text-align: left;"> </div><div style="text-align: left; display: none;"><input onclick=""
type="text" value="" /></div><div style="text-align: left;"> </div>

<div id="divID3" style="text-align: left; display: none;"></div><div style="text-
align: left;"> </div><div style="text-align: left; display: none;"><input onclick="" type="text"
value="" /></div><div style="text-align: left;"> </div>

<div id="divID4" style="text-align: left; display: none;"></div><div style="text-
align: left;"> </div><div style="text-align: left; display: none;"><input onclick="" type="text"
value="" /></div><div style="text-align: left;"> </div>

<div id="divID5" style="text-align: left; display: none;"></div>

APPENDIX E

JAVA CODE TO ENABLE IMPL

Java code to enable automatic filling in the table

```
Qualtrics.SurveyEngine.addOnload(function()

{var T1h=1;Qualtrics.SurveyEngine.setEmbeddedData("T1h",T1h); var T1 = \${e://Field/T2h}" + 1 +
"\${e://Field/T3h}" + "\${e://Field/T4h}" };Qualtrics.SurveyEngine.setEmbeddedData("T1",T1);

var MPL1a = 1;Qualtrics.SurveyEngine.setEmbeddedData("MPL1a",MPL1a);this.questionclick =
function(event,element){

if((element.type == "radio" && element.id=="QR~QID100~1~1") )

    {this.setChoiceValue(1, 1, true);this.setChoiceValue(2, 2, true); this.setChoiceValue(3, 2, true);
this.setChoiceValue(4, 2, true); this.setChoiceValue(5, 2, true); this.setChoiceValue(6, 2, true);
this.setChoiceValue(7, 2, true); var MPL1a = 20000;
Qualtrics.SurveyEngine.setEmbeddedData("MPL1a",MPL1a);

var var1=20001; var var2=21000; var var3=22000; var var4=23000; var var5=24000; var var6=24999;

Qualtrics.SurveyEngine.setEmbeddedData("var1",var1);Qualtrics.SurveyEngine.setEmbeddedData("var2
",var2);Qualtrics.SurveyEngine.setEmbeddedData("var3",var3);Qualtrics.SurveyEngine.setEmbeddedDat
a("var4",var4);Qualtrics.SurveyEngine.setEmbeddedData("var5",var5);Qualtrics.SurveyEngine.setEmbed
dedData("var6",var6);}

Repeat the above code for all the other choices

Qualtrics.SurveyEngine.setEmbeddedData("var1",var1);Qualtrics.SurveyEngine.setEmbeddedData("var2
",var2);Qualtrics.SurveyEngine.setEmbeddedData("var3",var3);Qualtrics.SurveyEngine.setEmbeddedDat
a("var4",var4);Qualtrics.SurveyEngine.setEmbeddedData("var5",var5);Qualtrics.SurveyEngine.setEmbed
dedData("var6",var6); }

});
```

Java code to enable refining values

```
Qualtrics.SurveyEngine.addOnload(function()

{this.enablePreviousButton();var MPL1b = 1;
Qualtrics.SurveyEngine.setEmbeddedData("MPL1b",MPL1b); this.questionclick =
function(event,element)

{if((element.type == "radio" && element.id=="QR~QID118~1~1") )

    {this.setChoiceValue(1, 1, true); this.setChoiceValue(2, 2, true); this.setChoiceValue(3, 2, true);
this.setChoiceValue(4, 2, true); this.setChoiceValue(5, 2, true); this.setChoiceValue(6, 2, true);

var MPL1b = "\${e://Field/var1}"; Qualtrics.SurveyEngine.setEmbeddedData("MPL1b",MPL1b);}

Repeat the code for the remaining choices
```

