View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by ScholarlyCommons@Penn

University of Pennsylvania
ScholarlyCommons

Wharton Pension Research Council Working Papers

Wharton Pension Research Council

1-22-2019

Retirement Preparedness and Financial Literacy in Singapore: How Do the Self-Employed Compare?

Benedict S.K. Koh
Singapore Management University

Olivia S. Mitchell
The Wharton School, University of Pennsylvania

Follow this and additional works at: https://repository.upenn.edu/prc_papers

Part of the Economics Commons

Koh, Benedict S.K. and Mitchell, Olivia S., "Retirement Preparedness and Financial Literacy in Singapore: How Do the Self-Employed Compare?" (2019). *Wharton Pension Research Council Working Papers*. 24.
https://repository.upenn.edu/prc_papers/24

The research was supported by the Singapore Ministry of Education (MOE) Academic Research Fund Tier 3 grant with the MOE's official grant number MOE2013-T3-1-009, the Singapore Management University, and the Pension Research Council/Boettner Center at The Wharton School of the University of Pennsylvania.

This paper is posted at ScholarlyCommons. https://repository.upenn.edu/prc_papers/24
For more information, please contact repository@pobox.upenn.edu.

Retirement Preparedness and Financial Literacy in Singapore: How Do the Self-Employed Compare?

Abstract

Policymaker and media attention has recently focused on the rise of the so-called “gig” or freelance employment sector, where workers lack formal long-term relationships with one specific firm. This topic has captured public interest partly because of concern that those engaged in nontraditional work arrangements may lack the opportunity to save in formal retirement plans. This paper examines how the self-employed in Singapore compare to regular employees as well as the unemployed in terms of retirement preparedness, retirement saving, and portfolio diversification. We also investigate the extent to which differences in financial literacy can account for the different behaviors across types of workers. Overall, we find that the self-employed and employees save and invest remarkably similarly. Financial literacy is quite important: respondents scoring one additional correct answer on the FinLit questions have about 3% more net financial wealth, 2% more nonhousing net wealth, and 14% more total wealth than their less savvy counterparts. More financially literate individuals also hold better diversified portfolios over the life cycle.

Keywords

gig economy, financial literacy, investment, household portfolios, pension, Central Provident Fund, retirement, saving

Disciplines

Economics

Comments

The research was supported by the Singapore Ministry of Education (MOE) Academic Research Fund Tier 3 grant with the MOE’s official grant number MOE2013-T3-1-009, the Singapore Management University, and the Pension Research Council/Boettner Center at The Wharton School of the University of Pennsylvania.

This working paper is available at ScholarlyCommons: https://repository.upenn.edu/prc_papers/24

Retirement Preparedness and Financial Literacy in Singapore: How Do the Self-Employed Compare?

Benedict Koh and Olivia S. Mitchell

January 22, 2019

PRC WP2019-1
Pension Research Council Working Paper
Pension Research Council
The Wharton School, University of Pennsylvania
3620 Locust Walk, 3000 SH-DH
Philadelphia, PA 19104-6302
Tel.: 215.573.3414 Fax: 215.573.3418
Email: prc@wharton.upenn.edu
http://www.pensionresearchcouncil.org

The authors acknowledge excellent programming assistance from Yong Yu and the Singapore Life Panel (SLP®) team at Singapore Management University, as well as the RAND SLP® team. The research was supported by the Singapore Ministry of Education (MOE) Academic Research Fund Tier 3 grant with the MOE's official grant number MOE2013-T3-1-009, the Singapore Management University, and the Pension Research Council/Boettner Center at The Wharton School of the University of Pennsylvania. All opinions are solely those of the authors. © 2019 Koh and Mitchell. All rights reserved.

Retirement Preparedness and Financial Literacy in Singapore: How Do the Self-Employed Compare?

Benedict Koh and Olivia S. Mitchell

Abstract

Policymaker and media attention has recently focused on the rise of the so-called "gig" or freelance employment sector, where workers lack formal long-term relationships with one specific firm. This topic has captured public interest partly because of concern that those engaged in nontraditional work arrangements may lack the opportunity to save in formal retirement plans. This paper examines how the self-employed in Singapore compare to regular employees as well as the unemployed in terms of retirement preparedness, retirement saving, and portfolio diversification. We also investigate the extent to which differences in financial literacy can account for the different behaviors across types of workers. Overall, we find that the self-employed and employees save and invest remarkably similarly. Financial literacy is quite important: respondents scoring one additional correct answer on the FinLit questions have about 3% more net financial wealth, 2% more nonhousing net wealth, and 14% more total wealth than their less savvy counterparts. More financially literate individuals also hold better diversified portfolios over the life cycle.

Keywords: gig economy, financial literacy, investment, household portfolios, pension, Central Provident Fund, retirement, saving

JEL Codes: D14, E21, G11, J32

Benedict S. K. Koh
Professor of Finance
Singapore Management University
50 Stamford Road, #04-01; Singapore 178899
T: 65-6828-0716 • F: 65-6828-0777
Email: skkoh@smu.edu.sg

Olivia S. Mitchell
International Professor of Employee Benefit Plans
Professor of Insurance/Risk Management and Business Economics/Policy
Director, Pension Research Council and Boettner Center for Pensions & Retirement Research
The Wharton School, 3620 Locust Walk, St 3000 SHDH, Philadelphia, PA 19104-6320
T: 215-898-0424 • F: 215-898-0310
Email: mitchelo@wharton.upenn.edu

Retirement Preparedness and Financial Literacy in Singapore: How Do the Self-Employed Compare?

In many nations, policymakers and the media are focusing increasing attention on what has been termed the "gig" or on-demand economic sector. In these markets, workers tend to be self-employed, hold temporary jobs, act as freelancers, and lack a permanent employment relationship with a long-term employer. Examples of such jobs include driver services (e.g. Uber or Lyft), rooming services (e.g. Airbnb), delivery and household services (e.g. TaskRabbit), and even banking and medical care services (Donovan et al., 2016). It has been estimated that in Europe and the US, for instance, 20-30 percent of the workforce currently engages in on-demand work,[1] and 95% of employment growth over the last decade occurred in the context of such alternative work arrangements (Katz and Kreuger, 2016). The gig economy is also prevalent and growing quickly in Asia; for example, 13% of Vietnamese population is currently self-employed, and in China the fraction is 11% (Solodkiy, 2017). In Singapore, it has been estimated that 9% of the workforce is currently comprised of freelancers (though this may be an underestimate; see Chan, 2017).

One reason that the gig workforce raises policy concerns is that individuals employed in the sector may lack coverage by important social protection programs including medical insurance and retirement accounts. In the U.S., for instance, regular employees are entitled to a minimum statutory hourly wage rate, unemployment compensation, and coverage by the national old-age retirement system (Donovan et al., 2016); by contrast, the self-employed generally lack access to such coverage. In Singapore, freelancers tend not to have medical insurance or medical leave, and it is believed that many do not make contributions to the national pension system known as the Central Provident Fund (CPF). While work is underway to enhance gig workers' access to the

[1] For instance see McKinsey Global Institute (2017).

Medisave program in Singapore (Cheng, 2018), much remains to be learned about freelancers' preparedness for retirement.[2]

The present paper contributes to knowledge by examining whether those engaged in nontraditional work arrangements in Singapore save and invest in ways similar to or different from their traditional employee counterparts. Our analysis focuses on Singapore as we have access to a nationally representative panel of economic and other information on both employees, the self-employed, and the unemployed; this survey is also unique in that it includes a special module on financial literacy. Our dataset therefore allows us to investigate how and whether traditional employees are similar to or different from the self-employed and unemployed, and what role financial literacy plays in these outcomes. Our goal is to determine what, if anything, might be done to enhance the financial wellbeing and retirement prospects for the freelance workforce.

What we find is that employees and the self-employed at older ages appear to be preparing for retirement in similar ways. In particular, their self-reported chances of struggling in retirement and being well-prepared for retirement are not significantly different, nor are their net wealth holdings. Moreover, the self-employed and employees hold comparable portfolios in terms of complex assets and diversification. We also find that the more financially literate are more confident about their retirement preparedness, but the financially literate among the self-employed are not differentially more confident. The unemployed are also rather similar to, but less likely to participate in the CPF than, the other two groups.

In what follows, we first briefly outline how Singapore's retirement saving system works. Next we describe the dataset and outline the empirical methodology used to address our empirical

[2] For recent efforts by Singaporean policymakers, see Tripartite Working Group (2018).

questions. This is followed by a discussion of results, and we conclude with a discussion of policy implications and further research questions deserving of attention.

