EQUITY HOLDINGS OF AUSTRALIAN BABY BOOMERS- COMPARING LIFE CYCLE PHASES

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ABSTRACT

This study aims to quantify the role of equity holdings in the asset portfolios of baby boomers over the accumulation and consolidation life cycle phases, and characteristics of baby boomer households that hold equities. The results did not confirm the hypothesis that baby boomer households have increased direct equity ownership in the consolidation phase and it is likely that the global financial crisis (GFC) reduced baby boomer household investment in equities. It may be of comfort to policy makers that baby boomer households are not at peak levels of equity market volatility exposure in this important pre-retirement consolidation phase.

Introduction

As a disproportionally large subgroup of the population, funding the impending retirement of the baby boomer generation (born between 1946 and 1966) is a challenge to Governments worldwide. Consequently, an increased onus on being self-funded in retirement mean that unlike any generation before them, baby boomers need to have well-developed financial literacy skills, in addition to access to financial education and advice. While Australia introduced compulsory retirement savings in 1992 via the *Superannuation Guarantee Charge*, the baby boomer population generally lack sufficient Superannuation savings to fully fund retirement (median superannuation balance is $47,000), and the scheme has some limitations in its coverage (those on welfare payments like disability support are not covered) (Keane, 2015). Thus, many baby boomers will draw on other assets such as equities and property to help fund consumption.

This paper focuses on the role of direct equity investment in satisfying this need. As an asset class, equities can play an important role in facilitating several key savings functions: they aid in providing diversification benefits to household portfolios that are often heavily weighted to property ownership; they have a higher risk/return profile than other assets commonly held by households (i.e. cash, property); and, they are highly liquid which assists in satisfying savings motives including storing wealth for a home deposit, precautionary savings and bequests. It is essential for investors to be aware that equities are an asset class that experiences a relatively high degree of price volatility compared to other assets, and thus investors may experience relatively high returns over long time horizons but risk losing money in any given year. This risk is a significant exposure for the baby boomer cohort who require as much capital as possible upon retirement when working incomes are foregone.

Many Australian households invest in equities both directly and indirectly through their superannuation fund holdings, self-managed superannuation funds (SMSFs), and other investment vehicles. Direct equity ownership is well represented among Australian households. With privatisation of many government organisations in the 1980s, favourable taxation treatment of dividends, and continued growth in returns for the ten years prior to 2014, household participation in equities in Australia of 27 per cent is comparable to the UK (also 27%, see Banks and Tanner, 1996) but lower than the US (with 36% participation, see Bertaut and Starr-McCluer, 2000). However, falls in equity prices since the start of the global financial crisis (GFC) saw the market capitalisation of the Australian stock market decline by 14 per cent between mid-2007 and March 2010. During this period, households sold equities to increase their cash deposits in response to the uncertain environment (West, 2015). Consequently, the GFC shook the confidence and retirement plans of 'baby boomers' to the extent of 'many (older) workers deciding to delay retirement and save longer following losses in superannuation and direct equity investment' (Humpel, *et al.* 2010, p. 130).

Thus, there is much interest in quantifying how vulnerable households may be to equity market fluctuations, particularly the portion of the population that are in the pre-retirement, rapid wealth accumulation phase. After briefly exploring the underlying theories of the 'life cycle hypothesis' and 'portfolio theory', this paper surveys the literature to get a sense of how well households implement investment concepts when managing their asset portfolios. Given the empirical evidence on households generally, it is expected that the equity holdings of baby boomers in the consolidation phase will be higher than they were in the accumulation phase, both in dollar values and portfolio share.

Accordingly, the wealth module of the Household Income and Labour Dynamics in Australia (HILDA) survey is employed, and the 2002 cross-section is used to represent the accumulation phase (baby boomers aged 38 to 56) and the 2014 cross-section represents the consolidation phase (baby boomers aged 50 to 68). Difference in means, logit and tobit analysis methodologies assist with assessing the difference between the equity holdings of the baby boomer generation in the accumulation and consolidation phases. In addition, the characteristics that determine equity ownership are examined in both phases. This particular cohort is of interest given the impending retirement of this disproportionally large subgroup of the population, and potential exposure to financial risk.

The outcomes of this study aim to inform policy makers, financial advisers and financial educators as to the exposure of Australian households to direct equity investment and therefore equity market volatility. As a consequence of this vulnerability, households may not be well prepared for retirement and defer to Government safety nets. On the other hand, as highlighted by portfolio theory, households can benefit from the addition of equities in the form of increased diversification and potential higher returns that are needed to fund a long retirement.

Theory

There are two theories that form the basis from which to compare household financial decisions in practice. First, Harry Markowitz showed mathematically how to construct an optimal portfolio where risk could be minimised or return maximised by varying the proportions of wealth held between the assets in his seminal 'Portfolio Selection' manuscript (Markowitz, 1952). This significant contribution to finance showed that risk specific to the individual asset can be diversified away as the number of assets in the portfolio increases, as far as they are not perfectly positively correlated. The risk reduction benefit achieved from diversification is an investment concept that is relatively easy to grasp.