BIBLIOGRAPHY

- Abadie, A. and Gay, S. (2006), ‘The Impact of Presumed Consent Legislation on Cadaveric Organ Donation: a Cross-Country Study’, *Journal of Health Economics* **25**, 599–620.
- ABS (1994-1995), Superannuation, Australia 1993, 1995, Cat. No.6319.0, Technical report, Australian Bureau of Statistics.
- ABS (2000-2013), Employee Earnings, Benefits and Trade Union Membership, Australia 1999-2013, Cat. No.6310.0, Technical report, Australian Bureau of Statistics.
- ABS (2001), Employee earnings, benefits and trade union membership, Technical report, Australian Bureau of Statistics (ABS).
- ABS (2009), Employment Arrangements, Retirement and Superannuation, Australia Apr to Jul 2007 (Re-Issue) Cat. No.6361.0, Technical report, Australian Bureau of Statistics.
- Agnew, J. (2013), ‘Defaults Matter: Lessons from the US Experience’, *RIPPA CEPAR Conference*.
- Agnew, J., Dalton, J. N., Bateman, H. and Thorp, S. (2013a), ‘Superannuation Knowledge and Plan Behaviour’, *JASSA* pp. 45–50.
- Agnew, J. R., Bateman, H. and Thorp, S. (2013b), ‘Financial literacy and retirement planning in Australia’, *Numeracy: Advancing Education in Quantitative Literacy* **6**, 1–25.

- Ameriks, J., Caplin, A. and Leahy, J. (2003), ‘Wealth Accumulation and the Propensity to Plan’, *Quarterly Journal of Economics* **68**, 1007–1047.
- Andersen, S., Harrison, G., Lau, M. and Rutstöm, E. (2009), ‘Elicitation Using Multiple Price List Formats’, *Experimental Economics* **12**, 365–366.
- APRA (2007), ‘Celebrating 10 Years of Superannuation Data Collection 1996 – 2006’ Insight, Technical report, Australian Prudential Regulation Authority (APRA).
- APRA (2014a), Annual Superannuation Bulletin, Technical report.
- APRA (2014b), Quarterly Superannuation Performance (interim edition), Technical report.
- ATO (2005), Superannuation Legislation Amendment (Choice of Superannuation Fund) Act 2004 – Revised Explanatory Memorandum, Technical report, Australian Government.
- Balfour, D. L. and Smith, J. L. (1996), ‘Transforming Lease-purchase Housing Program for Low Income Families: Towards Empowerment and Engagement’, *Journal of Urban Affairs* **18**, 173–188.
- Barakova, I., Bostic, R. W., Calem, P. S. and Wachter, S. M. (2003), ‘Does Credit Quality Matter for Homeownership?’, *Journal of Housing Economics* **12**, 318–336.
- Barber, B. and Odean, T. (2001), ‘Boys Will be Boys: Gender, Overconfidence, and Common Stock Investment’, *The Quarterly Journal of Economics* **116**, 261–292.
- Baron, J. and Ritov, I. (1994), ‘Reference points and omission bias’, *Organizational Behavior and Human Decision Processes* **59**, 475–498.
- Bateman, H., Deetlefs, J., Dobrescu, L., Newell, B., Ortmann, A. and Thorp, S. (2014), ‘Just Interested or Getting Involved? An Analysis of Superannuation Attitudes and Actions’, *Economic Record*.
- Bateman, H., Eckert, C., Geweke, J., Louviere, J., Satchell, S. and Thorp, S. (2014), ‘Financial Competence, Risk Presentation and Retirement Portfolio Preferences’, *Journal of Pension Economics and Finance* **13**, 27–61.
- Bateman, H., Eckert, C., Geweke, J., Louviere, J., Thorp, S. and Satchell, S. (2012), ‘Fi-

