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Housing equity and household consumption in retirement: Evidence from the Singapore Life Panel©

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ABSTRACT

Housing affordability for elderly homeowners involves an entirely different set of issues as compared to housing affordability for first-time homeowners. To afford to 'age-in-place' may require homeowners to access channels that enable them to withdraw their housing equity to finance consumption in retirement. We utilize data from the Singapore Life Panel© survey to empirically investigate the impact of housing equity on the consumption of elderly households. Based on panel analysis, we find housing equity value has no significant impact on non-durable consumption for elderly people. The conclusion holds for a battery of robustness checks. Moreover, heterogeneity analyses based on subsamples by the health condition, the age of household head, the house type, and the number of properties owned also show no significant impact of housing equity on consumption. Finally, we use scenario analysis to study the Lease Buyback Scheme (LBS), a novel housing equity monetization scheme that allows elderly households to unlock housing equity for retirement financing. An individual scenario analysis reveals positive but negligible effects, which may explain the low take-up rate for the LBS.

KEYWORDS: Housing wealth, elderly households, housing equity withdrawal, Singapore

1. Introduction

The link between housing wealth and consumption has been much studied in the past decade. Housing wealth is the most important component of household wealth in countries where homeownership rates are high. The permanent income hypothesis predicts that changes in wealth, regardless of whether the change is in housing or non-housing wealth, will have a similar effect on consumption. In other words, households view housing wealth as no different from non-housing wealth. However, this view does not account for the special characteristics of housing as both an investment and a consumption good for homeowners.

Moreover, housing affordability for elderly homeowners involves an entirely different set of issues as compared to housing affordability for first-time homeowners. For young first-time homeowners, housing affordability is often measured by affordability indicators such as house price to annual income ratio and mortgage to income ratio. Housing affordability, however, has a different meaning for the elderly. Homeowners who wish to withdraw housing equity to finance their retirement consumption can do so in different ways. They may downsize their house or rent alternative accommodation. Housing assets are relatively illiquid, and sale transactions involve high costs, unlike

financial assets such as deposits, stocks, and bonds. The large transaction costs involved may deter households from moving. Whether elderly homeowners can afford to 'age-in-place', that is, to afford to continue to stay in the homes and neighborhoods they have grown accustomed to, and at the same time to enjoy consumption levels in retirement that their wealth permit, may depend on their ability to make housing equity withdrawals. The inability to monetize housing wealth while preferring to remain in homes they have lived in for decades can be at the expense of discretionary consumption.

Recent financial innovations have made housing equity withdrawals easier without the need to incur high transaction or moving costs. Increasingly, homeowners have been able to borrow against their housing wealth through refinancing their mortgage with the higher principal, taking on a second mortgage, or through a home equity line of credit. The relaxing of financial constraints – the collateral effect – arising from an increase in housing wealth may also increase consumption.

In this paper, we use the data from the Singapore Life Panel© (SLP) survey to empirically investigate the impact of housing equity on household consumption in retirement. (See Vaithianathan, Hool, Hurd, and Rohwedder (2018) for more details on the SLP.) The SLP is a unique high-frequency longitudinal survey launched in 2015 by the Singapore Management University's Centre for Research on the Economics of Ageing to inform the retirement discussion as the population ages in Singapore. It is unique in tracking income, consumption, health, and work information of Singaporeans aged 50–70 years monthly. The SLP also contains rich information on household characteristics, consumption with a wide range of categories, and wealth in various forms, including housing and non-housing equity. As a result, it is particularly suitable for analyzing the link between consumption and housing equity.

Through panel regressions controlling for both unobserved household and time fixed effects, we find that housing equity does not have a significant impact on the non-durable consumption of elderly households. This conclusion holds under robustness checks that consider potential misreporting of housing equity value, quarterly-average or semi-annual average values, whether households reported unchanged housing value across all three waves of the survey, and whether unbalanced panel and dynamic panel are employed. We also investigate heterogeneity in our sample, that is, different health conditions of households, different ages of household heads, different housing types, and different number of properties that a household owns. We find no impact of housing equity on consumption as well. On the other hand, we find that the consumption response to the change in non-housing wealth is, in general, larger than for a change in housing wealth, and significant. Our findings are therefore broadly consistent with the theoretical models in Buiter (2010) and Souleles and Sinai (2005) that the magnitude of the housing wealth effect on consumption is comparatively smaller than that of non-housing wealth.

Our contributions are two-fold. First, we study the impact of housing equity on the consumption of elderly households in the context of Singapore. Singapore is an ideal place to study this issue since the homeownership rate in Singapore is very high and the majority of households hold a substantial proportion of their wealth in the form of housing equity. Singapore is also faced with an ageing population. In this context of housing asset-rich and ageing households, Singapore has been implementing policies that will allow homeowners to unlock their housing equity to improve standards of living in retirement. Our research, therefore, sheds light on the impact of these housing monetization policies that are unique to Singapore and also on the issues of elderly homeowners' affordability to 'age-in-place' from a local perspective.

Second, the high-frequency nature of the SLP allows us to estimate the relationship between equity and consumption more accurately and reliably. The household-level survey in the literature is often on an annual or biennial frequency. When the respondents in those surveys report their income and consumption levels, a long recall period may result in serious misreporting. As a result, traditional income and consumption measures are often contaminated with non-random measurement errors and their accuracy is questionable. However, the high-frequency nature of the SLP data allows us to

obtain the consumption measures with greater precision and to avoid potential measurement errors often associated with other household-level data sources. [1]