Retirement Saving and Investment in Singapore

The Singapore Central Provident Fund was established in 1955 as a national mandatory defined contribution retirement savings system, with working adults contributing between 5 to 20% of their salaries to the old-age (retirement) program. These contributions attract matching rates ranging from 7.5% to 17% from employers depending on the employees' age.[3]

The CPF Board channels monthly contribution from employees into three accounts: the Ordinary Account (OA), the Special Account (SA), and the Medisave Account (MA). Cash savings in these accounts earn interest on their balances. The savings in the Ordinary Account (OA) can be used to purchase homes, service mortgage payments, finance premiums for insurance protection, pay for children's tertiary education, and to invest in financial products to grow savings. The Special Account holds savings primarily for retirement and cannot be withdrawn before the age of 55. The Medisave account holds savings for members to pay inpatient hospital bills, selected outpatient treatments, and premiums for insurance against catastrophic illness and disabilities. All working adults have only three accounts until they turn 55 years old, when savings earmarked for retirement are deposited into the Retirement Account (RA). Balances in the Retirement Account will be invested in life annuities (CPF life).

[3] As per CPF (2018), mandatory total system contribution rates vary by age: for workers age 55 or younger, the employer pays 17% and the employee pays 20% of earnings; for workers age 55-60, the respective contribution rates are each 13%; for workers age 60-65 the rates are 9% and 7.5%; and for workers over age 65, the respective rates are 7.5% and 5%. The portion of the mandatory contribution allocated to the Special Account (SA) for retirement also varies by age: if 35 or younger, it is 6% of earnings; if age over age 35 to 45, 7%; if over age 45 to 50, 8%; if over age 50 to 55, 11.5%; if over age 55 to 60, 3.5%; if over age 60 to 65, 2.5%; and if over 65, 1%.

CPF members have the option of leaving their savings with the CPF Board to earn interest or alternatively, they may seek higher returns by investing in a wide variety of financial instruments. The instruments available for investments include bank fixed deposits, government bills and bonds, corporate bonds, property funds, equities traded on the Singapore stock exchange, annuities and endowment insurance policies, investment-linked insurance products, unit trusts, exchange traded funds, fund management accounts, and gold. For savings in the Special Account, a narrower set of financial products is permitted for investment, as members are discouraged from taking high risk when investing savings meant for retirement. Members can invest in all the financial instruments listed previously except fund management accounts, shares, property funds, REITS, corporate bonds, gold, investment-linked insurance products, unit trusts, and higher risk exchange traded funds. To hedge against longevity risk, it is mandatory for CPF members since 2013 to set aside a basic retirement sum ($85,500 in 2018) in their Retirement Account upon reaching age 55, to invest in a life annuity scheme which will pay out a stream of income from age 65 until their deaths.

Data: The Singapore Life Panel (SLP®)

Our empirical comparison of self-employed versus employed workers relies on the Singapore Life Panel (SLP®), a high-frequency survey fielded by the Centre for Research on the Economics of Ageing (CREA) at the Singapore Management University.[4] Initiated in 2015, the SLP® is a longitudinal study of individual and household circumstances and behavior in a representative cohort of Singaporean citizens and permanent residents age 50-70 when first included in the survey in 2015. Monthly surveys are ongoing.[5] Designed with input from

[4] For additional information on the SLP® see Vaithianathan et al. (2017).
[5] Data are anonymized so no personal identification of individuals or households is feasible.

international experts,[6] the survey includes many state-of-the-art and globally harmonized questions on health and health expenditures, wealth and investments, expectations and preferences, consumption and spending, and other factors central to the development of a broad-based survey useful for a wide range of economic, social, and other analyses.

The SLP® is distinguished from other longitudinal studies by its large-scale monthly frequency questionnaires delivered over the internet. The initial recruitment effort resulted in a panel of 15,000 individuals from 11,500 distinct households who completed a baseline survey in May-July 2015. Analysis of the panel along several dimensions has demonstrated that the survey is closely representative of the population, and attrition rates are low.[7]

Retirement Financial Wellbeing and Retirement Preparedness among Older Singaporeans:

To evaluate older Singaporeans' financial wellbeing and retirement preparedness, it is useful to examine both qualitative and quantitative measures available in the SLP® survey.

Key Dependent Variables

Respondents were asked two qualitative questions about their retirement preparedness. One requested respondents to provide their self-assessed chances of struggling financially in retirement, and the second asked them to assess the quality of their financial preparedness for retirement (potential answers were excellent, very good, good (all three coded as equal to 1), or fair or poor (coded as equal to 0).

[6] Input was provided by the creators of the US Health and Retirement Study (HRS), several of the international sister studies of the HRS including the American Life Panel (ALP) at RAND, and the Chilean Encuesta de Protección Social (EPS).
[7] For additional information on the survey see Koh et al. (2018) and https://crea.smu.edu.sg/singapore-monthly-panel.

A different approach explored respondents' wealth, which we measure here in three ways. The most comprehensive measure is *total net wealth* which includes respondent reports of household pension values (including CPF assets), financial wealth, bank accounts, insurance, vehicles, as well as primary and (if relevant) secondary residences net of debt. [8] Another measure, *total non-housing wealth*, excludes housing assets and debt from the previous measure. The narrowest wealth measure we use, *net financial wealth*, excludes pension assets from the previous definition.

We also compare self-employed versus traditional workers' investment behaviors based a portfolio diversification measure conventionally used in the literature. Specifically, we divided each respondent's portfolio into equity/stocks, fixed-income/bonds, and cash, and then we determined whether the respondent's *risky share*[9] of assets fell within +/-10% of the fraction conventionally recommended by financial advisors. This "rule of thumb" metric is 100 minus his age, a measure "deemed broadly consistent with a lifecycle model of saving and investing" (Milevsky cited in Powell 2018).

Finally, we examine SLP® respondents' portfolios by examining the proportion of complex assets they held. For wealth held outside CPF accounts, we sum each age-eligible respondent's holdings (plus those of the spouse, if any) to obtain household non-CPF assets. For wealth held in CPF accounts, the respondent was asked to report his own CPF balance (and that

[8] We cannot disentangle ownership for assets that tend to be jointly held such as owner-occupied housing.

[9] A respondent's risky share is defined as the value of his stocks/shares, unit trusts, mutual funds, investment-linked products, ETFs, properties, and gold, as a ratio of his total wealth (see Appendix Table 3). This is a composite of a variable HoldRisk = 1 if a respondent held any risky assets (defined as any common stocks/shares, unit trusts, mutual funds, investment-linked investments, ETFs, properties, gold), 0 otherwise; a variable HoldEquity = 1 if the respondent held equity (defined here as any common stocks/shares, unit trusts, mutual funds, investment-linked investments, ETFs, gold), 0 otherwise; a variable HoldFI=1 if a respondent holds corporate bonds, treasury bonds, Singapore savings bonds, endowment policies (life insurance), etc; and a variable HoldCash = 1 if the respondent held bank checking account, savings account, time or fixed deposits, 0 otherwise. If a respondent's total net wealth was less than $1,000, we dropped the observation.

of the spouse, if any). Each respondent also provided details of own CPF investments (and spouse's, if any) held in shares. Additionally, we defined *noncomplex nonpension investments* as including the respondent's owner-occupied home, checking/saving bank accounts, vehicles, any fixed-term deposits, bonds, and whole life insurance policies. *Complex nonpension assets* included own businesses, investment property, shares/stock funds, gold/gold funds, managed accounts, and mutual funds/unit trusts. Retirement account holdings were grouped according to whether the respondent left his CPF retirement assets in the default account (invested by the government), or whether he held "permitted" assets managed by non-government entities via the CPF Investment Scheme (CPFIS).[10] To this end, *noncomplex CPF assets* refer to money managed by the CPF, and *complex CPF assets* are assets invested in CPFIS accounts. We then investigate the fraction of complex assets held inside and outside the pension accounts, as well as the total fraction complex in the respondent's entire portfolio.

Control Variables

Our analysis of inancial wellbeing and retirement preparedness seeks to establish empirical relationships between the key behavioral outcomes and socioeconomic factors that we believe may be associated with these. As in most prior studies in this area, we control on the respondent's age, gender, marital status, educational level, health status, homeownership status, and whether the individual was employed, self-employed, or unemployed.[11] We also include an indicator of whether the respondent

[10] Risky assets included gold ETFs and gold certificates, investment-linked insurance products, annuities, government-guaranteed and statutory board bonds, unit trusts, and property funds; only those having at least $20,000 in their Old-Age accounts may invest in those (or at least $40,000 in their Special Accounts). For additional detail see https://www.cpf.gov.sg/Assets/members/Documents/CPFISInvestmentProducts.pdf. The funds permitted under the investment scheme are relatively expensive by international standards; see Koh et al. (2008a and b, 2010).