- nancial Competence and Expectations Formation: Evidence from Australia', *Economic Record* **88**, 39–63.
- Bateman, H., Islam, T., Louviere, J., Satchell, S. and Thorp, S. (2010), 'An Experimental Survey of Investment Decisions for Retirement Savings'.
- Beck, J. H. (1988), 'An Experimental Test of Preferences for the Distribution of Income and Individual Risk Aversion', *Eastern Economic Journal* **20**, 131–145.
- Becker, G., DeGroot, M. and Marschak (1964), 'Measuring Utility by a Single Response Sequential Method', *Behavioral Science* **9**, 226–232.
- Benartzi, S. and Thaler, R. H. (2007), 'Heuristics and Biases in Retirement Savings Behavior', *Journal of Economic Perspectives* **21**, 81–104.
- Bengtsson, C., Persson, M. and Willenhag, P. (2005), 'Gender and Overconfidence', *Economics Letters* **86**, 199–203.
- Beshears, J., Choi, J. J., Laibson, D. and Madrian, B. C. (2009), 'The importance of default options for retirement saving outcomes: Evidence from the United States', *Social Security Policy in a Changing Environment* pp. 167–195.
- Beshears, J., Choi, J. J., Laibson, D. and Madrian, B. C. (2011), 'The Availability and Utilization of 401 (k) Loans', In *Investigations in the Economics of Aging* (pp. 145-172). University of Chicago Press. .
- Beshears, J., Choi, J., Laibson, D. and Madrian, B. (2010), The limitations of defaults, Technical report, National Bureau of Economic Research working paper NB10-02.
- Binswanger, H. (1980), 'Attitude toward Risk: Experimental Measurement in Rural India', *American Journal of Agricultural Economics* **62**, 395–407.
- Binswanger, H. (1981), 'Attitudes toward Risk: Theoretical Implications of an Experiment in Rural India', *Economic Journal* **364**, 867–890.
- Blumenschein, K., Blomquist, G., Johannesson, M., Horn, N. and Freeman, P. (2008), 'Eliciting Willingness to Pay Without Bias: Evidence from a Field Experiment', *The Economic Journal* **118**, 114–137.
- Board, C. P. F. (2007), 'Saving for Retirement: Central Provident Fund Board Annual Report 2006', *Singapore: Central Provident Fund Board* .

- Board, C. P. F. (2009), 'CPF trends: CPF Housing Scheme', *Singapore: Central Provident Fund Board*.
- Bohm, P., Lindén, J. and Sonnegård, J. (1997), 'Eliciting Reservation Prices: Becker–DeGroot–Marschak Mechanisms vs. Markets', *The Economic Journal* **443**, 1079–1089.
- Bornovalova, M., Daughters, S., Hernandez, G., Richards, J. and Lejuez, C. (2005), 'Differences in Impulsivity and Risk-taking Propensity between Primary Users of Crack Cocaine and Primary Users of Heroin in a Residential Substance-use Program', *Experimental and Clinical Psychopharmacology* **13**, 311–318.
- Bostic, R. W. and Surette, B. J. (2001), 'Have the doors opened wider? Trends in homeownership rates by race and income', *The Journal of Real Estate Finance and Economics* **23**, 411–434.
- Bovenberg, L., Koijen, R., Nijman, T. and Teulings, C. (2007), 'Saving and Investing over the Life Cycle and the Role of Collective Pension Funds', *De Economist* **155**, 347–415.
- Brown, J. R., Farrell, A. M. and Weisbenner, S. J. (2012), The Downside of Defaults, Technical report, National Bureau of Economic Research working paper NB12-05.
- Browning, M. and Crossley, T. F. (2001), 'The Life-Cycle Model of Consumption and Saving', *Journal of Economic Perspectives* **15**, 3–22.
- Buzby, J. C., Fox, J. A., Ready, R. C. and Crutchfield, S. R. (1998), 'Measuring Consumer Benefits of Food Safety Risk Reductions', *Journal of Agricultural and Applied Economics* **30**, 69–82.
- Camerer, C. and Hogarth, R. (1999), 'The Effects of Financial Incentives in Experiments: A Review and Capital-Labor-Production Framework', *Journal of Risk and Uncertainty* **19**, 7–42.
- Carliner, G. (1974), 'Determinants of Home Ownership', *Land Economics* pp. 109–119.
- Carson, R., N.E., F., Martin, K. M. and J.L., W. (1996), 'Contingent Valuation and Revealed Preference Methodologies: Comparing the Estimates for Quasi-Public Goods', *Land Economics* **72**, 80–99.