At the same time, there is quite an 'art' to portfolio construction. Professional investors, such as fund managers and financial advisers, will have access to information and technical skills in order to make informed decisions about the future and calculate the required inputs, and the risk-profile of the portfolio will be determined methodically, i.e. by the fund objectives, a diagnostic tool or interview with a client. While such tools are not fool-proof, they do take some of the subjectivity out of investment decisions. However, for personal investors, the ability to make informed decisions that require subjective judgement will depend on the investor's level of investment knowledge and general financial literacy skills.

Second, Franco Modigliani and Richard Brumberg are credited with extending a consumption-savings function that became known as the Life Cycle Hypothesis (LCH) (Modigliani and Brumberg, 1954). Modigliani and Brumberg's contribution was to include a finite life span with a 'pre-working', 'working' and a 'retired' phase to address the main shortcoming of an assumption of an infinite life in previous models. Essentially, the LCH model recognises that individuals needs change over the course of their finite life, and thus an order of asset acquisition can be proposed (Paas, Vermunt, and Bijmolt, 2007).

For example, during the period of family formation people will put most of their savings into assets that help facilitate work or are required for the establishment of a household. After the initial

purchase of durables, savings flow into other kinds of assets. The acquisition of a house, for which many lenders require a significant deposit, may increase demand for savings products such as term deposits or equities. As family lives and careers progress, households are burdened with mortgage payments and costs of raising children. This is known as the accumulation phase.

In their late forties and fifties, when they are at their peak earnings capacity with grown children, they may accumulate savings rapidly and are motivated to save for retirement and bequest purposes, known as the consolidation phase. Equities may play a significant role in household portfolios in this life cycle phase. Finally, the retirement phase consists of spending down accumulated savings to fund consumption. Assets that are liquid and provide a steady income stream while maintaining capital investment are high in demand during this phase. While this pattern of asset acquisition may generally apply to households, there are reasons for variation. Demand for assets may vary due to reasons which include dual purpose assets (such as housing), access to credit, social pressures, macroeconomic conditions and personal attributes (such as risk aversion or myopia).

In summary, it is evident from these two perspectives on asset allocation that households face constraints and challenges to consistently construct an optimal portfolio that meet their risk and return objectives throughout all life cycle phases. Given these constraints, this study purports to understand the extent to which households attempt to invest 'well' and focus on the role of direct equities as a versatile asset that can be liquidated to fund a home deposit, diversify a portfolio, provide higher returns than other asset classes (subject to a higher risk tolerance) in order to meet savings motives, particularly that of retirement.

Literature Review

The extensive literature on household portfolios shows consistency across a number of jurisdictions on asset ownership, with much research concentrated in the United States (US). First, households are found to hold very simple asset portfolios that meet their needs (Bertaut and Starr-McCluer, 2000; McCarthy, 2004; Bucks, Kennickell and Moore, 2006). Second, direct equity investment is confined to those households that have higher levels of wealth, income, education, financial literacy, are older, and have a positive attitude to financial risk-taking. Where studies have investigated equity holdings with more detailed data, studies show that diversification within equity portfolios is very low (Goetzman and Kumar, 2008), households own few individual stocks (Kelly, 1995; Polkovnichenko, 2005), and there is evidence of local bias (Kelly, 1995; Huberman, 2001; Benartzi and Thaler, 2001).

Third, as the LCH model predicts, age is a significant determinant of asset ownership. In the early career building life cycle phase, households tend to overinvest in housing, and dependent children inhibit wealth accumulation and diversification (Bruekner, 1997; Flavin and Yamashita, 2002; Cocco, 2005; Pelizzon and Weber, 2008). As households progress to the consolidation and retirement phases, the portfolio share of equities rises, driven by the need to fund consumption in retirement and for bequest purposes (Cocco, 2005; Yao and Zhang, 2005; Kim, *et al.* 2012). However, equity holdings may be impacted by ageing and health issues, as these households divest of equities to fund retirement and medical expenses (Yao, Hanna and Lindamood, 2004; Edwards, 2010).

Fourth, macroeconomic conditions and events, such as the Great Depression, World Wars, the GFC, or even periods of high economic growth may impact asset holdings (Jianakoplos and Bernasek, 2006;

Fukuda, 2009; Malmendier and Nagel, 2011). For example, many people who experienced the Great Depression are reluctant to invest in equities (Malmendier and Nagel, 2011).

Fifth, attitudes to financial risk-taking are a characteristic that can greatly influence asset holdings, particularly higher risk assets like equities. Research shows that risk attitudes are not stable over time and people become more risk averse as they age, that is, that people may change how they respond to questions in between survey periods (Halek and Eisenhauer, 2001; Olivares, Diaz and Besser, 2008; Yao and Curl, 2011; Bucciol and Miniaci, 2011). Evidence for changing risk preferences over time is found in Australia (West and Worthington, 2013a, 2013b). Studies also show that financial risk tolerance tends to increase when equity returns increase and decrease when stock returns decrease (Bilias, Georgarakos and Haliassos, 2010; Yao and Curl, 2011; Malmendier and Nagel, 2011).