Our study is related to the debate about the housing wealth effect on consumption. There is a large body of literature that empirically investigates the housing wealth effect. However, the conclusions drawn by these studies are mixed, regardless of whether aggregate or micro data are used. Using aggregate data, several studies find that housing wealth affects consumption (Benjamin, Chinloy, & Jud, 2004; Carroll, Otsuka, & Slacalek, 2011; Carroll, Zhou, & Mae, 2010; Case, Quigley, & Shiller, 2005; Case, Quigley, & Shiller, 2013). Other studies using aggregate data do not arrive at similar conclusions. Ludwig and Sløk (2004) show a large and positive response of consumption to changes in financial wealth. However, the relationship is unclear for housing wealth, although, for the period 1985–2000, the relationship is positive and significant. Using aggregate time series data for Singapore, Phang (2004) also finds no significant housing wealth effect on consumption. Using household-level micro data from the Family Expenditure Survey (FES) in the UK, Campbell and Cocco (2007) find the housing wealth effect large for elderly homeowners and almost zero for young renters. Using the same dataset as Campbell and Cocco (2007), Attanasio, Blow, Hamilton, and Leicester (2009), in sharp contrast, find a stronger link between consumption and house prices for younger households (who are less likely to have high levels of housing wealth) rather than elderly ones. As the UK FES data is not panel data, Disney, Gathergood, and Henley (2010) use the British Household Panel Survey to show that there is only weak evidence for the housing wealth effect on consumption. Their conclusion is in line with Browning, Gørtz, and Leth-Petersen (2013), who find little evidence for the housing wealth effect in Denmark by using a large panel data set. Paiella and Pistaferri (2017), however, use panel data from the Italian Survey of Household Income and Wealth to show that the consumption responses to both the anticipated and unanticipated wealth changes are significant.

Using a panel data of consumer credit card and debit card transactions in Singapore, Agarwal and Qian (2017) find a significant negative consumption response to a decrease in access to housing equity. Our study differs from theirs by explicitly addressing the impact of housing equity on the consumption of *elderly* households. As their data do not cover homeownership information, Agarwal and Qian had to use marital status as a proxy for home equity. Our data, however, provides rich information on both housing equity and consumption.

This paper is organized as follows. Section 2 provides a brief overview of the housing market and housing policies in Singapore. This section also discusses current policies targeted at enabling elderly households to monetize their housing equity. In Section 3, we describe the SLP survey data. Section 4 explains the econometric methodology and discusses the results. Section 5 concludes.

2. Housing wealth and housing monetization schemes in Singapore

Singapore has a long-standing policy bias towards homeownership. As a result, the homeownership rate for resident households is 90%, and almost three-quarters of the housing stock has been built by a government agency – the Housing and Development Board (HDB). Only 6% of the HDB housing stock comprises rental units, and the HDB has sold 94% of its apartment units to eligible households at below-market prices, on a maximum 99-year leasehold basis (Phang, 2007, 2015, 2018).

A compulsory savings scheme, the Central Provident Fund (CPF), is the other major pillar of the homeownership framework. Employees maintain personal CPF accounts from which they are allowed to make withdrawals for down payment and mortgage payments for housing purchase, but not for housing rental payments. The HDB and commercial banks provide housing mortgage loans to households for their housing purchase. A high proportion of first-time homeowners start their homeownership journey by buying a new flat from the HDB. The minimum occupancy period is five years before resale is permitted. There are no income ceiling restrictions for buyers of HDB resale

flats; however, buyers need to be either citizens or permanent residents (who have been resident for a minimum of 3 years).

The HDB-CPF housing framework has been in place since 1968. In the 1970s and 1980s, the HDB's massive building program transformed the urban landscape, households' asset portfolio, and the country's homeownership rate. In the early 1990s, the deregulation of the HDB resale market and housing finance contributed to a housing price boom that rocketed the prices of housing assets for HDB flat owners (Phang, 2015, 2016). In the past two decades, demand-side subsidies in the form of substantial and targeted housing grants have allowed for differential pricing based on household characteristics.

Sustained increases in housing stock and housing values over the decades have resulted in the rapid growth of housing equity in household assets (Phang, 2016, 2018). In 2018, 79% of resident households resided in the HDB sector, with average housing wealth in HDB housing comprising 48% of average total housing wealth (see Table 1). The average housing wealth per household in the HDB sector was $402,628, [2] and that for the private housing sector was 4.6 times higher at $1,865,652. The average mortgage loan outstanding per household was $185,998, which was 26.1% of housing wealth and 75.1% of the average total household liabilities.

Table 1. Average assets and housing wealth ($), 2018Q4.

Housing type	Number of resident households (% of total)	Aggregate gross housing wealth $ (% of total)	Average gross housing wealth per household	Average mortgage loans per household	Average total assets per household
HDB	1,043,300 (79%)	$ 420,062 m (48%)	$402,628	n.a.	n.a.
Private	282,000 (21%)	$ 526,114 m (52%)	$1,865,652	n.a.	n.a.
TOTAL	1,325,300	$ 946,176 m	$713,933	$185,998	$1,640,862

Source: Data from Singapore government websites.

Housing wealth, however, is relatively illiquid and elderly homeowners may need to withdraw housing equity to finance their retirement consumption. Singapore's old-age support ratio, defined as the ratio of the number of persons aged 20–64 to the number of persons aged 65 and over, has declined from 9.0 in 2000 to 4.5 in 2019. With a rapidly ageing population, a significant portion of household wealth in housing, and few affordable rental options, there is a need for instruments to help elderly households monetize their housing wealth. In the past decade, the government has introduced three housing schemes to help elderly households monetize their housing assets: rental or sublet of room(s), downsizing to a smaller flat, or 'ageing-in-place' by selling the tail end of the flat lease under the Lease Buyback Scheme (LBS), which is the focus of this paper.

The LBS is similar to a reverse mortgage in that it allows the elderly household to 'age-in-place' while unlocking their home equity through providing a monthly income stream. However, due to the 99-year leasehold nature of HDB properties, the scheme works through the HDB 'buying back' the tail end of the remaining lease of the property. Under the scheme, an eligible homeowner of an eligible property retains a certain number of years of the lease and sells the remaining years of the lease back to the HDB while 'ageing-in-place'. A portion of the sales proceeds is required to be placed in his/her CPF retirement account to purchase an annuity with lifelong payouts. Table 2 shows the timeline for the gradual liberalization of the LBS from the time it was first introduced in 2009.

Table 2. Gradual liberalization of the lease buyback scheme (LBS), 2009 – present.