- Carter, T. (1997), ‘Current Practices for Procuring Affordable Housing: The Canadian Context’, *Housing Policy Debate* **8**, 593–631.
- Champ, P., Bishop, R., Brown, T. and McCollum, D. (1997), ‘Using Donation Mechanisms to Value Nonuse Benefits from Public Goods’, *Journal of Environmental Economics and Management* **33**, 151–162.
- Chew, N. (2010), What Action can the Superannuation Industry and the Australian Government Take to Increase Young People’s Engagement with their Superannuation and Take an Interest in their Retirement Incomes?, Technical report, Australian Securities & Investments Commission.
- Choi, J. J., Laibson, B. and Madrian, B. C. (2009), ‘Why does the law of one price fail? An Experiment on Index Mutual Funds’, *Oxford University Press* .
- Choi, J. J., Laibson, D., Madrian, B. C. and Metrick, A. (2002), ‘Defined Contribution Pensions: Plan Rules, Participant Choices, and the Path of Least Resistance’, *Tax Policy and the Economy* **16**, 67–113.
- Choi, J. J., Laibson, D., Madrian, B. C. and Metrick, A. (2004), ‘For Better or for Worse: Default Effects and 401(k) Savings Behavior’, *Perspectives in the Economics of Aging* pp. 81–126.
- Choi, J. J., Laibson, D., Madrian, B. C. and Metrick, A. (2005), ‘Saving for Retirement on the Path of Least Resistance’, *RODNEY L WHITE CENTER FOR FINANCIAL RESEARCH-WORKING PAPERS*-, 9 .
- Choon, C. N. (2013), ‘Adequacy and Inclusiveness of Pension Provision in Singapore’, *CEPAR/RIPPA Conference 2013* .
- Chuang, Y. and Schechter, L. (2013), ‘Stability of Experimental and Survey Measures of Social, Risk, and Time Preferences Over Multiple Year’, *Working Paper* .
- Cocco, J. F. (2000), ‘Portfolio Choice in the Presence of Housing’, *The Review of Financial Studies* **18**, 535–567.
- Cocco, J. F., Gomes, F. J. and Maenhout, P. J. (2005), ‘Consumption and Portfolio Choice over the Life Cycle’, *The Review of Financial Studies* **18**, 491–533.
- Coller, M., Harrison, G. W. and Rutström, E. E. (2001), Are Discount Rates Constant?

- Reconciling Theory and Observation, Technical report, Department of Economics, College of Business Administration, University of Central Florida.
- Coller, M. and Williams, M. (1999), ‘Eliciting Individual Discount Rates’, *Experimental Economics* **2**, 107–127.
- Cox, W. and Pavletich, H. (2011), ‘8th Annual Demographia International Housing Affordability Survey’.
- Croy, G., Gerrans, P. and Speelman, C. (2010a), ‘Injunctive Social Norms Primacy over Descriptive Social Norms in Retirement Savings Decisions’, *International Journal of Aging and Human Development* **71**, 259–282.
- Croy, G., Gerrans, P. and Speelman, C. (2010b), ‘The Role and Relevance of Domain Knowledge, Perceptions of Planning Importance, and Risk Tolerance in Predicting Savings Intentions’, *Journal of Economic Psychology* **31**, 860–871.
- Croy, G., Gerrans, P. and Speelman, C. (2012), ‘Normative Influence on Retirement Savings Decisions: Do People Care What Employers and the Government Want?’, *Australian Journal of Psychology* **64**, 83–91.
- Cummings, R., Elliott, S., Harrison, G. and Murphy, J. (1997), ‘Are Hypothetical Referenda Incentive Ompatible?’, *Journal of Political Economy* **105**, 609–621.
- Cummings, R. and Taylor, L. (1999), ‘Unbiased Value Estimates for Environmental Goods: a Cheap Talk Design for the Contingent Valuation Method’, *The American Economic Review* **89**, 649–665.
- DellaVigna, S. and Malmendier, U. (2006), ‘Paying not to Go to the Gym’, *The American Economic Review* **96**, 694–719.
- Diaz-Serrano, L. (2005), ‘On the negative relationship between labor income uncertainty and homeownership: Risk-aversion vs. credit constraints’, *Journal of Housing Economics* **14**, 109–126.
- Dietz, R. and Haurin, D. R. (2003), ‘The Social Consequences of Homeownership’, *Journal of urban Economics* **54**, 401–450.
- Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J. and Wagner, G. G. (2011),