[11] Respondents were asked "What is your current employment situation?" and we categorized as employees those saying they were working for pay; unemployed persons as those self-reporting as unemployed; and freelancers as those reporting they were self-employed.

managed the household's finances alone or whether help was received; a measure of the respondent's confidence about his financial knowledge; his stated time horizon over which he did financial planning; and his general and financial risk preferences. (Descriptive statistics for all of the control variables are provided in Appendix Table 2).

To measure each respondent's level of financial literacy, we implemented the "Big Three" questions developed by Lusardi and Mitchell (2008, 2011a, b). Specifically, in the Singapore Life Panel we asked (correct answers in **bold**):

- Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: [**more than $102,** exactly $102, less than $102? Don't know, refuse to answer.]

- Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy: [more than, exactly the same as, or **less than today** with the money in this account? Don't know; refuse to answer.]

- Do you think that the following statement is true or **false**? "Buying a single company stock usually provides a safer return than a Unit Trust. [Don't know; refuse to answer.]

As is conventional, we add each respondents' correct answers to the Big Three questions, to produce a Financial Literacy index.

Who are the Employed, Self-Employed, and Unemployed?

Our empirical analysis focuses on the 6,686 SLP® survey respondents age 50-70 who also answered the financial literacy questions of most interest to our analysis. Of these, half (51%) indicated they were employed, 10% were self-employed, and 39% reported themselves as unemployed.[12] Table 1 compares the employed, self-employed, and unemployed respondents in terms of their demographic characteristics, focusing on the full sample as well as the younger (and hence less likely to be retired) subset of those age 50-62. Given that Singapore's official retirement age is 62, some of the older

[12] Additional details on the respondents appear in Appendix Tables 1 and 2. This analysis omits persons self-reporting as retirees, homemakers, or disabled.

respondents who are self-employed and above 62 years old may have held full-time employment until their retirement. The subset allows us to focus on the respondents who chose to be self-employed even though they could seek full-time employment under current labor laws. Interestingly, very few observable factors differentiate the self-employed from the employed, as is clear from the MLogit marginal effects reported in column 1 (where employed is the reference category). The self-employed are slightly younger and slightly (2%) less likely to be married and more likely (11%) to be male compared to the employed subgroup, and they also score just slightly higher on the Financial Literacy questions. In contrast, many more factors differentiate the unemployed from the employed. Column 2 indicates that the unemployed tend to be female, older, less educated, in worse health, and tend not to own their own homes, compared to regular employees. Results are similar for the younger age group (age 50-62).

Table 1 here

Empirical Comparisons

Next we use multiple regression analysis to determine whether and how the key financial outcomes of interest vary across the population, and in particular, how these differ for regular employees, the self-employed, and the unemployed. Throughout, we describe results in terms of associations rather than causal relationships, since our goal is to explore whether different types of workers seem to be confident and well-equipped to manage their financial affairs and retirement account saving and investment. We are aware, of course, that many of the factors we examine could well be endogenous: that is, a life cycle economic model acknowledges that financial preparedness is endogenously determined by a number of decisions made over the lifetime including investment in health and education as well as financial market experience. Moreover, investing in financial knowledge is also endogenous: that is, consumers must devote time and money to learn about financial products and the working of the capital market (Lusardi et al., 2017;

Kim et al, 2016). While here we do not investigate the possibility of reverse causality, it is worth noting that there is now substantial evidence supporting the conclusion that financial knowledge does drive more saving, better retirement planning, better investment outcomes, and more informed decisions about retirement payouts. [13] Accordingly, the effort is likely to be quite informative to those interested in the association between the financial behaviors we explore, and financial literacy.

To evaluate how (and whether) employees differed from the self-employed and the unemployed in terms of their financial situations, we estimate models of the following general type:

$$Y = f\{c + \beta \quad X + [\gamma SE + \theta * SE * X] + [\delta UNEM + \sigma * UNEM * X], \epsilon\}.$$

Here Y refers to a financial outcome variable of interest; X to the controls including the FinLit index; SE is an indicator of the respondent's self-employment status (=1 if self-employed, 0 if not); *UNEM* is an indicator of the respondent's unemployment status (=1 if unemployed, 0 if not); $SE * X$ refers to interactions between a self-employed respondent's status and all controls; and *UNEM*X* refers to interactions between a unemployed respondent's status and all controls. The ϵ term is included to capture remaining random error. When the dependent variable is continuous, we use ordinary linear regression models, and when the dependent variable is qualitative, we use Probit estimation and present marginal effects (rather than coefficients for easier interpretation). In each case, we interpret the β vector as indicating how *employees' X* characteristics are associated with the dependent variable; γ indicates the differential effect of being *self-employed* (versus employed); θindicates whether the *X* variables have differential impacts among the self-

[13] A discussion of this literature appears in Lusardi and Mitchell (2014); see also Brown et al. (2016, 2017), and Clark et al. (2017).

employed; δ reveals the differential effect of being *unemployed* (versus employed); and σ indicates whether the X variables have different effects for the unemployed. At the base of each column we also report the value of the F-statistic indicating whether the vector of interaction terms differs from zero (values of less than 0.05 are considered statistically significant).

Self-Assessed Retirement Preparedness

Table 2 depicts our findings for the two self-assessed retirement preparedness questions: respondents' self-assessed chances of struggling in retirement (measured in percentage points), and an indicator of whether respondents believe they are well prepared for retirement (where yes=1, else =0). In the full sample as well as the younger subset, the average reported chance of struggling financially in retirement is 46%, while 43% of both samples feel they have made good financial preparations for retirement.

Table 2 here

The first column and top panel of Table 2 confirms that older employees feel less likely to struggle financially in retirement, along with the better-educated. Financially confident employees are also less likely to worry about financial retirement shortfalls and to feel better prepared. By contrast, employees in fair/poor health worry more and believe themselves to be less well prepared for retirement. Rather strikingly, the second panel of Table 2 shows that the self-employed *(self-emp)* term along with virtually all of the *self-emp* interactions in the first and second columns are not statistically significant. What this means is that the self-employed do not differ from their employed counterparts in terms of concerns over financial status in retirement, after controlling on other factors. Moreover, there is also no significant difference between the more versus the less

financially literate, comparing employees and the self-employed. Results are similar for the younger subset of persons age 50-62.

The third panel of Table 2 focuses on the unemployed, where we see that the most statistically important interaction terms are for education: specifically, the better-educated yet unemployed persons are less confident that they have done a good job saving, compared to their employee counterparts. Few other factors are statistically significant at conventional levels. It is worth noting, however, that the final two rows of Table 2 report the P values for tests that all *Self-emp* and *Unemp* interactions are zero. In other words, the self-employed do not differ from employees in any of the models evaluated in terms of their self-assessed retirement preparedness. This is of interest since it suggests that employees and the self-employed are not differentially concerned about retirement wellbeing. By contrast, there is a statistically significant difference between the factors rendering unemployed respondents less confident about retirement and their employee counterparts.

Wealth Patterns in the SLP®

Table 3 reports multivariate linear regression coefficients from models linking older Singaporeans' household wealth and the control variables of interest. For the full sample, net financial wealth in Column 1 averages S$191,000; Column 2 expands the wealth definition to include all non-housing net wealth, which averages S$485,000; and Column 3 is the broadest measure of net wealth reported, averaging S$11,430,000 (values are slightly higher for the age 50-62 subset).[14] Interestingly, the FinLit coefficient is positive, statistically significant, and economically meaningful for employees in all four columns, confirming the strong positive effects reported in

[14] Median wealth for the same three variables were S$38,000, S$238,000, and S$653,000 for the full sample, and S$40,000, S$280,000, and S$690,000 for the younger subset.

numerous other studies (e.g., Lusardi and Mitchell 2014). For instance, an employed respondent scoring one additional correct answer on the FinLit questions would be expected to have around $4,850 (3%) more net financial wealth, $9,400 (2%) more nonhousing net wealth, and S$1,547,000 (14%) more total wealth.

Table 3 here

Other attributes associated with higher wealth across the columns in Table 3 include being married, having more education, having more financial confidence and risk appetite, having finances managed by the respondent with help, and having a long planning horizon. Indeed the only control variable systematically associated with having lower wealth was reporting being in fair/poor health.

Turning to the interaction terms of central interest in Table 3, the *self-emp* interactions are generally not significantly different for all wealth measures. Indeed, the P-values reported at the base of the columns indicate that we cannot reject the hypothesis that the factors associated with employees' wealth are the same as those associated with wealth of the self-employed. Accordingly, these findings corroborate our earlier result that employees and the self-employed are not differentially prepared for retirement, after controlling demographic factors.