Year	Details of LBS and changes
2009	• Homeowners age 63 or older. • For 3-room HDB or smaller flats. • Monthly household income $3000 or below. • Homeowner retains 30 years of their lease and sells the remaining years to the HDB. • Proceeds deposited in CPF retirement account for purchase of annuity. • Flat owner receives a grant (referred to by HDB as an LBS bonus) of $10,000 for participating in the LBS.
2013	• The LBS grant is raised to $20,000. • The homeowner may withdraw proceeds from CPF account that are in excess of the target retirement balance.
2015	• The eligibility age is raised to 64 or older. • The LBS is extended to owners of 4-room HDB flats. • The monthly household income ceiling to be eligible is raised from $3000 to $10,000 from April 2015 and to $12,000 from August 2015. • 3-room HDB flat owners receive an LBS bonus of $20,000 for participating in the LBS while 4-room HDB flat owners receive $10,000. • Households may choose to retain 15–35 years of their lease, provided the retained lease covers the youngest owner until at least age 95. There must be at least 20 years of remaining lease to sell.
2019	• The eligibility age is raised to 65 or older. • The scheme is extended to all HDB flat types. • The monthly household income ceiling is raised to $14,000. • The LBS bonus is up to $5000 per household for homeowners of 5-room flats.
2020	• The LBS bonus caps are increased to $30,000 for owners of HDB 3-room or smaller flats, $15,000 for 4-room flat owners, and $7500 for 5-room flat owners.

Source: Housing and Development Board website at https://www.hdb.gov.sg/cs/infoweb/residential/living-in-an-hdb-flat/for-our-seniors/monetising-your-flat-for-retirement/lease-buyback-scheme

The LBS did not attract many households in the initial years as eligibility and lump sum cash withdrawal conditions were restrictive. Between 2009 and 2014, out of an estimated 42,000 eligible households, under 2% had signed on (*The Straits Times*, September 2, 2014). Gradual liberalization of the LBS led to more households becoming eligible. As of 2018, 3100 households out of an estimated 130,000 eligible households had taken up the scheme – a take-up rate of about 2.4%. [3]

3. The Singapore Life Panel

Beginning in 2015, the Singapore Management University has been surveying a sample of 10,000 Singaporeans between the ages of 50–70 every month. Known as the Singapore Life Panel© (SLP), the survey collects information about monthly household income and consumption spending, labor force status, and health shocks. In addition to the detailed monthly panel data, an annual survey is conducted to collect information on respondents' household assets and liabilities, pensions, and annual income.

The data that is of particular relevance to the present study are the home equity value and the household consumption information collected from respondents. Thus far, three surveys have been conducted for the asset and annual income modules. We utilize these annual surveys, namely wave 6 (January 2016), wave 18 (January 2017), and wave 30 (January 2018), to conduct a panel analysis.

We have a total of 5619 observations in our sample, which corresponds to 1873 households. The sample size is smaller than the total number of survey respondents primarily because households who did not report the values of key variables across all three surveys are excluded. In the baseline analysis, we exclude responses that show more than 100% change in home equity across three waves of the survey since such a change in one year is abnormal for the housing market in Singapore. In fact, many of such responses are merely incorrectly filled out. For example, a household respondent reported the apartment was worth $50,000 in the first year, $4000 in the second year, and $48,000 in the third year. In addition, for a considerable number of households (around 30%) in the sample, more than one respondent fill out the surveys. In this case, we take advantage of a baseline survey question that elicits information on the respondents' confidence in reporting household financial status and only consider the information reported by the most confident member in a household.

Our key variable of interest, housing equity value, is constructed with information from the annual submodule *Housing* in the SLP. We include all the properties owned by the respondents. If the property is partially owned, we calculate the property value based on respondents' sharing proportion.

Table 3 reports the summary statistics of the key variables we use in the regression analyses. The households in the sample spend $3713.8 on non-durable goods per month on average. For subcategories that span utilities, food, clothing, health, leisure, transportation, education, insurance, contribution to social groups, cash gift, and other expenditure, the averages among the households are $358.4, $790.2, $123.4, $268.4, $299.2, $673.7, $217.2, $163.4, $102.8, $238.5, $134.4,respectively.

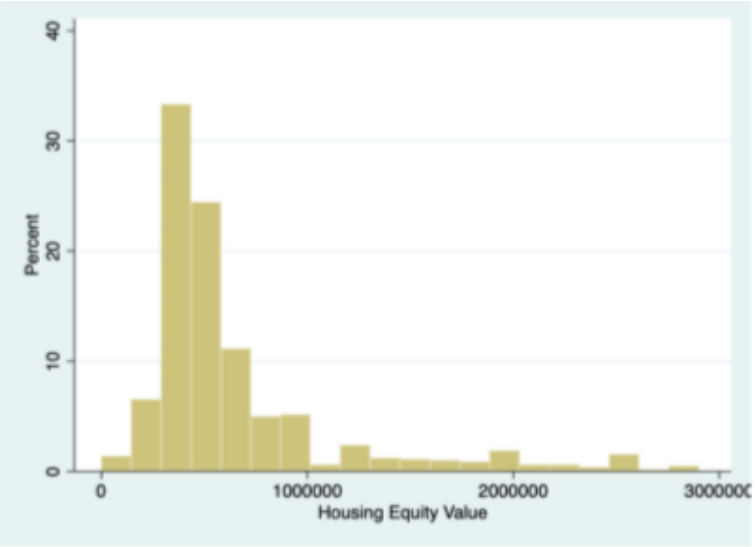
Table 3. Summary statistics.