- ‘Individual risk attitudes: Measurement, determinants, and behavioral consequences’, *Journal of the European Economic Association* **9**, 522–550.
- Dreber, A., Rand, D., Wernerfelt, N., Garcia, J., Vilar, M., Lum, J. and Zeckhauser, R. (2011), ‘Dopamine and Risk Choices in Different Domains: Findings among Serious Tournament Bridge Players’, *Journal of Risk and Uncertainty* **43**, 19–38.
- Epstein, L. and Zin, S. (1989), ‘Substitution, Risk Aversion, and the Temporal Behavior of Consumption and Asset Returns: a Theoretical Framework’, *Econometrica* **57**, 937–969.
- Fecteau, S., Pascual-Leone, A., Zald, D., Liguori, P., Théoret, H., Boggio, P. and Fregni, F. (2007), ‘Activation of Prefrontal Cortex by Transcranial Direct Current Stimulation Reduces Appetite for Risk during Ambiguous Decision Making’, *The Journal of Neuroscience* **27**, 6212–6218.
- Fellner, G. and Sutter, M. (2009), ‘Causes, Consequences, and Cures of Myopic Loss Aversion—An Experimental Investigation’, *The Economic Journal* **537**, 900–916.
- Fernandes, D., Lynch Jr, J. G. and Netemeyer, R. G. (2014), ‘Financial Literacy, Financial Education, and Downstream Financial Behaviors’, *Management Science* **60**, 1861–1883.
- Fisher, I. (1930), *The Theory of Interest*, New York: MacMillan.
- Fox, J. A., Shogren, J. F., Hayes, D. J. and Kliebenstein, J. B. (1998), ‘CVM-X: Calibrating Contingent Values with Experimental Auction Markets’, *American Journal of Agricultural Economics* **80**, 455–465.
- Fox, R. and Finlay, R. (2013), Dwelling Prices and Household Income, Technical report, RBA.
- Friedman, M. (1957), *A Theory of the Consumption Function*, Princeton: Princeton University Press for NBER.
- Glaeser, E. L. (2006), ‘Paternalism and Psychology’, *University of Chicago Law Review* **73**, 133–156.
- Gomes, F. and Michaelides, A. (2005), ‘Optimal Life-Cycle Asset Allocation: Understanding the Empirical Evidence’, *The Journal of Finance* **60**, 869–904.
- Gonzalez, R. and Wu, G. (1999), ‘On the Shape of the Probability Weighting Function’, *Cognitive Psychology* **38**, 129–166.