There is some evidence that wealth levels of the unemployed are different from those of their employed counterparts. Though many of the individual interaction terms are not significant, the P-value in the last row of the chart confirms that overall, non-housing net wealth is substantially lower for the unemployed than for employees. (The vectors of interactions for the other two wealth measures are not significantly different.) One potential explanation for why the unemployed might have less non-housing net wealth than other sample members might be that the unemployed could be less likely to be included in the CPF system. The following table shows that 97% of employees

in our sample had CPF accounts, and almost as many, 93%, of the self-employed. Somewhat fewer of the unemployed (albeit still a large majority, 85%), had CPF accounts. A similar pattern obtained for the younger respondents, age 50-62:

% Have CPF

	Whole sample	Subgroup Age<=62
Employed	97.4%	97.6%
Self-employed	92.8%	92.3%
Unemployed	84.7%	84.9%

Accordingly, the lower nonfinancial wealth of the unemployed could be a function of their weaker attachment to the CPF system.

Measures of Portfolio Complexity

Table 4 explores how employees compare with the self-employed and unemployed in terms of their investment allocations. The dependent variable in Column 1 indicates whether respondents hold a portfolio that includes at least some cash, shares, and bonds). On average, 33% of the full sample do so, and 37% of the younger subgroup. In Column 2, we use an indicator that takes the value of 1 if the respondent's risky share of financial wealth lies in a range of (+/-)10% of the 100-age rule of thumb. Interestingly, very few – between 7 and 8% -- of the respondents are diversified according to this second criterion.[15] Accordingly, older Singaporeans' net financial wealth is not particularly diversified, nor do most investors seem to follow the age-100 rule of thumb made popular by financial advisors.

Table 4 here

[15] Further examination showed that the bulk of those departing from this benchmark held less risky portfolios, not more.

We are also not surprised that more financially literate people are significantly more likely to be diversified, according to both outcome measures. Thus getting one more question right increases employees' probability of having a minimally diverse portfolio by 25% (=0.08/0.33); the results are similar for the younger age group. Moreover, getting one more question right boosts employees chances of being diversified according to the age-100 rule of thumb by 15-20%. The results also show that older employees are less diversified than younger ones, and the better educated are more diversified.

Turning to the self-employed results, small P-values in all four models lead us to reject the hypothesis that all *self-emp* interactions are equivalent to the employee results, yet few individual effects are individually influential. Overall, self-employed respondents are less well-diversified than their employee counterparts, though the better-educated among them do follow the 100-age benchmark more closely. Focusing on the unemployed interactions, in half the models the P-values are small, but in the other half they are not significantly different and the pattern of significant coefficients is unstable across columns.

Table 5 turns to an analysis of portfolio diversification. Column 1 indicates that, overall, SLP® respondents hold about 7% of their non-CPF net wealth in complex assets; Column 2 reveals that people hold almost 10% of their CPF net wealth in complex assets; and Column 3 shows that only 6% of household total net wealth is held in complex assets. Among employees, being financially literate and better educated is strongly associated with holding larger shares of complex assets. For instance, answering one additional question correctly is associated with a 1.8 pp (3.1 pp) increase in the complex fraction of non-CPF (CPF) assets. As the base holding rate for complex is 6.8 pp (9.7 pp), these are economically substantial magnitudes. Those who are financially literate will find it easier to understand complex assets and hence be more comfortable investing in them.

For total net wealth, scoring correctly on one additional question is associated with 1.8 pp higher wealth, for an increase of almost 30 percent over the base of 6.1 pp. Results for the younger age group are quite similar.

Table 5 here

Turning to the second panel of the table, there are relatively few cases where the self-employed interactions are statistically significant; moreover, the P-values at the bottom of the table reject the hypothesis that both the non-CPF and CPF interactions are different from zero at conventional levels. Only in the case of the total net wealth column is the P-value significantly nonzero at the 5% level, but the effect is small. Similarly, factors associated with the three wealth measures are also not statistically different for the unemployed, as attested to by the non-significant P values in the final row of the column. Accordingly, we do not detect many differences between the three different classes of individuals according to our three measures of net wealth.

Conclusions and Implications

Researchers and policymakers have noted both pros and cons associated with the growth of non-traditional employment around the world. On-demand service providers surely benefit a wide variety of consumers, and many workers favor the flexibility that freelance work brings. Moreover, firms hiring short-term free-lance and self-employed workers are likely to be able to manage staffing needs without engaging in expensive and often inflexible long-term employment arrangements. Nevertheless, the self-employed in some countries have lacked access to retirement saving arrangements, so that there is concern that they could accumulate less wealth and hold less diverse portfolios, compared to their employee counterparts.

This paper has used data on 6,686 SLP® survey respondents age 50-70 who also answered financial literacy questions to determine whether self-employed workers as well as the unemployed in Singapore save and invest differently from regular employees. We also sought to find out whether differences could be attributable to different levels of financial literacy and other socio-demographic factors. Overall, we find that half of older Singaporeans surveyed indicated that they are not confident of a financially secure retirement. These respondents also report a 46% chance of struggling financially in retirement and only 43% feel they have made good financial preparations for retirement. Additionally, the self-employed are similar to their employed counterparts in terms of concerns over financial status in retirement, after controlling on other factors. Moreover, there is no significant difference between the more versus the less financially literate, comparing employees and the self-employed. Across groups, we also find that the factors explaining wealth levels are similar for both employees and the self-employed, whereas the unemployed have less wealth and particularly less net housing wealth than their employed counterparts. The unemployed are also less likely to participate in the CPF: 85% versus 97% of employees (and 93 % of the self-employed). When we compare portfolio diversification and complexity, we find that relatively few Singaporeans hold well-diversified portfolios, yet again there are few statistically significant differences between the self-employed and employees.

Regarding financial literacy, we have shown that more financially literate respondents do not expect to fare any worse in retirement, and in fact many believe they have done a good job preparing for retirement. To be precise, we calculate that a respondent scoring one additional correct answer on the FinLit questions would be expected to have around $4,850 (3%) more net financial wealth, $9,000 (2%) more nonhousing net wealth, and S$1,547,000 (14%) more total wealth. More financially literate individuals also hold better diversified portfolios, and they are

more likely to invest in line with the 100-age rule. Overall, these patterns do not diverge between employees and the self-employed.

Our research is relevant to policymakers in Singapore and elsewhere in the region. In Singapore, the Tripartite Workgroup (2018) has indicated that the government will require self-employed individuals to contribute to their Medisave Accounts to help meet healthcare coverage needs. Thus far there is no requirement for Singaporean self-employed workers to save for retirement, and it appears that past efforts to encourage voluntary savings in the sector have been unsuccessful.[16] Nevertheless, the similarity of CPF participation between the two groups suggests some degree of permeability between the employee and employed categories in Singapore.

Outside of Singapore, Graham et al. (2017) have noted that online service providers in developing countries can benefit from the ability to transcend their local labor markets and permit them to build new skills. This positive can be outweighed by the fact that workers in developing countries they studied (the Philippines, South Africa, Kenya, Nigerian, and Vietnam) were often not covered by insurance and other social protections. Insofar as Singapore is a relatively well-off nation, saving for retirement among the self-employed is a sensible policy objective.

[16] The Tripartite Workgroup (2018) found that 86% of self-employed workers age 55+ lack CPF savings sufficient to meet the government minimum sum payout, versus 42% of regular employees of the same age.

References

Abraham, K. G., J. C. Haltiwanger, K. Sandusky, and J.R. Spletzer. (2017) "Measuring the Gig Economy: Current Knowledge and Open Issues." Institute for the Study of Labor (IZA) Working Paper. March. http://vox.lacea.org/?q=abstract/measuring_gig_economy

Brown, J., A. Kapteyn, E. Luttmer, and O. S. Mitchell. (2017). "Cognitive Constraints on Valuing Annuities." *Journal of the European Economic Association*. 15(2): 429-462.

Brown, J., A. Kapteyn, and O. S. Mitchell. (2016). "Framing and Claiming: How Information Framing Affects Expected Social Security Claiming Behavior." *Journal of Risk and Insurance*. 83(1): 139–162.

Burtch, G., S. Carnahan, and B. N. Greenwood. (2016). "Can You Gig It? An Empirical Examination of the Gig-Economy and Entrepreneurial Activity." Ross School of Business Working Paper 1208. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2744352

Central Provident Fund (CPF) Board. (2018). "CPF Contribution and Allocation Rates." https://www.cpf.gov.sg/employers/employerguides/employer-guides/paying-cpf-contributions/cpf-contribution-and-allocation-rates

Chan, S. J. (2017). "Thanks to the Gig Economy, Singapore's Labour Market Might be Rosier than You Think." TheEdge.com. https://www.theedgesingapore.com/thanks-gig-economy-singapore%E2%80%99s-labour-market-might-be-rosier-you-think

Cheng, K. (2018). "Freelancers to Get New Medisave Model, Insurance Scheme: Josephine Teo." todayonline.com, March. https://www.todayonline.com/singapore/freelancers-get-new-medisave-model-insurance-scheme-josephine-teo

Clark, R. L., A. Lusardi, and O.S. Mitchell. (2017). "Financial Knowledge and 401(k) Investment Performance." *Journal of Pension Economics and Finance*. November: 324-347.