	Count	Mean	Standard deviation
Panel A: Dependent variables			
Non-durable consumption	5619	3713.84	3756.65
Utility	5619	358.4	206.78
Food	5619	790.22	582.91
Clothing	5619	123.35	215.4
Health	5619	268.39	719.78
Leisure	5619	299.15	963.82
Transportation	5619	673.73	1934.89
Education	5619	217.16	1025.07
Insurance	5619	163.37	514.63
Contribution	5619	102.76	315.31
Cash gift	5619	238.52	556.64
Other	5619	134.38	289.63
Panel B: Explanatory variables			
Income	5619	7019.91	7558.82
Housing equity	5619	846,960	1,942,282
Non-housing wealth	5619	672,315	1,007,932
Panel C: Control variables			
Age	5619	60.13	5.36
Marital status	5619	0.79	0.4

Notes: This table reports the summary statistics of the whole sample. Panel A shows the statistics of dependent variables. Panel B shows the statistics of explanatory variables. Panel C shows the statistics of control variables, including age and marital status.

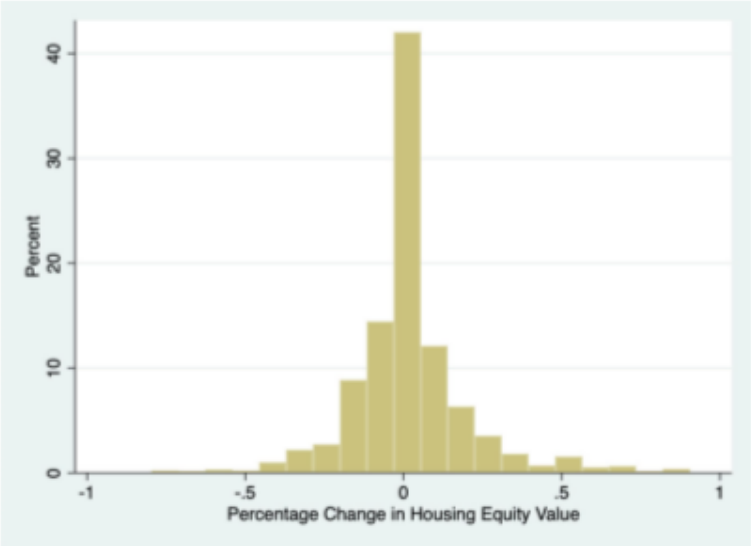
The mean of our main explanatory variable of interest, housing equity value, is $846,960. Yet according to the distribution chart in Figure 1, we see that housing equity values are concentrated in the range from $250,000 to $750,000. Figures 2 and 3 plot the distribution of percentage change in housing equity value from wave 6 to wave 18 and from wave 18 to wave 30. Although more than one-third of the households did not report changes in housing equity value in each wave (678 households in wave 18 and 684 households in wave 30), only 348 households did not experience any changes in both waves. In other words, 1525 households, accounting for 81.42% of our sample, reported a change in housing equity value at least once, which is crucial for our panel analysis.

Figure 1. Distribution of housing equity value.



Notes: This figure plots the distribution of housing equity value reported in the first annual asset module (wave 6, January 2016). The horizontal axis is capped at $3,000,000 (95 percentile of housing equity value).

Figure 2. Percentage change in housing equity value (from wave 6 to wave 18).



Notes: This figure plots the distribution of percentage change of housing equity value between the first annual asset module (wave 6, January 2016) and the second annual asset module (wave 18, January 2017).

Figure 3. Percentage change in housing equity value (from wave 18 to wave 30).

Notes: This figure plots the distribution of percentage change of housing equity value between the second annual asset module (wave 18, January 2017) and the third annual asset module (wave 30, January 2018).

The average household monthly income is $7019.9, and non-housing wealth is $672,315. In terms of control variables, the respondents are, on average, 60.1 years old. 79% of the respondents are married at the time of the surveys.

4. Econometric methods and empirical results

4.1. Econometric model and baseline results

The SLP allows us to investigate the impact of housing equity on household consumption behavior in panel regression. Specifically, we estimate the following model,

$$\begin{aligned}\log C_{i,t} = {} & \text{const} + \beta_1 \log I_{i,t-1} + \beta_2 \log \text{HE}_{i,t} \\ & + \beta_3 \log \text{NNH}_{i,t} + \beta_5 \text{Family}_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t},\end{aligned}$$

where $C_{i,t}$ is the non-durable consumption at time, t for household i, $I_{i,t-1}$ is the household's total income at time, $t-1$, $HE_{i,t}$ is the household's home equity wealth, $NNH_{i,t}$ is the household's net non-housing wealth, $Family_{i,t}$ are the household's time-variant characteristics, including age and marital status, γ_i denotes family fixed effects, which absorb the impact of time-invariant household characteristics, δ_t denotes wave fixed effects.

We follow the literature and focus on non-durable consumption rather than durable consumption in our analysis as the impact of the latter is often smoothed over an extended period. In the estimation, we cluster standard errors at the household level.

Table 4 presents the baseline results. Column 1 in Table 4 presents the results from the regression of log total non-durable consumption on log income, log home equity, and log non-housing wealth. The estimated coefficient on home equity is 0.0072, positive but statistically insignificant, so that there is little evidence of a housing wealth effect on consumption. One possible explanation is high housing transaction costs for elderly homeowners. Most of the elderly homeowners own only one property.

Therefore, it is difficult for them to monetize their home equity even if they feel that its value has increased. Moreover, elderly homeowners often face physical, cognitive, and psychological challenges in making housing transactions, which impairs their ability to utilize their housing assets in the best way.