Sixth, studies consistently find females are significantly more risk averse than their male counterparts and thus have low participation rates in direct equity investment (Olivares, Diaz and Besser, 2008; Yilmazer and Lyons, 2010), another contention supported by Australian data (West and Worthington, 2013a). Thus, females bypass opportunities to earn higher returns on higher risk assets like equities, which particularly compounds a wealth accumulation disadvantage that women experience in taking time out of the workforce to care for children and part-time work (Parr, Ferris and Mahuteau, 2007; Jefferson and Ong, 2010; Austen, Jefferson and Ong, 2010).

Finally, it is not surprising that many of the characteristics discussed thus far feed into levels of financial literacy. Individuals who demonstrate higher levels of financial literacy tend to have higher levels of portfolio diversification and thus invest in equities (Guiso and Jappelli, 2008; Abreu and Mendes, 2010). Those with low financial literacy levels are more likely to avoid equity investments (Van Rooij, Lusardi and Alessie, 2011) which is evidenced by research in Australia (Worthington, 2005, 2006, 2009; ASIC, 2011). Much of the financial literacy literature identifies people who are young (aged under 24), elderly (aged over 70), women, those on low incomes, people with low levels of education, and people from non-English speaking backgrounds or of Aboriginal or Torres Strait Islander descent as being characteristics associated with low levels of financial literacy (Dvorak and Hanley, 2010; Hung, Yoong and Brown, 2012). Low levels of financial literacy and consequential financial decisions mean that returns earned fall short of the theoretical returns that could be earned by well-informed, disciplined investors (Burtless, 2010).

From this general examination of household portfolio composition it is evident that households have difficulty implementing a diversification strategy, and although they generally affirm the LCH, there are many factors that complicate their financial decisions. While there is extensive literature on household characteristics and asset investment, there is a distinct lack of literature that compares the investment patterns of the same households during the accumulation phase or consolidation phase, thus this paper is a novel contribution to the literature. This study also investigates household characteristics that are significant determinants of holding direct equities and having a higher portfolio share of equities for the baby boomer cohort in both the accumulation and consolidation phases, as determinants may change over time.

The consequence of uneducated financial decisions may have wider reach than impacting the household alone. In a report on national financial education strategies, the OECD's International

Network on Financial Education noted that households were partially responsible for widening the GFC because of their lack of understanding financial issues, as they 'accepted (sometimes unknowingly) to support more financial risk than what they could afford' (2009, p. 4). The OECD notes that the lack of awareness of households of the risks they face is a major problem, given the increased sophistication of financial products and the transfer of risk to households that are taking on more financial risk and responsibility for credit and retirement decisions. Households do not seek protection from risks either because they do not understand the need to be protected, or they overestimate their protection and their understanding of the risks they face (Laboul, 2011).

Data and Methodology

The purpose of this study is to understand the direct equity investment patterns of the baby boomer cohort during the accumulation phase and the consolidation phase. Quantifying the equity investment of baby boomers in the consolidation phase is of particular interest to assess their exposure to volatility and potential capital loss in this very important pre-retirement life cycle phase. Accordingly, this study employs data from the Australian HILDA survey, which is an annual survey of households on various topics including income, labour market and family dynamics, with additional modules added in various years. The survey aims to follow the 6,542 households and 13,969 individuals interviewed in wave 1 in 2001. As this study aims to compare the equity ownership of the accumulation phase with the consolidation phase of the baby boomers, the 2002 cross section will be used to proxy for the baby boomer cohort in the accumulation phase, as baby boomers are aged 38 to 56 (i.e. born between 1946 and 1966) and the 2014 sample will be used to proxy the consolidation phase, as baby boomers are aged 50 to 68 in 2014. The baby boomer cohort consists of 4,725 people in the 2002 cross-section of the HILDA survey and 4,914 people in the 2014 cross-section.

The wealth module is implemented every four years, and questions relate to the householder's assessment of their investment in assets such as bank accounts, cash investments, equities, superannuation, cash-in values of life insurance policies, trust funds, the family home and other property, business assets, vehicles and collectibles. The level of equity investment is used for direct investment in equities, but unfortunately, the HILDA survey does not collect detailed information on equity ownership other than an overall estimate of value. As this study is aiming to get an understanding of exposure to equity market risk in general terms, this level of data suffices and detailed analysis is left to future research.

The two dependent variables are defined as follows. The first dependent variable is a dummy variable for direct equity ownership (EQT_{owner}), where positive values (>$0) are identified as 1 and non-holders (≤$0) are 0. The second is the portfolio share of equities ($EQT_{portfolioshare}$), which is the dollar investment in direct equities as a proportion of the total assets. Table 1 shows the descriptive statistics for the two dependent variables and the asset classes for both the sample population and the baby boomer population, for 2002 and 2014. As can be seen in Table 1, the baby boomer population had a slightly higher participation rate for equity ownership than the sample population (48.4% vs 43.7%) for 2002 and for 2014 (39.5% vs 31.8%). Indeed, comparison of the two samples show that baby boomers have higher participation rates in most of the asset classes. By inspection alone, it is significant to note that the participation of baby boomers in direct equities

reduced by approximately nine per cent from 2002 to 2014 (0.484 to 0.395). This reduction was mostly offset by increases in participation in Other Property (0.233 to 0.304).