- Greene, W. H. (2003), *Econometric analysis*, Pearson Education India.
- Grether, D. M. and Plott, C. R. (1979), 'Economic Theory of Choice and the Preference Reversal Phenomenon', *The American Economic Review* **69**, 623–638.
- Halpern, S. D., Ubel, P. A. and Asch, D. A. (2007), 'Harnessing the Power of Default Options to Improve Health Care', *The New England Journal of Medicine* **357**, 1340–1344.
- Harrison, G. W., Lau, M. I. and Williams, M. B. (2002), 'Estimating Individual Discount Rates for Denmark: A Field Experiment', *The American Economic Review* **92**, 1606–1617.
- Hateley, L. and Tan, G. (2003), *The Greying of Asia: Causes and Consequences of Rapid Ageing in Asia*, Singapore: Eastern Universities Press.
- Heckman, J. J. (1979), 'Sample selection bias as a specification error', *Econometrica: Journal of the econometric society* pp. 153–161.
- Hendershott, P. H., Ong, R., Wood, G. A. and Flatau, P. (2009), 'Marital History and Home Ownership: Evidence from Australia', *Journal of Housing Economics* **18**, 13–24.
- HILDA (2013), HILDA Survey Annual Report 2012, Technical report.
- Hoffman, E., Menkhaus, D. J., Chakravarti, D., Field, R. A. and Whipple, G. D. (1993), 'Using Laboratory Experimental Auctions in Marketing Research: A Case Study of New Packaging for Fresh Beef', *Marketing Science* **12**, 318–338.
- Holt, C. A. and Laury, S. K. (2002), 'Risk Aversion and Incentive Effects', *The American Economic Review* **92**, 1644–1655.
- Huang, J. and Kisgen, D. (2013), 'Gender and Corporate Finance: Are Male Executives Overconfident Relative to Female Executives?', *Journal of Financial Economics* **108**, 822–839.
- Hunt, M., Hopko, D., Bare, R., Lejuez, C. and Robinson, E. (2005), 'Construct Validity of the Balloon Analog Risk Task (BART): Associations with Psychopathy and Impulsivity', *Assessment* **12**, 416–428.
- Johannesson, M., Liljas, B. and Johansson, P.-O. (1998), 'An Experimental Comparison

- of Dichotomous Choice Contingent Valuation Questions and Real Purchase Decisions’, *Applied Economics* **30**, 643–647.
- Johnson, E. J. and Goldstein, D. (2003), ‘Do Defaults Save Lives?’, *Science* **302**, 1338–1339.
- Johnson, E. J., Hershey, J., Meszaros, J. and Kunreuther, H. (1993), ‘Framing, Probability Distortions, and Insurance Decisions’, *Journal of Risk and Uncertainty* **7**, 35–51.
- Kahneman, D., Knetsch, J. and Thaler, R. (1990), ‘Experimental Tests of the Endowment Effect and the Coase Theorem’, *Journal of Political Economy* **98**, 1325–1348.
- Kahneman, D. and Tversky, A. (1979), ‘Prospect Theory: an Analysis of Decision under Risk’, *Econometrica* **47**, 263–292.
- Kain, J. F. and Quigley, J. M. (1972), ‘Housing market discrimination, home-ownership, and savings behavior’, *The American Economic Review* **62**, 263–277.
- Kakpo, N. and Cattacin, S. (2011), ‘Local welfare in Switzerland: Housing, employment and child care’, *WILCO Publication no. 7*.
- Kemeny, J. (2005), ‘“The Really Big Trade Off” between Home Ownership and Welfare: Castles’ Evaluation of the 1980 Thesis, and a Reformulation 25 Years on’, *Housing, Theory and Society* **22**, 59–75.
- Kraft, H. and Munk, C. (2011), ‘Optimal Housing, Consumption, and Investment Decisions over the Life Cycle’, *Management Science* **57**, 1025–1041.
- Lai, A., Bateman, H. and Stevens, R. (2012), ‘Risk Information and Retirement Investment Choices Under Prospect Theory’.
- Lejuez, C., Read, J., Kahler, C., Richards, J., Ramsey, S., Stuart, G., Strong, D. and Brown, R. (2002), ‘Evaluation of a Behavioral Measure of Risk Taking: the Balloon Analogue Risk Task (BART)’, *Journal of Experimental Psychology* **8**, 75–84.
- Libby, R. and Marlys, G. (1992), ‘Incentives, Effort, and the Cognitive Processes Involved in Accounting-Related Judgments’, *Journal of Accounting Research* **30**, 249–273.
- Linneman, P. and Wachter, S. (1989), ‘The impacts of borrowing constraints on home-ownership’, *Real Estate Economics* **17**, 389–402.

