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Housing Equity and Household Consumption in Retirement: Evidence from the Singapore Life Panel

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Housing Equity and Household Consumption in Retirement: Evidence from the Singapore Life Panel[1]

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Abstract: We utilize data from the Singapore Life Panel© survey to empirically investigate the impact of housing equity on 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 check. Moreover, heterogeneity analyses based on subsamples by age of household head, house type, and number of property possessed also show no significant impact of housing equity on consumption in general. Finally, we use scenario analysis to study the Lease Buyback Scheme (LBS), a novel housing equity monetization scheme which allows elderly households to unlock housing equity for retirement financing. We find LBS increases non-durable consumption by about only 0.69%, which may explain the low take-up rate for the LBS.

Keywords: Housing wealth, elderly households, monetization, Singapore

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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. This view, however, does not take into account the special characteristics of housing.

As an asset class, housing differs from other financial assets. For homeowners, it is both an investment and a consumption good. Homeowners, who wish to withdraw housing equity can do so in different ways. They may downsize their house or rent alternative accommodation. However, housing assets are relatively illiquid and housing transactions involve high transaction costs unlike financial assets such as deposits, stocks, and bonds. 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 lead to an increase in 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. The SLP is a unique high-frequency longitudinal survey launched in 2015 by Singapore Management University's Centre for Research on the Economics of Ageing with the objective of informing the retirement discussion as the population ages in Singapore. It is unique in tracking income, consumption, health and work information of Singaporeans aged 50 to 70 years on a monthly frequency. The SLP also contains rich information on household characteristics, consumption with a wide range of categories, and wealth in various forms, including both 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 non-durable consumption of elderly households. This conclusion holds under robustness checks that consider lagging consumption, potential misreporting of housing equity value, and whether households reported unchanged housing value across three waves of survey. We also investigate heterogeneity in our sample, i.e., different age of household head, different housing types, and different numbers of property that households possess, and find no impact of housing equity on consumption as well. On the other hand, we find that the consumption response to the change of non-housing wealth is, in general, larger than for change in housing wealth, and significant. Our findings are therefore broadly consistent with the theoretical models in Buiter (2010) and Sinai and Soules (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 at 90%. This high homeownership rate is the result of a comprehensive housing supply and housing finance framework that is strongly biased toward homeownership. Sustained increases in housing prices over the decades have resulted in the rapid growth of housing equity in household assets. The majority of households hold substantial proportions of their wealth in the form of housing equity. In the meantime, Singapore is also faced with an ageing population. The old age support ratio, defined as the ratio of the number of persons aged 20 to 64 per person to the number of persons aged 65 years and over, has declined from 9.0 in 2000 to 4.8 in 2018. In this context of housing asset-rich and ageing households, Singapore has been implementing policies that will allow homeowners to unlock their

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housing equity to improve standards of living in retirement. Our research, therefore, shed light on the impact of these housing monetization policies that are unique to Singapore.

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.

Our study is related to the debate about the housing wealth effect on consumption. There is a large literature empirically investigating the housing wealth effect. The conclusions drawn by these studies are however mixed, regardless of whether aggregate or micro data were used. Using aggregate data, several studies find that housing wealth affects consumption (Benjamin, Chinloy, and Jud, 2004; Case, Quigley, and Shiller, 2005; Carroll, Zhou, and Mae, 2010; Carroll, Otsuka, and Slacalek, 2011; Case, Quigley, and Shiller, 2013). Other studies using aggregate data does not arrive at similar conclusions. Ludwig and Sløk (2004) show a large and positive response of consumption to changes in financial wealth. The relationship is however 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 evidence of housing wealth effect on consumption. Using household-level micro data from the Family Expenditure Survey (FES) in the UK, Campbell and Coco (2007) find the housing wealth effect to be large for elderly homeowners and almost zero for young renters. Using the same dataset as Campbell and Coco (2007), Attanasio, Hamilton, and Leicester (2009) in contrast find a stronger link between consumption and house prices for younger households (who are less likely to have high levels of

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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 (2016) find a significant negative consumption response to a decrease in access to housing equity. Our study differs from theirs by specifically addressing the impact of housing equity on 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 organised as follows. Section 2 provides an overview of the housing market and housing policies in Singapore. This section also provides a discussion of recent 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.