Regarding portfolio share, Table 1 shows that there are several assets that dominate the portfolio for the samples, such as the Family Home (32% to 44%), Superannuation (20% to 26%) and Vehicles (7% to 12%). For the sample population *compared to* (baby boomers), direct investment in equities comprised 3.9 (3.2) per cent of the total asset portfolio in 2002 and 2.3 (2.4) per cent in 2014. In 2014, the baby boomers reduced the portfolio share of equities by 0.8 per cent (0.032 to 0.024). This reduction could be due to either or both a reduction in the dollar value of equities and a rise in property prices (considering portfolios are heavily weighted towards property).

Table 1: Dependent Variable Descriptive Statistics

Parameter	Description	Sample Population				Baby Boomer Population			
		2002		2014		2002		2014	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Generation category	Generation Y	0.030	0.171	0.252	0.434				
	Generation X	0.321	0.467	0.307	0.461				
	Baby Boomer generation	0.399	0.490	0.310	0.462				
	Silent generation	0.207	0.406	0.126	0.332				
	Greatest generation	0.041	0.199	0.006	0.077				
Asset Class Ownership	Bank accounts	0.980	0.140	0.983	0.131	0.980	0.139	0.986	0.119
	Cash investments	0.032	0.176	0.012	0.110	0.024	0.154	0.012	0.107
	Equities (EQT_{owner})	0.437	0.496	0.318	0.466	0.484	0.500	0.395	0.489
	Superannuation	0.808	0.394	0.871	0.336	0.931	0.281	0.890	0.313

Table 1: Dependent Variable Descriptive Statistics (continued)

Parameter	Description	Sample Population				Baby Boomer Population			
		2002		2014		2002		2014	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Asset Class Ownership	Insurance	0.124	0.329	0.067	0.250	0.150	0.357	0.079	0.270
	Trusts	0.041	0.199	0.044	0.205	0.046	0.210	0.048	0.214
	Family home	0.721	0.448	0.663	0.473	0.785	0.411	0.797	0.403
	Other property	0.186	0.390	0.229	0.420	0.233	0.423	0.304	0.460
	Businesses	0.148	0.356	0.114	0.318	0.193	0.395	0.129	0.336
	Vehicles	0.912	0.284	0.930	0.255	0.941	0.235	0.959	0.198
	Collectibles	0.146	0.353	0.140	0.347	0.154	0.361	0.155	0.362
Asset Class Portfolio Share	Bank accounts	0.095	0.193	0.095	0.184	0.064	0.148	0.074	0.151
	Cash investments	0.003	0.027	0.001	0.019	0.002	0.019	0.001	0.011
	Equities ($EQT_{portfolioshare}$)	0.039	0.104	0.023	0.080	0.032	0.084	0.024	0.074
	Superannuation	0.203	0.230	0.262	0.257	0.223	0.225	0.264	0.237
	Insurance	0.009	0.052	0.012	0.074	0.010	0.052	0.009	0.056
	Trusts	0.005	0.044	0.007	0.054	0.004	0.041	0.005	0.043
	Family home	0.422	0.332	0.389	0.334	0.441	0.309	0.424	0.295
	Other property	0.060	0.156	0.084	0.183	0.073	0.165	0.099	0.183
	Businesses	0.035	0.126	0.019	0.086	0.044	0.136	0.019	0.082
	Vehicles	0.118	0.198	0.101	0.182	0.099	0.175	0.074	0.162
	Collectibles	0.011	0.061	0.008	0.053	0.009	0.051	0.006	0.041

As outlined in the literature review, factors that other studies highlight as significant determinants of asset selection include levels of wealth, income, education, age, gender, health, and household structure, as well as financial literacy and financial risk-taking factors. The descriptive statistics, expected signs and names for these variables are provided in Tables 2 and 3 for 2002 and 2014. Unfortunately, the HILDA survey does not ask questions that can test respondent's knowledge of financial concepts directly. Financial literacy literature indicates that goal setting and planning is

an important characteristic of a financially literate person (Dvorak and Hanley, 2010). Hence, the questions regarding 'Savings Habits' (asks respondents to indicate how regularly they save) and 'Investment Horizon' (asks respondents to indicate how far ahead they plan when investing) are employed as financial literacy proxies. Responses that are towards the 'Save regularly by putting money aside' and 'More than 10 years ahead' spectrum are considered to be financially literate, while the opposite end of the spectrum as shown in Table 3 is considered less financially literate.

The reference categories are designated with a hashtag (#) and are chosen based on being important for policy implications or that they comprise a relatively large proportion of the population. Results are interpreted with respect to the constant being equal to the mean of the reference category, and then the coefficients of each of the dummy variables in the regression is equal to the difference between the mean of the group coded 1 and the mean of the reference category. The p-value associated with that coefficient is the test of the category versus the reference category.