Table 4. Baseline results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Non-durable	Utility	Food	Clothing	Health	Leisure	Trans-port	Educ-ation	Insur-ance	Contri-bution	Cash gift	Others
Income	0.0788***	0.0305***	0.0684***	0.0492	0.0682	0.202***	0.0821***	−0.0258	0.0543	0.105***	−0.00617	0.0211
	(4.42)	(2.95)	(3.78)	(1.24)	(1.32)	(3.16)	(2.92)	(−0.20)	(0.86)	(3.10)	(−0.12)	(0.49)
Housing	0.00721	0.00164	0.0596	−0.0896	0.0358	0.176	0.0769	−0.228	0.0133	0.0268	0.00454	−0.125
equity	(0.19)	(0.06)	(1.64)	(−1.32)	(0.34)	(1.02)	(1.13)	(−0.70)	(0.11)	(0.35)	(0.04)	(−1.25)
Non-housing	0.0386**	0.0054	0.0567***	−0.0235	0.0322	0.150**	0.0429**	0.158*	−0.0402	0.0392	0.0327	0.0813**
wealth	(2.42)	(0.47)	(3.70)	(−0.61)	(0.56)	(2.12)	(2.20)	(1.69)	(−0.63)	(1.04)	(0.70)	(2.16)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	5619	5403	5445	1722	2376	2439	5286	468	1167	1929	1209	3180
R-squared	0.869	0.878	0.817	0.697	0.617	0.62	0.88	0.792	0.783	0.913	0.763	0.721

Notes: This table reports the estimates of Model (1). Dependent variables and explanatory variables are log transformed. All specifications include control variables (age and marital status), family fixed effects, and wave fixed effects. The *t*-statistics are provided in parentheses below the estimates. Standard errors are clustered at the household level. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.

In Column 1 of Table 4, the estimated coefficients on income and non-housing wealth are positive and statistically significant. The estimated coefficient on income is 0.0788, significant at the 1% level, indicating a strong income effect on consumption. The estimated coefficient on non-housing wealth is 0.0386, significant at the 5% level, indicating a weaker effect of non-housing wealth on consumption than income.

We further divide non-durable consumption into different subcategories according to SLP guidelines, which include utilities, food, clothing, health, leisure, transportation, education, insurance, contribution to social groups, cash gifts, and others. The variation in the observation number is because households may not make a specific type of consumption in the months when the survey was administered and hence are excluded from the regression.

Columns 2–12 in Table 4 present the results from the regressions of log non-durable consumption of subcategories on log income, log home equity, and log non-housing wealth. Despite the smaller sample sizes, we observe a robust finding across different consumption subcategories: the impact of housing equity value is insignificant for all consumption subcategories.

In sum, Table 4 shows little support for the housing wealth effect on consumption. Furthermore, there is a relatively strong income effect and a mild effect of non-housing wealth on consumption. In general, our findings are broadly consistent with the theoretical models in Buiter (2010) and Souleles and Sinai (2005) that the magnitude of the housing wealth effect on consumption is comparatively smaller than that of non-housing wealth.

4.2. Robustness checks

We perform several robustness checks for the baseline results. For the first robustness check, we change how we define abnormal reports in terms of housing equity. In the baseline regressions, we exclude the households that reported over 100% change in their housing value across three waves. For the robustness check, we raise the threshold and exclude households that reported over 150% change or 200% change in the housing value. As can be seen from Table A1, the estimated results are similar to the baseline results, where the coefficients on housing equity are positive but statistically insignificant.

For the second robustness check, we use the quarterly-average and half-yearly-average values for variables in the regressions except for housing value and non-housing wealth since these are reported yearly. We retain household fixed effects but not age and marital status since the averages for these two variables are not economically meaningful. The results presented in Table A2 again show that the coefficients on housing equity are positive but statistically insignificant.

For the third robustness check, we exclude households that experienced no change in the housing value across three waves of the survey, which results in a sample of 1525 households. The regression results based on this new sample are reported in Table A3; the results are unaffected.

For the fourth robustness check, we run the regressions with an unbalanced panel. In our baseline analysis, we use the sample with a balanced panel, so only households that responded in all three waves are included. Here, the unbalanced sample panel also includes households that responded only in two waves. The regression results are shown in Table A4. The number of observations in Table A4 increases by over 2100 compared with the baseline regression, but the results are qualitatively unchanged.

As a final check, we add the lagged non-durable consumption variable to the explanatory variables in the specification of Model (1). In other words, we estimate a dynamic panel model specified as

$$\begin{aligned}\log C_{i,t} = \text{const} + \rho \log C_{i,t-1} + \beta_1 \log I_{i,t-1} + \beta_2 \log \text{HE}_{i,t} \\ + \beta_3 \log \text{NNH}_{i,t} + \beta_5 \text{Family}_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t}, \qquad (2)\end{aligned}$$

where $Ci,t-1$ is the non-durable consumption at time $t-1$ for household $i.$. We use the GMM estimator of Arellano and Bond (1991) to estimate the model because our dataset has many households and only a few periods. Table A5 presents the results, which permit the following four observations. First, the coefficient on the lagged non-durable consumption is large, positive and statistically significant, which is consistent with the theory on habit persistence. Second, once again, we find little evidence for the housing wealth effect. The estimated coefficient on home equity remains statistically insignificant. The sign of the estimated coefficient on home equity becomes negative. This may be because we have a noisier sample in the dynamic panel setup: the effective observations, compared with that in the static model, decreases by about 67%, from 5619 to 1873. Third, the income effect is still positive and statistically significant, in line with our baseline results. Finally, the coefficient on non-housing wealth is positive as well, but becomes statistically insignificant, which may be attributed to the impact of the added lagged consumption or the noisier sample.

4.3. Heterogeneity analysis

In this section, we run our baseline regression on the subsamples based on households' characteristics. We first consider the health condition of family members since households facing large medical expenditures may resort to liquidating their housing asset and hence change their consumption behavior. We use two classification standards: whether a household member has any chronic disease(s) (Columns 1 and 3) or whether average monthly health expenditure exceeds the 75th percentile of the health expenditure distribution (Columns 2 and 4). Table 5 shows that for both non-durable consumption and health expenditure subcategories, housing equity value has no significant impact. This result could be attributed to the comprehensive social safety nets in Singapore, such as Medisave which is Singapore's compulsory medical insurance scheme.

Table 5. Differential impact based on the health condition of household members.