1. Housing Wealth and Housing Monetization Schemes in Singapore

Singapore has a high resident homeownership rate of 90%, with three quarters of its current housing stock built by the Housing and Development Board (HDB). Only 6% of the HDB housing stock is rental units and the HDB have sold 94% of the flats it built to eligible households at below market prices, on a 99-year leasehold basis. This unusual high homeownership rate and dominance of the state in the housing market are the results of long-standing housing policy bias towards homeownership (Phang 2007, 2015, 2018).

The HDB and commercial banks provide housing mortgage loans to households for their purchase. A compulsory savings scheme, the Central Provident Fund (CPF), is the other pillar in the homeownership framework. Employees maintain CPF personalized accounts from which they are allowed to make withdrawals for down payment and mortgage payments for housing purchase, but not for housing rental payments. Mortgage loan tenors are typical of 25-year tenor; the HDB interest rate is 2.6% per annum, with commercial banks competing for market share with starting rates below 2%.

The household income ceiling for a couple buying a new HDB flat, or a resale HDB flat with a housing grant, is S$12,000 per month (only one unit per household is permitted). The 2018 median monthly household income from work among resident employed households was S$9,293. As the HDB income cap is 29% above the median household income, almost all first-time homeowners who are citizens start their homeownership journey at 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 the 1960s. In the 1970s and 1980s, the HDB's massive building program transformed the urban landscape, households' asset portfolio and the country's homeownership rate. HDB dwellings as a proportion of the total housing stock increased from 39% in 1970 to 83% in 1990. The homeownership rate over the same period increased from 29.4% to 87.5%. 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 decade, demand-side subsidies in the form of substantial and targeted housing grants have enabled low-income households to afford ownership of an HDB flat.

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). The Singapore government's Department of Statistics provides macro data on resident household balance sheets every quarter, with the series starting from 1995Q1.[4] At the end of 2018, the resident household sector total assets to GDP was 4.46 times GDP while the household net worth to GDP ratio was 3.79. The ratio of housing assets owned by the resident household sector was 1.94 times GDP, and outstanding housing mortgage loans was 50.6% of GDP.

For resident households, housing assets comprised 44% of total household assets. In 2018, 79% of resident households resided in the HDB sector, with housing wealth in HDB housing comprising 48% of total housing wealth (see Table 1). The average housing wealth per household in the HDB sector was S$420,062 and that for the private housing sector was 4.4 times higher at S$1,865,652. Mortgage loans outstanding was 26.1% of housing wealth and 75.1% of total household liabilities. The average mortgage loan outstanding per household was $185,998. The Singapore Department of Statistics does not collect balance sheet data from household units and the aggregate nature of the data published does not permit us to analyse the relative importance of housing wealth by house type or household characteristics.

Housing wealth, however, is relatively illiquid. With a rapidly aging population, a significant portion of household wealth in housing, and few affordable rental options, there is a need for instruments to help households monetize their housing wealth in the face of retirement and problems related to aging. The first reverse mortgage instrument was introduced in 1997 by a local insurance company, NTUC Income. The next reverse mortgage offering was from OCBC Bank, one of the 'big three' commercial banks in Singapore, in 2006. Both have however discontinued their schemes, citing low demand. Koh (2015) identified the lack of government involvement and the

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[4] See the Singapore government Department of Statistics website at: http://www.singstat.gov.sg/statistics/browse-by-theme/household-sector-balance-sheet

leasehold nature of most housing in Singapore as contributing to the scarce offerings and very limited take-up, as borrowers were made to bear most of the risks.

Since 2009, the government began to introduce various housing schemes for elderly HDB households to enable them to monetize housing wealth for retirement financing. The HDB advises elderly households of three possible housing monetization options: rental or sublet of room(s), down-sizing to a smaller flat, or selling the tail end of the flat lease under the Lease Buyback Scheme (LBS), which is the focus of this paper.