Table 2: Independent Dummy Variables, Descriptive Statistics, Baby Boomer Cohort

Parameter	Description	Variable sign	Expected sign	2002		2014	
				Mean	Standard Deviation	Mean	Standard Deviation
Gender	Female=1	FEM	–	0.524	0.499	0.529	0.499
	Male=1#	MAL	+	0.476	0.499	0.471	0.499
Household structure	Couples with children=1#	CWC	+	0.577	0.494	0.321	0.467
	Lone parents=1	LPC	–	0.097	0.296	0.079	0.269
	Lone person=1	LNP	–	0.117	0.321	0.164	0.370
	Couple=1	CPL	+	0.192	0.394	0.415	0.493
	Multi-family/ Other=1	MFO	–	0.017	0.130	0.022	0.146
Education category	Bachelor's degree and above=1	DEG	+	0.235	0.424	0.263	0.440
	Vocational qualification=1	VOC	–	0.300	0.458	0.358	0.479
	Year 12#=1	Y12	–	0.113	0.316	0.091	0.287
	Year 11=1	Y11	–	0.353	0.478	0.288	0.453

Table 2: Independent Dummy Variables, Descriptive Statistics, Baby Boomer Cohort (continued)

Parameter	Description	Variable sign	Expected sign	2002		2014	
				Mean	Standard Deviation	Mean	Standard Deviation
Health	Excellent health=1	EHT	+	0.098	0.298	0.063	0.243
	Very good health=1	VHT	+	0.343	0.475	0.300	0.458
	Good health#=1	GHT	–	0.334	0.472	0.357	0.479
	Fair health=1	FHT	–	0.116	0.320	0.162	0.368
	Poor health=1	PHT	–	0.027	0.162	0.042	0.200
Household income	<$20,000=1	INC1	–	0.042	0.201	0.037	0.188
	$20,000 to $49,999=1	INC2	–	0.152	0.359	0.183	0.386
	$50,000 to $99,999#=1	INC3	+	0.348	0.477	0.268	0.443
	>$100,000=1	INC4	+	0.458	0.498	0.513	0.500
Net wealth	Under $499,999=1	NW1	–	0.649	0.477	0.335	0.472
	$500,000-$999,999#=1	NW2	+	0.217	0.412	0.263	0.440
	$1,000,000-$1,499,999=1	NW3	+	0.061	0.239	0.152	0.359
	Above $1,500,000=1	NW4	+	0.047	0.211	0.231	0.422

 # denotes the reference category.

Table 3: Independent Financial Literacy Variables, Descriptive Statistics, Baby Boomer Cohort

Parameter	Description	Variable sign	Expected sign	2002	
				Mean	Standard Deviation
Financial risk prepared to take	Takes substantial financial risks expecting substantial financial returns	FIR	+	0.014	0.012
	Takes above average financial risks expecting above average financial returns		+	0.079	0.058
	Takes average financial risks expecting average financial returns		–	0.376	0.409
	Not willing to take financial risks		–	0.332	0.384
	Never has any spare cash		–	0.199	0.138
Savings habits	Don't save: Usually spend more than income	FIS	–	0.061	0.052
	Don't save: Usually spend about as much as income		–	0.261	0.172
	Save whatever is left over–no regular savings plan		–	0.389	0.432
	Spend regular income, save other income		–	0.069	0.077
	Save regularly by putting money aside		+	0.219	0.268
Investment horizon	The next week	FIH	–	0.195	0.194
	The next few months		–	0.230	0.246
	The next year		–	0.169	0.175
	The next 2 to 4 years		+	0.128	0.129
	The next 5 to 10 years		+	0.177	0.170
	More than 10 years ahead		+	0.101	0.086

Variance inflation factors (VIFs) were used to test for multicollinearity between some groups of the independent variables. Where the variable has been transformed into a dummy variable, the original variable has been used. For tests of age, education, income and net assets, VIFs were 1.088 for age, 1.048 for education, 1.307 for income and 1.231 for net assets. Tests of gender, household structure, health and income yielded VIFs of 1.001 for gender, 1.048 for household structure, 1.034 for health and 1.082 for income. The financial literacy and financial risk variables resulted in VIFs of 1.153 for saving habits, 1.188 for investment horizon, and 1.179 for financial

risk-taking. As a rule of thumb, VIFs greater than ten warrant further examination, but there is no issue here as the VIFs are universally very small (less than 1.4) (O'Brien, 2007).

The analysis consists of two parts. To compare the accumulation and consolidation phases, a difference in means test will be used to examine significant differences in means between equity ownership and the portfolio share of equities in 2002 and 2014. Then, a regression of the household factors on equity ownership and the portfolio share of equities is applied to 2002 and 2014 data sets. The two models are defined as follows.

Given that this dependent variable is specified as a binary response ($0, 1$), a logit model is appropriate and it models the probability of a positive outcome (1) given a set of regressors by maximum likelihood. The log likelihood function for logit is:

$$lnL = \sum_{j \in S} w_j lnF(x_j b) + \sum_{j \in S} w_j ln\{1 - F(x_j b)\} \quad (1)$$

where S is the set of all observations j, such that $y_j \neq 0$, $F(z) = e^z/(1+e^z)$, and w_j denotes the optional weights. lnL is maximised where 0 corresponds to the 'constant only' model and 1 corresponds to perfect prediction for a discrete model (in which case the overall log likelihood is 0).