	Non-durable consumption		Health expenditure	
Dependent variable	(1)	(2)	(3)	(4)
Income	0.0761***	0.0861***	0.049	0.0414
	(3.46)	(2.80)	(0.74)	(0.59)
Housing equity	0.00249	−0.0532	0.0945	0.121
	(0.05)	(−1.13)	(0.72)	(0.72)
Non-housing wealth	0.027	0.00833	0.0369	0.000316
	(1.35)	(0.22)	(0.49)	(0.00)
Controls	Yes	Yes	Yes	Yes
Family fixed effects	Yes	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes	Yes
Observations	4044	1650	1830	1122
R-squared	0.865	0.824	0.608	0.517

Notes: This table reports the estimates of Model (1) using subsamples based on the health condition of household members. Dependent variables and explanatory variables are log transformed. Columns 1 and 3 restrict the sample to households with at least a household member with chronic disease(s). Columns 2 and 4 restrict the sample to households whose average monthly health expenditure exceeds the 75th percentile of the health expenditure distribution. The *t*-statistics are provided in parentheses below the estimates. Standard errors are clustered at the household level. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.

Next, we divide the sample into HDB households and non-HDB households and run separate regressions. Again, we find that housing equity value has no significant impact on non-durable consumption for both types of households, as shown in Table 6.

Table 6. Differential impact on HDB and non-HDB households.

Dependent variable: Non-durable consumption		
	(1)	(2)
	HDB households	Non-HDB households
Income	0.0805***	0.0745**
	(3.87)	(2.18)
Housing equity	0.0362	−0.0311
	(0.66)	(−0.62)
Non-housing wealth	0.0346*	0.0532
	(1.94)	(1.53)
Controls	Yes	Yes
Family fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
Observations	4386	1233
R-squared	0.855	0.822

Notes: This table reports the estimates of Model (1) using subsamples based on households' house type. Dependent variable and explanatory variables are log transformed. Column 1 restricts the sample to HDB households. Column 2 restricts the sample to non-HDB households. The *t*-statistics are provided in parentheses below the estimates. Standard errors are clustered at the household level. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.

We then divide the households into two groups based on the age of household head. Since the statutory retirement age in Singapore is 62, and employers are required to offer re-employment options to eligible employees up to the age of 67, we use 64 as the threshold. We only consider households whose respondents either remained working or in retirement throughout all three surveys. In other words, households that switched from work to retirement are excluded from the analysis. As shown in Table 7, no matter if the sample is limited to households with their head at age 50–63 or age 64–70, housing equity does not have a significant impact on non-durable consumption.

Table 7. Differential impact based on age group.

Dependent variable: Non-durable consumption		
	(1)	(2)
	Age 50 - 63	Age 64 - 70
Income	0.0964***	0.0372
	(4.46)	(0.99)
Housing equity	0.0615	−0.127
	(1.14)	(−1.47)
Non-housing wealth	0.0558***	0.011
	(3.15)	(0.28)
Controls	Yes	Yes
Family fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
Observations	3882	1257
R-squared	0.863	0.858

Notes: This table reports the estimates of Model (1) using subsamples based on the age group. Dependent variable and explanatory variables are log transformed. Column 1 restricts the sample to households with a household head aged between 50 and 63. Column 2 restricts the sample to households with a household head aged between 64 and 70. The *t*-statistics are provided in parentheses below the estimates. Standard errors are clustered at the household level. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.

Table 8. Differential impact based on number of properties owned.

Dependent variable: Non-durable consumption		
	(1)	(2)
	One property	More than one property
Income	0.0851***	0.0248
	(4.45)	(0.51)
Housing equity	0.0188	0.199
	(0.41)	(0.93)
Non-housing wealth	0.0352**	0.0903
	(2.13)	(1.19)
Controls	Yes	Yes
Family fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
Observations	5085	432
R-squared	0.859	0.851

Notes: This table reports the estimates of Model (1) using subsamples based on the number of property owned by households. Dependent variable and explanatory variables are log transformed. Column 1 restricts the sample to households with one property. Column 2 restricts the sample to households with more than one property. The *t*-statistics are provided in parentheses below the estimates. Standard errors are clustered at the household level. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.

Finally, we divide households into subsamples based on the number of properties they own and reported the results in Table 8. Most households own only one property (1695 households); only about 144 households in our sample own more than one property. Table 8 shows that, again, housing equity value does not have a significant impact on non-durable consumption for both types of households. The coefficients on income and non-housing wealth for households with more than one property are now insignificant, which may be due to the small sample size.

4.4. A scenario analysis

We are unable to discern whether the LBS will have an effect on consumption from the results presented in Table 4, as the effect depends not only on the coefficients of income, home equity, and net non-housing wealth, but also on the values of these variables before and after a household takes up the LBS. Therefore, we analyze the potential consumption impacts of the LBS in this subsection using scenario analysis.

Table 9. Scenario analysis.

	Non-durable consumption
Income	0.00000765**
	(2.28)
Housing equity	1.83E-08
	(0.83)
Non-housing wealth	4.54E-08
	(1.33)
Controls	Yes
Family fixed effects	Yes
Wave fixed effects	Yes
Observations	4422
R-squared	0.854

Notes: This table reports the estimates of Model (3) in the scenario analysis in Section 4.4. Dependent variable is log transformed. The *t*-statistics are provided in parentheses below the estimates. Standard errors are clustered at the household level. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.

This scenario analysis is drawn from an LBS example provided by the HDB on their website.[4] A couple, both 65 years old, are joint owners of a 5-room HDB flat with a remaining lease of 65 years. There is no outstanding mortgage loan on the property. Under the LBS, they can retain 30 years of the lease and sell the remaining 35 years of the lease to the HDB. The HDB values the property to be worth $520,000 and the 35-year tail lease is valued at $219,300. The proceeds of the sale for the tail lease is divided between the two and amounts to $109,650 for each. As the 2020 basic retirement sum set by the CPF Board is $90,500 per person (at age 65), the LBS proceeds are used to top up the retirement accounts to $90,500 each with the remaining available as a cash payout. In this scenario, the total cash payout is $63,300, and the CPF retirement balances of $90,500 each are used to purchase an annuity plan which pays a monthly amount of $1,000 to the household for life. As the CPF top-up in this example exceeds $60,000, the couple qualifies to receive a $7,500 cash bonus.