Donovan, S. A., D.H. Bradley, and J. O. Shimabukuro. (2016). "What Does the Gig Economy Mean for Workers?" Congressional Research Service Paper, Feb. 5.

General Accounting Office (GAO; 2015). "Contingent Workforce: Size, Characteristics, Earnings, and Benefits." GAO-15-168R, April, available from: http://www.gao.gov/products/GAO-15-168R.

Graham, M., I Hjorth, and V. Lehdonvirta. (2017). "Digital Labor and Development: Impacts of Global Digital Labor Platforms and the Gig Economy on Worker Livelihoods." *Transfer*. 23(2): 135-162.

Jackson, E., A. Looney, and S. Romnath. (2017). "The Rise of Alternative Work Arrangements: Evidence and Implications for Tax Filing and Benefit Coverage," Office of Tax Analysis Working Paper 114. January.

Katz, L. and A. B. Kreuger. (2016). "The Rise and Nature of Alternative Work Arrangements in the United States, 1995-2015." NBER WP 22667. September.

Kim, H. H., R. Maurer, and O. S. Mitchell. (2016). "Time is Money: Rational Life Cycle Inertia and the Delegation of Investment Management." *Journal of Financial Economics*. 121(2): 231-448.

Koh, B.S.K. and O. S. Mitchell. (2010) "What's on the Menu? Included versus Excluded Investment Funds for Singapore's Central Provident Fund Investors." *Pensions: An International Journal.*

Koh, B. S. K., O. S. Mitchell and J. H.Y. Fong. (2008a). "Cost Structures in Defined Contribution Systems: The Case of Singapore's Central Provident Fund." *Pensions: An International Journal*. 13 (1-2): 7-14.

Koh, B., O. S. Mitchell, and S. Rohwedder. (2018). "Financial Knowledge and Portfolio Complexity in Singapore." The Wharton School, Pension Research Council WP2018.

Koh, B., O.S. Mitchell, T. Tanuwidjaja, and J.Fong. (2008b). "Investment Patterns in Singapore's CPF Central Provident Fund." *Journal of Pension Economics and Finance*. 7(1): 1-29.

Lusardi, A., P.-C. Michaud, and O. S. Mitchell. (2017). "Optimal Financial Literacy and Wealth Inequality." *Journal of Political Economy*. 125(2): 431-477.

Lusardi, A. and O. S. Mitchell. (2014). "The Economic Importance of Financial Literacy: Theory and Evidence." *Journal of Economic Literature*. 52(1): 5-44.

McKinsey Global Institute. (2016). *Independent Work: Choice, Necessity, and the Gig Economy*. https://www.mckinsey.com/global-themes/employment-and-growth/independent-work-choice-necessity-and-the-gig-economy

Quartz.com. (2018). *Contingent Workers Now Make Up 34% of the US Labor Force*. https://qz.com/472248/contingent-workers-now-make-up-34-of-the-us-labor-force/

Powell, R. (2018). "How to Use the 100-minus-your-age Rule of Thumb When Investing in Your 401(k)."USA Today. Feb. 16. https://www.usatoday.com/story/money/personalfinance/retirement/2018/02/16/how-use-100-minus-your-age-rule-thumb-when-investing-your-401-k/310338002/

Solodkiy, V. (2017). "The Gig Economy is on the Rise in Asia, and it Drives Fintech for SMEs." e27.com. https://e27.co/gig-economy-rise-asia-drives-fintech-smes-20170222/

Straits Times. (2017). "Growing Gig Economy Cushions Impact of Weak Job Market." October 7. http://www.straitstimes.com/business/economy/growing-gig-economy-cushions-impact-of-weak-job-market.

Tripartite Working Group. (2018). *Report on Self Employed Persons*. February. http://www.mom.gov.sg/~/media/mom/documents/press-releases/2018/0222-tripartite-workgroup-report-on-self-employed-persons.pdf

Vaithianathan, R., B. Hool, M. D. Hurd, and S. Rohwedder. (2017). "High-Frequency Internet Survey of a Probability Sample of Older Singaporeans: *The Singapore Life Panel." Singaporean Economic Review*. Forthcoming.

Table 1. Multivariate Models of Employment Status (Mlogit models, marginal effects reported)

	Whole sample		Subgroup Age<=62	
	Self-employed vs Employed	Unemployed vs Employed	Self-employed vs Employed	Unemployed vs Employed
FinLit total score	0.008 *	0.005	0.009	0.000
Age55-59	-0.008	0.081 **	-0.005	0.070 **
Age60-64	-0.026 **	0.270 **	-0.011	0.202 **
Age65-70	-0.044 **	0.445 **		
Female	-0.111 **	0.208 **	-0.117 **	0.199 **
Married	-0.024 *	0.024	-0.019	0.027
2ndry educ.	-0.006	-0.047 **	-0.012	-0.073 **
Post-2ndry educ.	-0.003	-0.040 *	-0.012	-0.066 **
Fair/poor health	-0.012	0.065 **	-0.009	0.052 **
Own home	0.007	-0.044 *	0.007	-0.043 *
R+Other mgs fins	-0.005	0.053 **	-0.001	0.041 *
Other mgs fins	-0.014	0.231 **	-0.006	0.238 **
FinConfident	-0.004	-0.020	-0.012	-0.016
LongHorizon	0.005	0.010	-0.005	0.014
GenlRiskPrefer	0.013	0.033	0.035	0.034
FinRiskPrefer	0.016	-0.045	0.005	-0.042
N	6,686		4,832	
Pseudo R-sq	0.108		0.078	
Dep. Var. Mean	0.87		0.70	
Dep. Var. St. Dev.	0.94		0.89	

Note: * significant at 0.05; ** significant at 0.01. Controls include missing value dummies. Reference levels: Age50-54; <HS; R manages HH finances, employed. Sample unweighted; includes SLP® respondents age 50-70 (or 50-62 in right column) who answered the financial literacy questions.

Table 2. Multivariate Models of Qualitative Variables Reflecting Retirement Preparedness
(Probit models, marginal reported)

	Whole sample		Subgroup Age<=62	
	Chance of struggling financially in retirement (%)	Good financial prep. for retirement (0/1)	Chance of struggling financially in retirement (%)	Good financial prep. for retirement (0/1)
FinLit total score	-1.020	0.039 **	-1.093	0.036 **
Age55-59	-2.121	0.042	-2.052	0.042
Age60-64	-3.352 *	0.075 **	-2.384	0.057 *
Age65-70	-8.267 *	0.095 **		
Female	-1.174	0.005	-1.522	0.002
Married	-2.062	0.037	-2.992	0.050
2ndry educ.	-3.358 *	0.100 **	-3.460 *	0.093 **
Post-2ndry educ.	-9.734 *	0.198 **	-9.508 **	0.188 **
Fair/poor health	7.466 *	-0.265 **	7.206 **	-0.254 **
Own home	-1.027	-0.045	-1.528	-0.045
R+Other mgs fins	-0.771	0.027	-0.334	0.035
Other mgs fins	-3.708 *	0.004	-2.272	0.013
FinConfident	-6.391 *	0.210 **	-5.546 **	0.226 **
LongHorizon	-0.623	0.052 **	-0.438	0.044 *
GenlRiskPrefer	-0.631	-0.037	1.078	-0.036
FinRiskPrefer	-2.646	0.091 *	-3.218	0.098 *
Self-emp	3.379	-0.020	5.078	-0.067
Self-emp*FinLit total score	-0.975	0.016	-1.625	0.009
Self-emp*Age55-59	1.005	-0.077	1.558	-0.072
Self-emp*Age60-64	-3.938	-0.046	-7.485	-0.030
Self-emp*Age65-70	5.023	-0.043		
Self-emp*Female	-3.522	0.099	-3.686	0.123 *
Self-emp*2ndry educ.	0.928	-0.08	-0.108	-0.06
Self-emp*Post-2ndry educ.	0.395	-0.089	2.001	-0.053
Self-emp*Fair/poor health	-1.160	0.004	-0.635	-0.032
Self-emp*Own home	3.493	0.104	3.608	0.123
Self-emp*R+Other mgs fins	-5.212	-0.002	-6.857	0.028
Self-emp*Other mgs fins	0.868	-0.054	-3.100	-0.074
Self-emp*FinConfident	2.623	-0.128 *	2.091	-0.134 *
Self-emp*LongHorizon	-1.303	0.059	-3.719	0.117 *
Self-emp*GenlRiskPrefer	4.924	0.082	5.857	0.098
Self-emp*FinRiskPrefer	-0.815	-0.045	-2.610	-0.057