- List, J. A. and Lucking-Reiley, D. (2000), ‘Demand Reduction in Multiunit Auctions: Evidence from a Sportscard Field Experiment’, *The American Economic Review* **90**, 961–972.
- List, J. A. and Shogren, J. F. (1998), ‘Calibration of the Difference between Actual and Hypothetical Valuations in a Field Experiment’, *Journal of Economic Behavior & Organization* **37**, 193–205.
- Lonnqvist, J. E., Verkasalo, M., Walkowitz, G. and Wichardt, P. C. (2014), ‘Measuring individual risk attitudes in the lab: Task or ask? An empirical comparison’, (*No. 1905*). *Kiel Working Paper* .
- Lusardi, A. and Mitchell, O. S. (2006), ‘Baby Boomer Retirement Security: the Roles of Planning, Financial Literacy, and Housing Wealth’, *Journal of Monetary Economics* **54**, 205–244.
- Lusardi, A. and Mitchell, O. S. (2011), *Financial Literacy: Implications for Retirement Security and the Financial Marketplace*, Oxford University Press.
- Lusardi, A., Mitchell, O. S. and Curto, V. (2010), ‘Financial Literacy among the Young’, *The Journal of Consumer Affairs* **44**, 358–380.
- Maccrimmon, K. and Wehrung, D. (1990), ‘Characteristics of Risk Taking Executives’, *Management Science* **36**, 422–435.
- Macintyre, S., Ellaway, A., Der, G., Ford, G. and Hunt, K. (1998), ‘Do housing tenure and car access predict health because they are simply markers of income or self esteem? A Scottish study’, *Journal of epidemiology and community health* **52**, 657–664.
- Maisel, S. J. (1965), ‘Rates of Ownership, Mobility and Purchase’, *Essays in Urban Land Economics* .
- McKenzie, C. R., Liersch, M. J. and Finkelstein, S. R. (2006), ‘Recommendations implicit in policy defaults’, *Psychological Science* **17**, 414–420.
- Modigliani, M. and Brumberg, M. (1954), *Utility Analysis and the Consumption Function: an Interpretation of Cross-section Data*, New Brunswick: Rutgers University.
- Murnighan, K. J., Roth, A. E. and Shoumaker, F. (1988), ‘Risk Aversion in Bargaining: An Experimental Study’, *Journal of Risk and Uncertainty* **1**, 101–124.

- Nettleton, S. and Burrows, R. (1998), 'Mortgage debt, insecure home ownership and health: an exploratory analysis', *Sociology of health and Illness* **20**, 731–753.
- Noussair, C., Robin, S. and Ruffieux, B. (2004), 'Revealing Consumers' Willingness-To-Pay: A Comparison of the BDM Mechanism and the Vickrey Auction', *Journal of Economic Psychology* **25**, 725–741.
- O'Donoghue, T. and Rabin, M. (2003), 'Studying Optimal Paternalism, Illustrated by a Model of Sin Taxes', *The American Economic Review* **93**, 186–191.
- OECD (2007), Pension at a Glance 2007: Public Policies across OECD Countries, Technical report, OECD.
- Parliamentary Joint Committee on Corporations and Financial Services (2007), The Structure and Operation of the Superannuation Industry, Technical report, Parliament of Australia.
- Plackett, R. L. (1983), 'Karl Pearson and the chi-squared test', *International Statistical Review/Revue Internationale de Statistique* pp. 59–72.
- Plott, C. R. and Zeiler, K. (2005), 'The willingness to pay-willingness to accept gap, the "Endowment effect," Subject misconceptions, and experimental procedures for eliciting valuations', *The American Economic Review* **95**, 530–545.
- Quercia, R. G., McCarthy, G. W. and Wachter, S. M. (2003), 'The Impacts of Affordable Lending Efforts on Homeownership Rates', *Journal of Housing Economics* **12**, 29–59.
- Ramsey, F. (1928), 'A mathematical Theory of Saving', *Economic Journal* **38**, 543–559.
- Robert, S. and House, J. S. (1996), 'SES differentials in health by age and alternative indicators of SES', *Journal of Aging and Health* **8**, 359–388.
- Rohe, W. M. and Basolo, V. (1997), 'Long-term effects of homeownership on the self-perceptions and social interaction of low-income persons', *Environment and Behavior* **29**, 793–819.
- Rohe, W. M., Van Zandt, S. and McCarthy, G. (2013), 'The social benefits and costs of homeownership: A critical assessment of the research', *The affordable housing reader* pp. 196–212.