Because the household's income and net non-housing wealth before and after the take-up of the LBS are not provided in the LBS example, we adopt a semi-log specification here and regress log of non-durable consumption on the levels of income, home equity, and net non-housing wealth, controlling for household characteristics. Thus, instead of using Model (1), we estimate

$$\log C_{i,t} = \text{const} + \beta_1 I_{i,t-1} + \beta_2 \text{HE}_{i,t} + \beta_3 \text{NNH}_{i,t} + \beta_4 \text{Family}_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t}, \qquad (3)$$

where the variables are as defined for Model (1). The regression results are reported in Table 9. Based on Model (3), we obtain

$$\Delta \log C_{i,t} = \beta_1 \Delta I_{i,t-1} + \beta_2 \Delta HE_{i,t} + \beta_3 \Delta NNH_{i,t} + \Delta\delta_t + \Delta\varepsilon_{i,t}, \qquad (4)$$

where Δ refers to the difference of the variable before and after household *i* takes up the LBS at time *t*.

As described in the example above, if this household takes up the LBS, their home equity will decrease by $219,300 since they sell the tail lease of their flat by this amount. Their net non-housing wealth will increase by the amount of the cash payout and cash bonus, which is $70,800, and their income each month from the CPF annuity will increase by $1,000. After we plug the estimates into equation (4), we obtain an estimate of the percentage change in the household's non-durable consumption, which is 0.69%. That is, the LBS will increase the couple's non-durable consumption by 0.69%. For the median 5-room HDB flat household in the SLP sample, the medium non-durable consumption is around $2,000 per month. An increase of 0.69% translates to an increase of about $14 per month, an economically insignificant value, which may explain the low take-up rate for the LBS.

5. Conclusion

The majority of Singapore households have a high proportion of wealth in the form of housing equity. The importance of housing equity is particularly pronounced for lower and middle-income households. The SLP data allows us to analyze whether housing wealth has a significant impact on household consumption and therefore shed some light on the issue of elderly homeowners' affordability to 'age-in-place' from a unique Singaporean perspective.

Panel analysis shows that housing equity does not have a significant impact on household non-durable consumption. The conclusion holds after we consider lagging consumption and potential misreporting of housing equity value. For heterogeneity analysis, we divide the sample according to the health condition of households, the age of household head, and housing type. Again, for all subsample regressions, we do not observe a significant impact of housing equity on household consumption. On the other hand, we find that the consumption response to the change in non-housing wealth is, in general, larger than that for housing wealth, and significant. Our findings are therefore broadly consistent with the theoretical models in Buiter (2010) and Souleles and Sinai (2005) that the magnitude of the housing wealth effect on consumption is comparatively smaller than that of non-housing wealth.

In addition, our estimations show that the LBS, which allows households to monetize their housing equity, potentially increases consumption by less than one percent. The magnitude of the potential increase in consumption is rather low, which may explain the low take-up rate for this scheme.

An important caveat of our analysis is that the SLP survey only covers the elderly Singaporeans at age 50–70. Although our robustness checks show that home equity does not have a significant impact on non-durable consumption for different age groups in the survey, we should keep the reservation in mind that this result may not hold for elderly Singaporeans over age 70.

Given the strong homeownership bias and the importance of housing equity in the households' portfolio, the insignificant effect of changes in housing equity on non-durable consumption for the elderly is a phenomenon that deserves further study. Is housing wealth a sideshow, or held as insurance against retirement contingencies? Are there other institutional or behavioral factors at work? At the micro level, our findings have implications for the design of policies that seek to improve the well-being of elderly households and their affordability to 'age-in-place'. At another level, the relative inelasticity of consumption behavior of elderly households as the general population ages rapidly has implications for economic growth and macroeconomic policy.

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Notes

1 Vaithianathan et al. (2018) compare monthly household income and expenditure recorded in the SLP with those in official statistics, and they find that the data is very similar in distribution.

2 All references to $ in this paper are to Singapore dollars. The exchange rate on 14 October 2020 was S$1.36 to US$1.

3 Comprising 830 households in four-room HDB flats, 2,030 households in three-room HDB flats, and the remaining 240 households in smaller HDB flats. (As revealed in Parliament by the Minister for National Development, and reported by Channel News Asia, Oct 1, 2018). Access at: https://www.channelnewsasia.com/news/singapore/3-100-households-have-taken-up-lease-buyback-scheme-mostly-3-10775596.

4 Access on August 12, 2020. https://www.hdb.gov.sg/cs/infoweb/residential/living-in-an-hdb-flat/for-our-seniors/monetising-your-flat-for-retirement/lease-buyback-scheme/how-it-works.

References

Agarwal, S., & Qian, W. (2017). Access to home equity and consumption: Evidence from a policy experiment. *Review of Economics and Statistics*, *99* (1), 40–52.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58* (2), 277–297.

Attanasio, O. P., Blow, L., Hamilton, R., & Leicester, A. (2009). Booms and busts: Consumption, house prices and expectations. *Economica*, *76* (301), 20–50.

Benjamin, J. D., Chinloy, P., & Jud, G. D. (2004). Real estate versus financial wealth in consumption. *The Journal of Real Estate Finance and Economics*, *29* (3), 341–354.

Browning, M., Gørtz, M., & Leth-Petersen, S. (2013). Housing wealth and consumption: A micro panel study. *The Economic Journal*, *123* (568), 401–428

Buiter, W. H. (2010). Housing wealth isn't wealth. *Economics: The Open-Access, Open-Assessment E-Journal*, *4* (22), 1–29.

Campbell, J. Y., & Cocco, J. F. (2007). How do house prices affect consumption? Evidence from micro data. *Journal of Monetary Economics*, *54* (3), 591–621.

Carroll, C. D., Otsuka, M., & Slacalek, J. (2011). How large are housing and financial wealth effects? A new approach. *Journal of Money, Credit and Banking*, *43* (1), 55–79.

Carroll, C. D., Zhou, X., & Mae, F. (2010, October). Measuring wealth effects using US state data. In Federal Reserve Bank of San Francisco Conference on Empirical Macroeconomics Using Geographical Data on March (Vol. 18, *p*. 2011).