(continued)

Table 2 (cont)

	Whole sample		Subgroup Age<=62	
	Chance of struggling financially in retirement (%)	Good financial prep. for retirement (0/1)	Chance of struggling financially in retirement (%)	Good financial prep. for retirement (0/1)
Unemp	-5.684	0.065	-4.599	0.184 *
Unemp*FinLit total score	-0.723	-0.014	-1.693	-0.009
UnUnemp*Age55-59	2.327	-0.014	2.310	-0.017
Unemp*Age60-64	-0.323	0.007	-0.876	0.047
Unemp*Age65-70	3.477	-0.006		
Unemp*Female	-0.687	0.034	-0.558	0.031
Unemp*Married	3.769	-0.035	4.847	-0.071
Unemp*2ndry educ.	1.997	-0.081 *	4.058	-0.155 **
Unemp*Post-2ndry educ.	4.841 *	-0.066	5.987 *	-0.139 **
Unemp*Fair/poor health	0.852	0.028	-0.366	0.014
Unemp*Own home	-1.586	0.09 *	0.299	0.067
Unemp*R+Other mgs fins	-0.085	-0.05	-0.819	-0.03
Unemp*Other mgs fins	3.170	-0.072	1.117	-0.098 *
Unemp*FinConfident	0.862	-0.047	-1.170	-0.060
Unemp*LongHorizon	-2.930	0.029	-3.113	0.017
Unemp*GenlRiskPrefer	2.487	0.075	0.099	0.064
Unemp*FinRiskPrefer	1.773	-0.040	5.618	-0.063
N	5,391	6,670	3,841	4,821
R-sq/Pseudo R-sq	0.074	0.106	0.074	0.106
Dep. Var. Mean	45.59	0.43	46.34	0.43
Dep. Var. St. Dev.	26.16	0.50	25.62	0.50
P-value of tests: All Selfemp interactions=0	0.227	0.328	0.279	0.207
P-value of tests: All Unemp interactions=0	0.096	0.055	0.186	0.035

Note: * significant at 0.05; ** significant at 0.01. Controls include missing value dummies. Reference levels: Age50-54; <HS; R manages HH finances, employed. Sample unweighted; includes SLP® respondents age 50-70 (or 50-62 in right column) who answered the financial literacy questions.

Table 3. Multivariate Models of Household Wealth (OLS models)

	Whole sample			Subgroup Age<=62		
	HH net financial wealth (S$100k)	HH non-housing net wealth (S$100k)	HH total net wealth (S$100k)	HH net financial wealth (S$100k)	HH non-housing net wealth (S$100k)	HH total net wealth (S$100k)
FinLit total score	0.485 **	0.940 **	1.547 **	0.514 **	0.956 **	1.492 **
Age55-59	0.404 *	0.492	0.922	0.404 *	0.501	0.893
Age60-64	0.552 **	0.989 *	2.549 **	0.599 **	1.210 *	2.842 **
Age65-70	0.738 **	0.117	1.862			
Female	0.158	0.382	1.033	0.140	0.386	1.071
Married	0.406 *	1.697 **	4.68 **	0.431 *	1.908 **	5.076 **
2ndry educ.	0.476 **	1.727 **	3.593 **	0.504 **	1.925 **	3.365 **
Post-2ndry educ.	2.457 **	5.597 **	11.145 **	2.354 **	5.674 **	10.416 **
Fair/poor health	-0.465 **	-1.006 **	-1.804 **	-0.492 **	-1.044 **	-1.937 **
Own home	0.150	0.524	2.749 **	0.108	0.430	2.087 **
R+Other mgs fins	0.532 **	0.812 *	0.630	0.620 **	0.864 *	0.780
Other mgs fins	0.160	0.161	0.211	0.289	0.256	1.319
FinConfident	0.406 **	1.038 **	1.991 **	0.369 *	1.002 **	2.048 **
LongHorizon	0.764 **	1.646 **	2.449 **	0.869 **	1.846 **	2.907 **
GenlRiskPrefer	0.847 **	1.270 *	2.520 *	1.010 **	1.638 **	3.069 **
FinRiskPrefer	0.694 *	0.911	1.303	0.696 *	0.700	0.732
Self-emp	-1.149	-1.173	11.435	-1.329	-1.717	13.518
Self-emp*FinLit total score	0.134	0.329	-0.026	0.095	0.460	-0.216
Self-emp*Age55-59	-0.231	-0.100	-3.161	-0.187	-0.056	-2.957
Self-emp*Age60-64	-0.099	-0.663	-4.531	0.035	-0.538	-3.847
Self-emp*Age65-70	-0.526	-0.609	-5.313			
Self-emp*Female	1.146 *	1.573 *	3.573	1.370 *	1.645	4.936
Self-emp*Married	0.589	0.183	3.185	0.577	0.118	3.006
Self-emp*2ndry educ.	-0.191	-1.540 *	-9.541 *	0.080	-1.065	-10.823 *
Self-emp*Post-2ndry educ.	-0.702	-2.221 **	-8.131 *	-0.279	-1.660	-8.088
Self-emp*Fair/poor health	-0.394	-0.457	-3.019	-0.728	-1.280 *	-4.896 *
Self-emp*Own home	0.234	0.272	-4.882	0.071	0.082	-6.597
Self-emp*R+Other mgs fins	0.377	1.483 *	1.202	0.538	1.826 *	1.422
Self-emp*Other mgs fins	-0.001	0.842	4.370	-0.054	0.962	5.433
Self-emp*FinConfident	0.053	-0.472	-1.679	0.089	-0.498	-1.988
Self-emp*LongHorizon	0.559	0.754	4.250	0.669	0.904	5.238
Self-emp*GenlRiskPrefer	0.021	-0.234	-0.699	-0.309	-1.278	-1.942
Self-emp*FinRiskPrefer	-0.602	-0.850	-2.145	-0.416	0.019	-0.244

(continued)

Table 3 (continued)

	Whole sample			Subgroup Age<=62		
	HH net financial wealth (S$100k)	HH non-housing net wealth (S$100k)	HH total net wealth (S$100k)	HH net financial wealth (S$100k)	HH non-housing net wealth (S$100k)	HH total net wealth (S$100k)
Unemp	-0.178	-0.124	-1.108	0.096	0.029	-0.965
Unemp*FinLit total score	0.080	0.030	0.293	0.058	0.174	0.552
UnUnemp*Age55-59	0.278	0.517	2.067	0.279	0.496	1.948
Unemp*Age60-64	-0.185	-0.507	1.302	-0.246	-0.735	0.987
Unemp*Age65-70	-0.22	0.093	1.607			
Unemp*Female	0.200	0.167	0.546	0.339	0.272	-1.077
Unemp*Married	0.054	-0.311	-1.747	-0.249	-0.754	-1.910
Unemp*2ndry educ.	-0.028	-0.392	-1.554	-0.155	-0.773 *	-2.605
Unemp*Post-2ndry educ.	-0.032	-1.089 *	-0.218	0.284	-0.857	-0.854
Unemp*Fair/poor health	0.504 *	0.978 **	1.106	0.433	1.079 *	1.461
Unemp*Own home	-0.131	-0.116	1.809	-0.225	-0.253	1.917
Unemp*R+Other mgs fins	-0.287	-0.119	1.240	-0.381	-0.282	0.094
Unemp*Other mgs fins	-0.490	-0.406	-0.417	-0.741 *	-0.658	-1.204
Unemp*FinConfident	0.072	-0.253	-0.525	0.354	0.258	1.899
Unemp*LongHorizon	0.184	0.194	0.346	0.044	-0.098	0.275
Unemp*GenlRiskPrefer	-0.749	-1.723 *	-2.341	-0.727	-1.854 *	-2.873
Unemp*FinRiskPrefer	0.662	1.100	0.317	0.097	0.580	-1.410
N	6,686	6,686	6,686	4,832	4,832	4,832
R-sq	0.143	0.188	0.116	0.140	0.183	0.112
Dep. Var. Mean	1.91	4.85	11.43	1.98	5.27	11.75
Dep. Var. St. Dev.	4.52	7.83	20.49	4.77	8.26	21.06
P-value of tests: All Selfemp interactions=0	0.123	0.146	0.053	0.140	0.151	0.180
P-value of tests: All Unemp interactions=0	0.515	0.003	0.431	0.677	0.029	0.222

Note: * significant at 0.05; ** significant at 0.01. Controls include missing value dummies. Reference levels: Age50-54; <HS; R manages HH finances, employed. Sample unweighted; includes SLP® respondents age 50-70 (or 50-62 in right column) who answered the financial literacy questions.