- Rooija, M., Lusardi, A. and Alessie, R. (2011), ‘Financial Literacy and Stock Market Participation’, *Journal of Financial Economics* **101**, 449–472.
- Rosenthal, S. S. (2002), ‘Eliminating Credit Barriers: How Far Can We Go’, *Low-income Homeownership* pp. 111–145.
- Rossi, P. H. and Weber, E. (1996), ‘The social benefits of homeownership: Empirical evidence from national surveys’, *Housing policy debate* **7**, 1–35.
- Samuelson, W. and Zeckhauser, R. (1988), ‘Status Quo Bias in Decision Making’, *Journal of Risk and Uncertainty* **1**, 7–59.
- Savage, L. (1954), *The Foundations of Statistics*, John Wiley, New York.
- Smith, V. and Walker, J. (1976), ‘Experimental Economics: Induced Value Theory’, *American Economic Review Proceedings* **66**, 247 – 279.
- Smith, V. and Walker, J. (1982), ‘Microeconomic Systems as an Experimental Science’, *The American Economic Review* **72**, 923–955.
- Smith, V. and Walker, J. (1993), ‘Monetary Rewards and Decision Cost in Experimental Economics’, *Economic Inquiry* **31**, 245 – 261.
- Stiglitz, J. E. and Weiss, A. (1981), ‘Credit Rationing in Markets with Imperfect Information’, *The American Economic Review* **71**, 393–410.
- Sunstein, C. R. and Thaler, R. H. (2003), ‘Libertarian Paternalism is Not an Oxymoron’, *The University of Chicago Law Review* **70**, 1159–1202.
- Sy, W. (2008), Superannuation Fund Governance: An Interpretation, Technical report, APRA.
- Thaler, R. H. and Sunstein, C. R. (2003), ‘Libertarian Paternalism’, *The American Economic Review* **93**, 175–179.
- Thaler, R. H. and Sunstein, C. R. (2008), ‘Nudge: Improving Decisions about Health, Wealth, and Happiness’, *Yale University Press*.
- Torkar, N. (2008), Mind & Mood Superannuation, Technical report.
- Tversky, A. and Kahneman, D. (1991), ‘Loss Aversion in Riskless Choice: a Reference Dependent Model’, *The Quarterly Journal of Economics* **106**, 1039–1061.

- Vickrey, W. (1961), 'Counterspeculation, Auctions, and Competitive Sealed Tenders', *Journal of Finance* **16**, 8–37.
- Vischer, T., Dohmen, T., Falk, A., Huffman, D., Schupp, J., Sunde, U. and Wagner, G. G. (2013), 'Validating an ultra-short survey measure of patience', *Economics Letters* **120**, 142–145.
- Wachter, S., Follain, J., Linneman, P., Quercia, R. G. and McCarthy, G. (1996), 'Implications of Privatization: The Attainment of Social Goals', *US Department of Housing and Urban Development, Studies on Privatizing Fannie Mae and Freddie Mac* pp. 337–377.
- Waggle, D. and Johnson, D. T. (2003), 'The Impact of the Single-family Home on Portfolio Decisions', *Financial Services Review* **13**, 201–217.
- Weber, E., Blais, A. and Betz, N. (2002), 'A Domain-specific Risk-attitude Scale: Measuring Risk Perceptions and Risk Behaviors', *Journal of Behavioral Decision Making* **15**, 263–290.
- Wertenbroch, K. and Skiera, B. (2002), 'Measuring Consumers' Willingness to Pay at the Point of Purchase', *Journal of Marketing Research* **39**, 228–241.
- Yang, F. (2009), 'Consumption over the Life Cycle: How Different is Housing?', *Review of Economic Dynamics* **12**, 423–443.