As $EQT_{portfolioshare}$ is naturally censored between 0 and 1, a tobit model is appropriate. The expected value of y is given as:

$$E(y_i | x_i, y_i > L) = x_i'\beta + \sigma \frac{\emptyset\{x_i'\beta - L/\sigma\}}{\Phi\{(L - x_i'\beta/\sigma)\}} \quad (2)$$

where $\emptyset$ is the standard normal density and Φ is the standard normal cumulative distribution function, y_i is the observed variable, x_i denotes the vector of exogenous and fully observed regressors, β is the coefficient, σ is the standard deviation. As two-tailed censoring applies, estimates are observed in the interval $[L, U]$, where L (lower limit or zero) and U (upper limit or 1) are the known censoring points.

Results

Participation in direct equities in accumulation and consolidation phases

The first analysis tests the hypothesis that there is a difference in the average participation in direct equities and the portfolio share of direct equities due to life cycle stage, i.e. that during the consolidation phase, baby boomer households increase their investment in direct equities to diversify and increase potential returns when compared to the accumulation phase. Multivariate means tests conclude that the means are likely different between 2002 and 2014 by rejecting the null hypothesis that the means are equal at the one per cent level. This result confirms that ownership levels have significantly changed over the 2002 and 2014 period, but it does not confirm the direction of the change. As mentioned previously, inspection of the descriptive variables show a nine per cent reduction in ownership in 2014, not an increase in ownership as expected.

Table 1 provides an indication that the baby boomer cohort increased their share of 'Superannuation'and 'Other Property' assets in 2014 as compared to 2002, by inspection of the mean values.

This finding has both positive and negative implications. The positive aspect is that baby boomers approaching retirement have not increased their exposure to equity market fluctuations, in fact they have reduced their exposure in the consolidation phase. However, it also indicates that those baby boomers who are not participating in equities are disregarding the benefits of equity investment, such as diversification and much needed higher returns to sustain a long period of retirement consumption.

Household Characteristics Relating to Likelihood of Direct Equity Ownership

Table 4 provides the estimated coefficients, standard errors and p-values of the parameters for the 2002 and 2014 logit regressions for the baby boomer cohort. The 2002 and 2014 logit models support the literature, in that households with lower levels of income (*INC1* and *INC2*), net wealth (*NW1*), being in poor health (*PHT*) and being a lone parent (*LPC*) significantly decrease the likelihood of direct equity ownership. In particular, *NW1* and *INC1* had very high coefficients for both models (*NW1*: -0.808 in 2002 and -0.963 in 2014; *INC1*: -0.845 in 2002 and -0.403 in 2014). This is not surprising as households with low levels of financial resources, which because of their low level of income or high levels of expenditure to income have little discretionary income available to contribute to savings. In addition, identifying as having poor health increases future income uncertainty and correspondingly household's lower investment in risky assets such as equities (Yao, Hanna and Lindamood, 2004).

Significant positive variables for both 2002 and 2014 logit regressions include the higher levels of net wealth (*NW3* and *NW4*), savings habits (*FIS*), savings horizon (*FIH*) and financial risk-taking (*FIR*). The highest level of net wealth (*NW4*) had particularly high coefficients (0.678 in 2002 and 0.986 in 2014), with the change showing that being in the highest wealth category increased the magnitude of likely ownership in 2014 since 2002. These results confirm key factors identified by the literature. First, households with higher levels of net wealth are more likely to have more diversified portfolios, thus increasing the likelihood of including equities in the portfolio. Second, higher levels of wealth also provide opportunity to acquire and practice financial literacy skills, or seek advice, thus enabling these households to develop good savings habits, have long savings horizons and be more willing to take financial risks. Thus, these households are more likely to understand risk, return and compounding concepts and want to avail of the risk/return profile of equities and to diversify their portfolio.

There are differences between the results reported in 2002 and 2014 in Table 4. First, there are a smaller number of significant coefficients. The lone parent with children household structure (*LPC*) is the only household structure variable that is significant in 2014. In 2002, both the lone person (*LNP*) and multi-family/other (*MFO*) households were significant negative coefficients, while being in a couple (*CPL*) household was significantly positive. The highest level of income variable (*INC4*) is also not significant in 2014, and the lower levels of income variables have lost their highly significant status (but are still significant at the 5% and 10% level). Surprisingly, being female (*FEM*)

in 2002 was a significant positive determinant of equity holdings, but was not significant in 2014.

Thus for the baby boomer cohort, variances in household structure, income level and gender impacted equity ownership significantly more in 2002 than in 2014. These results may be indicative of a number of changes the baby boomers have experienced as they transitioned from the accumulation phase to the consolidation phase. Namely, that as the cohort aged, financial decisions are determined more by wealth than by income, as households have now reached peak earnings and may be funnelling more into their wealth accumulation strategy. Also, household structures in the consolidation phase may not be as important as in the accumulation phase because some household expenses (mortgages and children's education) have been paid down (with the exception of lone parents that still have children in their care).

In addition, macroeconomic conditions in 2014 in Australia were substantially different to that of 2002, with the GFC in 2007-08 having a detrimental impact on economic growth (1% per annum of gross domestic product (GDP) in 2002 and 0.3% in 2014) (ABS, 2017). This experience may be the reason that the female coefficient was no longer significant in 2014, as females are well substantiated in the literature for being risk averse. Furthermore, the GFC may have exacerbated the wealth divide, and thus the wealthier portion of the population were able to continue holding equities while those in lower wealth categories liquidated their holdings.