Table 4. Multivariate Models of Portfolio Diversification (Probit models, marginal effects reported)

	Whole sample		Subgroup Age<=62	
	Diversified asset	EquityAs PerAge	Diversified asset	EquityAs PerAge
FinLit total score	0.082 **	0.017 **	0.091 **	0.011 **
Age55-59	-0.068 **	-0.002	-0.073 **	-0.001
Age60-64	-0.079 **	0.007	-0.057 *	0.008
Age65-70	-0.147 **	0.006		
Female	0.032	0.004	0.021	0.002
Married	-0.019	0.007	-0.052	0.006
2ndry educ.	0.128 **	0.041	0.136 **	0.024
Post-2ndry educ.	0.302 **	0.091 **	0.310 **	0.059 **
Fair/poor health	-0.059 **	0.001	-0.075 **	0.001
Own home	0.115 **	0.002	0.134 **	0.001
R+Other mgs fins	0.011	0.004	0.025	0.002
Other mgs fins	0.038	-0.005	0.038	0.000
FinConfident	0.062 **	-0.010	0.066 *	-0.003
LongHorizon	0.050 **	0.022 *	0.062 **	0.017 *
GenlRiskPrefer	-0.010	0.050 *	0.003	0.031
FinRiskPrefer	0.052	-0.011	0.040	-0.004
Self-emp	-0.098	-0.019	-0.124	-0.071 **
Self-emp*FinLit total score	0.009	0.007	0.002	-0.001
Self-emp*Age55-59	0.128 *	0.029	0.130 *	0.022
Self-emp*Age60-64	0.029	-0.005	-0.001	-0.006
Self-emp*Age65-70	-0.007	0.080		
Self-emp*Female	0.095	-0.024	0.130 *	-0.016
Self-emp*Married	0.065	0.019	0.130	0.001
Self-emp*2ndry educ.	-0.043	0.053	-0.050	0.939 **
Self-emp*Post-2ndry educ.	-0.093	0.095	-0.110	0.968 **
Self-emp*Fair/poor health	-0.012	-0.037 **	-0.007	-0.028 **
Self-emp*Own home	-0.026	-0.026	-0.061	-0.013
Self-emp*R+Other mgs fins	0.112 *	0.003	0.093	-0.004
Self-emp*Other mgs fins	-0.095	-0.058 **	-0.084	-0.037 **
Self-emp*FinConfident	0.039	-0.019	0.090	-0.014
Self-emp*LongHorizon	-0.009	0.005	-0.033	0.012
Self-emp*GenlRiskPrefer	-0.017	-0.027	-0.072	-0.016
Self-emp*FinRiskPrefer	-0.047	-0.008	0.015	-0.018

(continued)

Table 4 (cont)

	Whole sample		Subgroup Age<=62	
	Diversified asset	EquityAs PerAge	Diversified asset	EquityAs PerAge
Unemp	-0.086	-0.013	-0.167 *	0.001
Unemp*FinLit total score	-0.002	-0.001	-0.009	0.000
UnUnemp*Age55-59	0.052	0.010	0.056	0.009
Unemp*Age60-64	-0.005	0.059	-0.046	0.017
Unemp*Age65-70	0.069	0.067		
Unemp*Female	-0.015	0.025	-0.002	0.017
Unemp*Married	-0.008	-0.033 *	0.051	-0.025 *
Unemp*2ndry educ.	-0.081 *	-0.007	-0.027	0.002
Unemp*Post-2ndry educ.	-0.073 *	-0.01	0.000	0.007
Unemp*Fair/poor health	0.08 **	0.011	0.095 *	0.005
Unemp*Own home	-0.023	-0.016	-0.047	-0.023
Unemp*R+Other mgs fins	0.026	0.028	-0.032	0.002
Unemp*Other mgs fins	-0.068	0.019	-0.095 *	0.015
Unemp*FinConfident	0.044	0.008	0.093	0.004
Unemp*LongHorizon	0.023	0.003	0.027	0.018
Unemp*GenlRiskPrefer	-0.020	-0.033 *	-0.049	-0.034 **
Unemp*FinRiskPrefer	0.090	0.101	0.105	0.166
N	6,606	5,014	4,765	3,597
Pseudo R-sq	0.153	0.094	0.153	0.109
Dep. Var. Mean	0.33	0.08	0.37	0.07
Dep. Var. St. Dev.	0.47	0.27	0.48	0.26
P-value of tests: All Selfemp interactions=0	0.024	0.000	0.030	0.000
P-value of tests: All Unemp interactions=0	0.025	0.144	0.106	0.000

Note: * significant at 0.05; ** significant at 0.01. Controls include missing value dummies. Reference levels: Age50-54; <HS; R manages HH finances, employed. Sample unweighted; includes SLP® respondents age 50-70 (or 50-62 in right column) who answered the financial literacy questions.

Table 5. Multivariate Models of Complex Asset Holding Patterns (OLS models)

	Whole sample			Subgroup Age<=62		
	% Complex: non-CPF net wealth	% Complex: CPF Wealth	% Complex: Total Net Wealth	% Complex: non-CPF net wealth	% Complex: CPF	% Complex: Total Net Wealth
FinLit total score	1.764 **	3.105 **	1.782 **	1.647 **	3.465 **	1.691 *
Age55-59	-0.784	0.281	-1.036	-0.827	0.376	-1.032
Age60-64	0.758	-2.910 *	-0.092	0.390	-1.926	-0.503
Age65-70	2.129	-5.978 **	1.896			
Female	0.395	-2.062 *	1.734	-0.172	-1.927	1.700
Married	-0.740	-1.067	-2.958	-0.751	0.223	-3.697
2ndry educ.	1.986 **	5.006 **	2.144 **	1.989 **	5.516 **	1.938 **
Post-2ndry educ.	6.370 **	11.260 **	7.479 **	6.232 **	12.526 **	7.390 **
Fair/poor health	-0.339	-0.102	0.832	-0.252	0.276	1.202
Own home	-2.902 **	1.695	-5.246	-2.272 *	1.074	-5.379
R+Other mgs fins	1.500	0.281	1.917	1.681	-0.358	2.386
Other mgs fins	0.764	-0.589	1.402	0.402	-1.275	1.192
FinConfident	0.388	2.917 *	1.118	-0.304	3.103 *	0.923
LongHorizon	3.377 **	1.556	3.183 **	3.630 **	1.976	3.204 *
GenlRiskPrefer	2.575 *	-0.007	3.431	2.986 *	-0.826	4.141
FinRiskPrefer	3.231 **	2.376	4.556 *	2.760 *	2.671	4.341
Self-emp	7.466	-5.351	3.845	7.242	-8.582	3.533
Self-emp*FinLit total scor	0.899	2.139	1.089	0.327	2.492	0.417
Self-emp*Age55-59	-1.674	5.300	-0.668	-1.487	5.319	-0.637
Self-emp*Age60-64	-1.592	4.445	-2.270	-0.449	3.490	-1.707
Self-emp*Age65-70	1.013	1.950	1.738			
Self-emp*Female	2.891	2.709	1.342	2.255	2.639	0.070
Self-emp*Married	-1.309	-0.257	3.036	-2.693	-1.252	4.332
Self-emp*2ndry educ.	-1.428	-0.510	-2.396	0.201	-0.302	-1.460
Self-emp*Post-2ndry educ	-1.540	-2.636	-2.910	-0.320	-1.084	-1.683
Self-emp*Fair/poor health	0.879	-0.787	-0.356	0.172	-1.181	-2.276
Self-emp*Own home	-3.188	-5.201	3.812	-4.302	-4.843	2.929
Self-emp*R+Other mgs fir	-0.035	7.451 **	-1.845	0.663	9.521 **	-2.226
Self-emp*Other mgs fins	-0.151	4.308	-0.928	0.135	7.952	-1.638
Self-emp*FinConfident	-0.550	-0.571	-5.029 *	1.304	-1.201	-3.534
Self-emp*LongHorizon	-3.478 *	-5.581 *	-3.628 *	-2.306	-4.438	-2.741
Self-emp*GenlRiskPrefer	-1.917	2.611	-3.023	-1.023	1.153	-3.975
Self-emp*FinRiskPrefer	2.593	3.712	0.221	1.861	8.126	1.414

(continued)

Table 5 (continued)