Similar to a reverse mortgage, the LBS enables the elderly household to age in place while unlocking their home equity to finance retirement. The mechanics are however very different due to the leasehold nature of HDB properties. When first introduced a decade ago in 2009, to be eligible for the LBS, home-owners had to be of retirement age (age 63 or older) and lived in 3-room HDB or smaller flats. Household income had to be lower than S$3,000. HDB flat owners retained 30 years of their lease and sold the remaining years to the HDB. They received a bonus (grant) of up to S$10,000 for participating in the LBS. Proceeds from the lease sale were used to top up the CPF retirement account. Participating members were then required to purchase an annuity with their CPF retirement balance and received lifelong payouts.[5] A 2013 enhancement to the scheme raised the bonus to S$20,000 and also allowed homeowners the choice to withdraw cash from the LBS proceeds if they had met the target retirement balance.[6] Between 2009 to August 2014, just under 800 households had signed on to the LBS.[7]

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[5]   CPF Retirement Scheme, Retrieved September 2015. https://mycpf.cpf.gov.sg/Members/Schemes#Retirement

[6]   Prior to the 2013 enhancement, all net proceeds, except for a maximum of $5,000 lump sum cash, had to be used to purchase an immediate annuity with the CPF Board. The 2013 changes lowered the top up requirement and allowed households to keep up to $100,000 of net proceeds in cash. Joint Press Release by the Ministry of National Development, HDB and CPF Board, "Silver Housing Bonus and Lease Buyback Scheme made more attractive for elderly," 27 Dec 2012.

[7]   This is out of an estimated 42,000 owners of 3- and 2-room HDB flats who met the age and other criteria. "Lease Buyback Scheme: emotional barriers to retirement adequacy", The Straits Times, 2 Sep 2014.

On 17 August 2014, the Prime Minister announced further significant enhancements to the LBS which came into effect in April 2015. The enhancements extended the eligibility for LBS to those who lived in 4-room HDB flats and raised the income ceiling from $3,000 to $10,000 from April 2015 (and to $12,000 from August 2015), and the eligibility age to 64 or older. 3-room HDB flat owners continued to receive a bonus of S$20,000 for participating in the LBS while 4-room HDB flat owners received a bonus of S$10,000.

In addition, the enhanced LBS allows households greater flexibility in choosing how much of their home lease they wish to retain. Instead of a fixed 30-year term, the choice of the lease to retain is from 15 to 35 years, provided the retained lease covers the youngest owner until at least age 95. Owners must have at least 20 years of lease remaining to sell. The enhanced LBS saw 779 new applications in the April to September 2015 period as newly eligible households looked to monetize their housing equity.[8]

In August 2018, the Prime Minister announced that the LBS would be further extended to all HDB flat types from January 2019. With the eligibility age set at 65 or older, the HDB estimated that about 130,000 households were eligible for LBS as of November 2018. The cash bonus[9] is up to S$5,000 per household for seniors in 5-room and larger flats when they participate in the LBS.

The following example, which is from the HDB website, illustrates the mechanics of the LBS scheme.[10] Consider a couple, both aged 65 years old, who 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. The couple can retain 30 more years of the lease and sell the remaining 35 years of the lease to the

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[8]   "Spike in HDB lease buyback applications", The Straits Times, 21 Oct 2015.

[9]   The household will receive the full bonus if the total CPF top-up to the flat owners' retirement account is $60,000 or more. If the amount is less, the bonus if $1 for every $3 CPF top-up for 3-room or smaller flats; $1 for every $6 top-up for 4-room flats; or $1 for every $12 top-up for 5-room or bigger flats.

[10] HDB website at http://www.hdb.gov.sg/cs/infoweb/residential/living-in-an-hdb-flat/for-our-seniors/how-it-works&rendermode=preview.

HDB through the LBS. In this specific example, the HDB determines the current market value of the property to be $520,000 and estimates the current worth of the 35-year tail lease to be $219,300. (The methodology used by the HDB to determine the present value of the asset for which it will resume ownership 30 years hence has not been made public.) This $219,300 is split equally between the husband and wife, that is, $109,650 each. As the required basic retirement sum determined by the CPF Board is $88,000 per person (at age 65), the lease payout is used to top up their individual retirement account to $88,000 with the remaining available as a cash payout. In the example provided by the HDB, the total cash payout is $68,300, and the CPF retirement balances of $88,000 each are used to purchase a CPF annuity plan (CPF LIFE) which pays a monthly amount of $1,000 to the household for life. As the CPF top-up in this example exceeds S$60,000, the couple qualifies to receive a $5,000 cash bonus.