The statistical significance of the financial literacy variables in equity ownership point to another issue regarding macroeconomic conditions noted in the literature- that low levels of financial literacy cause people to overweight their decisions based on recent events such as equity bull and bear markets (Yao, Hanna and Lindamood, 2004). To some degree, it may be a comfort that those who invest in equities have a higher degree of financial literacy, as these investors have increased awareness of financial risks and may be more able to withstand market fluctuations. From a public policy and financial education perspective though, there is more to do to increase financial literacy levels to attain better wealth outcomes for more of the population.

Table 4: Logit Regression Results for EQT_{owner}, Baby Boomer Cohort

Variable	2002			2014		
	Coefficient	Robust standard error	p-values	Coefficient	Robust standard error	p-values
FEM	0.127	0.070	0.069	0.074	0.068	0.278
LPC	-0.302	0.122	0.013	-0.309	0.153	0.043
LNP	-0.304	0.120	0.011	0.014	0.116	0.906
CPL	0.250	0.088	0.004	-0.006	0.079	0.940
MFO	-0.759	0.287	0.008	-0.167	0.243	0.493
DEG	0.108	0.122	0.373	-0.113	0.128	0.379

Table 4: Logit Regression Results for EQT_{owner}, Baby Boomer Cohort (continued)

Variable	2002			2014		
	Coefficient	Robust standard error	p-values	Coefficient	Robust standard error	p-values
VOC	0.030	0.118	0.801	0.019	0.124	0.880
Y11	-0.145	0.115	0.206	-0.103	0.129	0.424
EHT	0.090	0.116	0.437	0.030	0.130	0.815
VHT	0.065	0.076	0.395	-0.013	0.077	0.869
FHT	-0.081	0.111	0.470	-0.011	0.100	0.912
PHT	-0.390	0.235	0.096	-0.336	0.197	0.089
INC1	-0.845	0.219	0.000	-0.403	0.219	0.066
INC2	-0.376	0.107	0.000	-0.261	0.108	0.016
INC4	0.241	0.077	0.002	0.063	0.084	0.452
NW1	-0.808	0.079	0.000	-0.963	0.092	0.000
NW3	0.744	0.180	0.000	0.454	0.096	0.000
NW4	0.678	0.207	0.001	0.986	0.092	0.000
FIS	0.057	0.030	0.058	0.123	0.030	0.000
FIH	0.091	0.023	0.000	0.041	0.023	0.079
FIR	-0.494	0.043	0.000	-0.391	0.047	0.000
Constant	1.703	0.251	0.000	0.462	0.258	0.073
Number of observations	4725			4914		
Wald Chi2	846.910	0.000		837.430	0.000	
Log Psedolikelihood	-2714.409			-2781.297		
Pseudo R2	0.171			0.162		

Household characteristics relating to higher (or lower) direct equity portfolio share

Table 5 reports the tobit regression results for 2002 and 2014 for the portfolio share of equity ownership. The coefficients in these regressions are small because as described in Table 2, the portfolio share of equities accounts for between two and 10 per cent of household portfolios. For

both of the 2002 and 2014 models, there are many more significant positive coefficients than negative coefficients. Being in a couple household (*CPL*), having higher levels of net wealth (*NW3* and *NW4*) and the financial literacy and financial risk variables (*FIS*, *FIH*, *FIR*) positively increased the likelihood of an increasing portfolio share of equities. Being in the lowest net wealth category (*NW1*) was a significant negative coefficient for both 2002 and 2014, due to the limited opportunity to save after paying living expenses. As aforementioned, it is not surprising that higher levels of net wealth, financial literacy and financial risk taking are good indicators of equity investment in a household's asset portfolio.

The results for 2014 differ slightly to that of 2002. First, a multi-family/other household structure (*MFO*) and a low educational attainment (*Y11*) are negatively significant in 2002 but not significant in 2014. These factors most likely feed in to a low socio-economic profile of the household, as lower levels of education and being in share accommodation are indicative or lead to lower incomes and net wealth. In 2014, the second income category, *INC2*, is negatively significant at the five per cent level, and is the only income variable to be significant in both 2002 and 2014. It is somewhat surprising that income levels have not factored more significantly in determining the portfolio share of equities, but wealth is a very important determinant. Besides the minor variations in significant variables between 2002 and 2014, this analysis continues to show that no matter the life cycle phase, having higher levels of wealth, financial literacy and financial risk-taking are an extremely important determinant of equity holdings.