Case, K. E., Quigley, J. M., & Shiller, R. J. (2005). Comparing wealth effects: The stock market versus the housing market. *Advances in Macroeconomics*, *5* (1), 1–34.

Case, K. E., Quigley, J. M., & Shiller, R. J. (2013). Wealth effects revisited 1975–2012. *Critical Finance Review*, *2* (1), 101–128.

Disney, R., Gathergood, J., & Henley, A. (2010). House price shocks, negative equity, and household consumption in the United Kingdom. *Journal of the European Economic Association*, *8* (6), 1179–1207.

Ludwig, A., & Sløk, T. (2004). The relationship between stock prices, house prices and consumption in OECD countries. *The B.E. Journal of Macroeconomics*, *4* (1), 1–28.

Paiella, M., & Pistaferri, L. (2017). Decomposing the wealth effect on consumption. *The Review of Economics and Statistics*, *99* (4), 710–721.

Phang, S. Y. (2004). House prices and aggregate consumption: Do they move together? Evidence from Singapore. *Journal of Housing Economics*, *13* (2), 101–119.

Phang, S. Y. (2007). The Singapore model of housing and the welfare state. In R. Groves, A. Murie, & C. Watson (Eds.), *Housing and the New Welfare State* (pp. 15–44). Ashgate.

Phang, S. Y. (2015). *Singapore's housing policies: Responding to the challenges of economic transitions*. Singapore Economic Review, 50th Anniversary Special Issue on Singapore's Economy.

Phang, S. Y. (2016). *Housing wealth accumulation and distribution in global cities: The case of Singapore*. Paper presented at International Symposium on Land Policy and Housing Market, Hong Kong University Workshop, May 16–17, 2016, Hong Kong.

Phang, S. Y. (2018). *Policy innovations for affordable housing in Singapore: From Colony to Global City*. Cham, Switzerland: Palgrave Macmillan.

Souleles, N. S., & Sinai, T. (2005). Owner-occupied housing as a hedge against rent risk. *Quarterly Journal of Economics*, *2*, 763–789.

Vaithianathan, R., Hool, B., Hurd, M. D., & Rohwedder, S. (2018). High-frequency internet survey of a probability sample of older Singaporeans: The Singapore Life Panel®. *The Singapore Economic Review*. https://doi.org/10.1142/S0217590818420043

Appendix

Table A1. Robustness check: change the threshold of defining abnormal reports.

Dependent variable: Non-durable consumption		
	(1)	(2)
	Exclude > 150%	Exclude > 200%
Income	0.0733***	0.0733***
	(4.34)	(4.40)
Housing equity	0.0364	0.0358
	(1.11)	(1.16)
Non-housing wealth	0.0315**	0.0314**
	(2.11)	(2.15)
Controls	Yes	Yes
Family fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
Observations	6030	6132
R-squared	0.874	0.874

Notes: This table reports the estimates of Model (1) for the robustness in which where we change how we define abnormal reports in terms of housing equity. Dependent variable and explanatory variables are log transformed. Column 1 excludes households that reported over 150% change in their housing equity value across three waves. Column 2 excludes households that reported over 200% change in their housing equity value across three waves. The *t*-statistics are provided in parentheses below the estimates. Standard errors are clustered at the household level. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.

Table A2. Robustness check: use quarterly- or half-yearly-average values.

Dependent variable: Non-durable consumption		
	(1)	(2)
	Quarter	Half Year
Income	0.162***	0.195***
	(7.28)	(9.62)
Housing equity	0.0134	0.00227
	(0.46)	(0.09)
Non-housing wealth	0.0330***	0.0241**
	(2.92)	(2.19)
Family fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
Observations	6087	6161
R-squared	0.92	0.92

Notes: This table reports the estimates of Model (1) for the robustness check in which we use the quarterly-average and half-yearly-average values for the monthly variables. Dependent variable and explanatory variables are log transformed. Age and marital status are not controlled. Column 1 uses quarterly-average values for variables. Column 2 uses half-yearly-average values for variables. Housing value and non-housing wealth are not averaged because they are reported yearly. The *t*-statistics are provided in parentheses below the estimates. Standard errors are clustered at the household level. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.

Table A3. Robustness check: exclude households with stable housing equity.

	Non-durable consumption
Income	0.0807***
	(3.97)
Housing equity	0.00731
	(0.19)
Non-housing wealth	0.0398**
	(2.26)
Controls	Yes
Family fixed effects	Yes
Wave fixed effects	Yes
Observations	4575
R-squared	0.869

Notes: This table reports the estimates of Model (1) for the robustness check in which we exclude households with stable housing equity across three waves. Dependent variable and explanatory variables are log transformed. The *t*-statistics are provided in parentheses below the estimates. Standard errors are clustered at the household level. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.

Table A4. Robustness check: unbalanced panel.

	Non-durable consumption
Income	0.0914***
	(5.77)
Housing equity	0.0212
	(0.63)
Non-housing wealth	0.0315**
	(2.42)
Controls	Yes
Family fixed effects	Yes
Wave fixed effects	Yes
Observations	7745
R-squared	0.878

Notes: This table reports the estimates of Model (1) for the robustness check in which we consider an unbalanced panel data. Dependent variable and explanatory variables are log transformed. The *t*-statistics are provided in parentheses below the estimates. Standard errors are clustered at the household level. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.

Table A5. Robustness check: dynamic panel model.

	Non-durable consumption
Lagged non-durable consumption	0.223***
	(2.65)
Income	0.0796***
	(3.13)
Housing equity	−0.0522
	(−0.80)
Non-housing	0.0143
wealth	(0.71)
Controls	Yes
Family fixed effects	Yes
Wave fixed effects	Yes
Observations	1873

Notes: This table reports the estimates of Model (2) for the robustness check in which we consider a dynamic panel model. In the model, lagged non-durable consumption denotes the non-durable consumption from the previous period. Dependent variable and explanatory variables are log transformed. The *t*-statistics are provided in parentheses below the estimates. Standard errors are clustered at the household level. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.