	Whole sample			Subgroup Age<=62		
	% Complex: non-CPF net wealth	% Complex: CPF Wealth	% Complex: Total Net Wealth	% Complex: non-CPF net wealth	% Complex: CPF	% Complex: Total Net Wealth
Unemp	-0.129	5.713	0.198	1.532	4.391	3.448
Unemp*FinLit total score	0.149	-0.120	-0.220	0.180	0.833	-0.604
UnUnemp*Age55-59	3.756	-3.661	4.511 *	3.740	-3.810	4.423 *
Unemp*Age60-64	1.125	-3.529	1.618	0.372	-2.985	0.345
Unemp*Age65-70	1.770	-3.38	2.058			
Unemp*Female	1.861	1.251	0.961	3.205	0.537	1.284
Unemp*Married	0.954	2.52	0.489	0.668	1.396	1.105
Unemp*2ndry educ.	0.499	-0.845	-0.043	-0.026	0.805	-0.600
Unemp*Post-2ndry educ.	1.602	-2.407	1.801	1.15	-1.739	2.569
Unemp*Fair/poor health	-0.316	0.238	-1.839	-0.778	0.466	-2.305
Unemp*Own home	-2.383	-1.933	0.998	-3.387	-1.655	0.167
Unemp*R+Other mgs fins	0.113	-1.432	-0.219	-1.130	-1.849	-2.932
Unemp*Other mgs fins	-0.823	-0.811	-0.768	-2.009	-1.372	-2.678
Unemp*FinConfident	0.394	-2.096	-1.242	0.548	-0.881	-1.250
Unemp*LongHorizon	-2.208	-0.285	-0.758	-2.724	-0.994	-1.287
Unemp*GenlRiskPrefer	-0.662	-4.129	-3.129	0.739	-5.635	-3.221
Unemp*FinRiskPrefer	1.173	4.901	-1.589	1.462	6.243	-3.133
N	6,578	6,569	6,126	4,747	4,740	4,362
R-sq	0.057	0.074	0.052	0.053	0.071	0.05
Dep. Var. Mean	6.77	9.70	6.10	6.38	11.85	5.74
Dep. Var. St. Dev.	22.81	28.30	25.97	24.00	30.74	28.20
P-value of tests: All Selfemp interactions=0	0.630	0.190	0.045	0.851	0.189	0.431
P-value of tests: All Unemp interactions=0	0.916	0.344	0.552	0.725	0.357	0.852

Note: * significant at 0.05; ** significant at 0.01. Controls include missing value dummies. Reference levels: Age50-54; <HS; R manages HH finances, employed. Sample unweighted; includes SLP® respondents age 50-70 (or 50-62 in right column) who answered the financial literacy questions.

Appendix Table 1. Descriptive Statistics on Financial Knowledge and Other Financial Variables

	Whole sample		Subgroup Age<=62	
Variable	Mean	Sd.Dev.	Mean	Sd.Dev.
Chance of struggling financially during retirement (%)	45.59	26.16	46.34	25.62
Good financial preparedness for retirement (1/0)	0.43	0.50	0.43	0.50
HH financial net wealth (S$100k)	1.91	4.52	1.98	4.77
HH non-housing net wealth (S$10	4.85	7.83	5.27	8.26
HH total net wealth (S$100k)	11.43	20.49	11.75	21.06
%Complex non-CPF wealth	6.77	22.81	6.38	24.00
%Complex CPF wealth	9.70	28.30	11.85	30.74
%Complex of total net wealth	6.10	25.97	5.74	28.20
Diversified asset allocation (0/1)	0.33	0.47	0.37	0.48
EquityAsPerAge (0/1)	0.08	0.27	0.07	0.26
N	6,686		4,832	

Note: * significant at 0.05; ** significant at 0.01. Controls include missing value dummies. Reference levels: Age50-54; <HS; R manages HH finances, employed. Sample unweighted; includes SLP® respondents age 50-70 (or 50-62 in right column) who answered the financial literacy questions.

Appendix Table 2. Descriptive Statistics on Control Variables in Multivariate Analysis

	Whole sample		Subgroup Age<=62	
Variable	Mean	Sd.	Mean	Sd.
FinLit total score	2.01	0.97	2.01	0.98
Age 50-54	0.27	0.45	0.38	0.49
Age 55-59	0.30	0.46	0.42	0.49
Age 60-64	0.23	0.42	0.21	0.40
Age 65-70	0.20	0.40		
Female	0.52	0.50	0.53	0.50
Married	0.81	0.39	0.83	0.38
Education, 1ry	0.21	0.41	0.17	0.38
2ndry educ.	0.41	0.49	0.42	0.49
Post-2ndry educ.	0.37	0.48	0.41	0.49
Fair/poor health	0.34	0.48	0.33	0.47
Home owner	0.84	0.36	0.85	0.35
R mgs fins	0.38	0.49	0.38	0.49
R+Other mgs fins	0.46	0.50	0.47	0.50
Other mgs fins	0.16	0.36	0.15	0.35
FinConfident	0.78	0.41	0.79	0.41
LongHorizon	0.42	0.49	0.43	0.50
GenlRiskPrefer	0.15	0.36	0.16	0.37
FinRiskPrefer	0.15	0.36	0.16	0.37
Self-emp	0.10	0.30	0.11	0.31
Unemp	0.39	0.49	0.29	0.46
N	6,686		4,832	

Note: * significant at 0.05; ** significant at 0.01. Controls include missing value dummies. Reference levels: Age50-54; <HS; R manages HH finances, employed. Sample unweighted; includes SLP® respondents age 50-70 (or 50-62 in right column) who answered the financial literacy questions.

Appendix Table 3. Variable Descriptions

Variable	Description
Chance of struggling financially during retirement	A continous variable equal to chances that R will experience financial distress sometime during retirement, resulting in a range of 0-100.
Good financial preparedness for retirement	A binary variable equal to one if R rate sfinancial preparation for retirement excellent, very good or good, and zero otherwise.
HH financial net wealth (S$100k)	The sum of R's (+ spouse if any) wealth components incl. life insurance policies, saving, fixed deposit, bonds, stocks, gold and other savings less debt.
HH non-housing net wealth (S$100k)	The sum of R's (+ spouse if any) wealth components including CPF, pension, life insurance, saving, fixed deposit, bonds, stocks, gold, other savings, business, vehicles and
HH total net wealth (S$100k)	The sum of R's (+ spouse if any)non-housing net wealth plus net value of home and properties.
%Complex non-CPF wealth	The percentage of R's (+ spouse, if any) complex investments outside CPF assets
%Complex CPF wealth	The percentage of R's (+ spouse, if any) complex investments inside CPF assets
%Complex of total net wealth	A continous variable equal to percentage of complex investment outside and inside CPF assets
EquityAsPerAge	A binary variable equal to one if percentage of equities in financial net wealth ±10% of the fraction (100-R's age), zero otherwise.
FinLit total score	Total # of correct answers to 3 financial literacy questions
Age 50-54	A binary variable equal to one if R's age between 50-54 and zero otherwise
Age 55-59	A binary variable equal to one if R's age between 55-59 and zero otherwise
Age 60-64	A binary variable equal to one if R's age between 60-64 and zero otherwise
Age 65-70	A binary variable equal to one if R's age between 65-70 and zero otherwise
Female	A binary variable equal to one if R is female and zero otherwise
Married	A binary variable equal to one if R married and zero otherwise
Education, 1ry	A binary variable equal to one if R had only primary education and zero otherwise
2ndry educ.	A binary variable equal to one if R had secondary education and zero otherwise
Post-2ndry educ.	A binary variable equal to one if R had post-secondary education and zero otherwise

(continued)

Appendix Table A3 (cont)

Variable	Description
Fair/poor health	A binary variable equal to one if R reported health status fair or poor and zero otherwise
Home owner	A binary variable equal to one if R owned home and zero otherwise
R mgs fins	A binary variable equal to one if R managed household finance and zero otherwise
R+Other mgs fins	A binary variable equal to one if R (+ spouse if any) managed household finances and zero otherwise
Other mgs fins	A binary variable equal to one if someone else managed household finance and zero otherwise
FinConfident	A binary variable equal to one if R reported very confident, confident, or somewhat confident on finances and zero otherwise
LongHorizon	A binary variable equal to one if R reported longer than 5 years on financial planning and zero otherwise
GenlRiskPrefer	A binary variable equal to one if R reported willing to take risks rate(>5 from 0-10) and zero otherwise
FinRiskPrefer	A binary variable equal to one if R reported willing to take financial risks (rate >5 from 0-10) and zero otherwise
Selfemp	A binary variable equal to one if R Self-employed, zero else
Unemp	A binary variable equal to one if R unemployed, zero else