Table 5: Tobit Regression Results for $EQT_{portfolioshare}$, Baby Boomer Cohort

Variable	2002			2014		
	Coefficient	Robust standard error	p-values	Coefficient	Robust standard error	p-values
FEM	0.007	0.004	0.116	0.002	0.005	0.673
LPC	0.008	0.009	0.384	0.013	0.013	0.315
LNP	0.006	0.009	0.530	0.019	0.008	0.023
CPL	0.025	0.005	0.000	0.010	0.005	0.050
MFO	-0.036	0.017	0.038	-0.007	0.016	0.642
DEG	0.000	0.008	0.961	0.001	0.008	0.899
VOC	0.002	0.007	0.825	0.003	0.008	0.746
Y11	-0.013	0.007	0.078	0.000	0.009	0.986
EHT	0.006	0.007	0.403	0.002	0.008	0.806
VHT	0.003	0.005	0.467	0.002	0.005	0.659

Table 5: Tobit Regression Results for $EQT_{portfolioshare}$, Baby Boomer Cohort (continued)

Variable	2002			2014		
	Coefficient	Robust standard error	p-values	Coefficient	Robust standard error	p-values
FHT	-0.001	0.008	0.901	0.009	0.007	0.200
PHT	0.010	0.020	0.622	0.009	0.017	0.601
INC1	-0.024	0.018	0.177	-0.017	0.019	0.366
INC2	-0.012	0.008	0.131	-0.019	0.008	0.014
INC4	0.006	0.005	0.209	-0.002	0.006	0.681
NW1	-0.042	0.005	0.000	-0.049	0.007	0.000
NW3	0.033	0.009	0.000	0.029	0.006	0.000
NW4	0.058	0.013	0.000	0.074	0.007	0.000
FIS	0.003	0.002	0.084	0.006	0.002	0.003
FIH	0.005	0.001	0.000	0.004	0.002	0.006
FIR	-0.033	0.003	0.000	-0.026	0.003	0.000
Constant	0.077	0.016	0.000	-0.014	0.017	0.428
Number of observations	4725			4914		
F statistic	21.450	0.000		19.170	0.000	
Log Psedolikelihood	370.416			-25.887		
Pseudo R2	7.112			0.941		

Practical Implications for Financial Advice

This study offers some insights that are of practical use for financial advisers. For the baby boomer cohort, direct equity investment is like a double-edged sword, on the one hand the volatility puts capital at risk of loss, while on the other hand the relatively higher returns are somewhat necessary to fund longer life expectancies. For those that give it consideration, the shortening investment time horizon and increasing aversion to risk that comes with ageing, in addition to experiencing stock market crashes during their lifetimes, makes direct equity investment a wary proposition the closer they get to retirement. This study shows that baby boomers in 2014 are less invested in equities than they were 12 years prior. Thus advisers must understand these concerns and give them due consideration when formulating advice. Client education and tailored communication will be key to providing an investment strategy that benefits the client's wealth outcome but that the client can also digest.

Furthermore, financial advisers will need to consider their approach when formulating advice to clients that are at the margin, that is, those that are hovering below being categorised as having higher levels of wealth, financial literacy and financial risk-taking, as these clients are less likely to be inclined to invest in equities as a general rule. Females are also an important segment of the clientele that need tailored advice and communication strategies. Regular risk-profiling and data collection may help an adviser identify clients that need financial literacy education intervention.

Conclusion

This study seeks to measure the extent to which Australian baby boomer households ascribe to financial theory by increasing direct equity investment in the consolidation life cycle phase and garner insight into vulnerability to equity market volatility as they approach retirement. The 2002 and 2014 cross sections of the HILDA survey were employed to compare equity ownership and equity portfolio share of the baby boomer population in the accumulation phase and the consolidation phase. A number of conclusions can be drawn from the findings. First, the average level of equity investment and portfolio share are significantly different in 2002 to 2014. However, the descriptive statistics show that the direction of the change is not as predicted as participation in equity investments was reduced in 2014. Furthermore, the logit and tobit models highlighted differences in the significance of characteristics between the two periods, such as variances in household structure, income level and gender. Thus it can be argued that transitioning to the consolidation phase induces a change in financial decision-making, but that in this study the impact of the GFC and ongoing changed macroeconomic circumstances could not be disentangled.

Second, an elevated level of wealth is highly significant for equity participation and portfolio share. The results of the 2014 model show an increase in magnitude of high wealth level, and it can be inferred that the GFC may have exacerbated the wealth divide, and thus the wealthier portion of the population were able to continue holding equities while those in lower wealth categories liquidated their holdings. Concomitantly, higher levels of financial literacy and willingness to take financial risks were consistent with equity investment, and in combination with exacerbating the wealth divide, the market volatility derived from the GFC may have led people with lower levels of financial literacy to divest of equity ownership while those with higher levels persisted.

Overall, the results did not confirm our hypothesis that baby boomer households have increased direct equity ownership in the consolidation phase. While an avenue for future research, it is likely that the GFC reduced household investment in equities, particularly those household members who may have lower levels of wealth, income, financial literacy and willingness to take financial risk. Accordingly, these households are missing out on important diversification benefits that equities can provide as well as potential for higher portfolio returns. However, it may be of comfort to policy makers that baby boomer households are not at peak levels of equity market volatility exposure in this important pre-retirement consolidation phase.

These results have important implications for public policy and financial educators and advisers. Clearly, higher levels of financial literacy have positive impacts on minimising the risk exposure of a household's asset portfolio by the inclusion of direct equity investment as an important component of a diversification strategy. More financial literacy education may improve financial decisions made by those at the lower levels of income and wealth. Future research may benefit from more detailed decomposition of equity ownership and controlling for the macroeconomic environment.

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