2. The Singapore Life Panel

The Singapore Life Panel© (SLP) is a high-frequency panel survey of a representative sample of Singaporeans between the ages of 50 to 70, conducted by the Singapore Management University's Centre for Research on the Economics of Ageing from 2015. It is designed to inform the retirement discussion as the population ages in Singapore. The study interviews approximately 10,000 respondents randomly selected from the population and covers questions over areas including monthly household income and spending, labour force status, as well as health shocks. Over 30 categories of consumption spending are covered. In addition to monthly surveys, the SLP also conducts an annual survey to collect information on household assets and liabilities, pensions, and annual income from the respondents. The questions on assets include home ownership, mortgage loans outstanding, as well as property values.

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 module. We will make use of these surveys to conduct a panel analysis.

We have a total of 5,628 observations in our sample, which corresponds to 1,876 households. The sample size is smaller when compared to the total number of survey respondents primarily because households who do not report the values of key variables across all the three surveys are excluded. We further excluded responses that show more than 100% change in home equity across three waves of the survey as the housing market in Singapore has been relatively stable and we do not expect such a large change in house value within one year. In fact, many of such responses are merely incorrectly filled out. For example, a household respondent reports the apartment is worth $50,000 in the first wave, $4,000 in the second wave, and $48,000 in the third wave. In addition, for a considerable number of households (around 30%) in the sample, more than one respondent in a household filled out the surveys. In this case, we take advantage of a 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 calculated the property value based on respondents' sharing proportion.

Table 2 reports the summary statistics of the key variables used in the regression analyses. The households in the sample spent an average amount of $3,718.08 per month on non-durable goods and services. 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 $358.60, $790.64, $123.71, $268.40, $299.56, $673.79, $217.99, $163.27, $102.89, $238.61, $134.55, respectively. The mean of our main explanatory variable of interest, housing equity value, is $848,418.80. According to the distribution chart in Figure 1, we see that

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the median is far lower as housing equity values are concentrated in the range from $250,000 to $750,000. The average household monthly income is $7,026.34, and non-housing wealth is $672,230.30. In terms of control variables, the respondents are on average 60.13 years old. 79% of the respondents are married at the time of the surveys.

3. Econometric Methods and Empirical Results
4.1 Econometric model

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

$$\log C_{it} = const + \beta_1 \log I_{i,t-1} + \beta_2 \log HE_{i,t} + \beta_3 \log NNH_{i,t}$$
$$+ \beta_4 Family_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t} \tag{1}$$

where

C_{it} 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 housing equity wealth at time t,

$NNH_{i,t}$ is the household's net non-housing wealth a time t,

$Family_{i,t}$ 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 a longer period of time.

Table 3 shows the estimation results for the regression above. The results indicate the estimated effect of home equity on non-durable consumption is not significantly different from zero, whereas for non-housing wealth, its impact on household non-durable consumption is significant

at the 1% level. We further divide non-durable consumption into different subcategories according to the SLP classifications which include utilities, food, clothing, health, leisure, transportation, education, insurance, contribution to social groups, cash gift, and others. The variation in the observation numbers is due to households not spending on all subcategories of consumption in the months when the survey was administered and hence are excluded from the regressions. We observe a pattern across the different consumption subcategories: the impact of housing equity value is consistently insignificant for all subcategories.

In general, our findings are broadly consistent with the theoretical models in Buiter (2010) and Sinai and Soules (2005) that the magnitude of the housing wealth effect on consumption is comparatively smaller than that of non-housing wealth.

4.2 Robustness check

We conduct three robustness checks for the results above. For the first robustness check, we changed how we defined abnormal reports in terms of housing equity. In the baseline regression, we had excluded households that reported more than 100% change in housing value across three waves. For the robustness check, we raised the bar and excluded households that reported more than 150% change, and 200% change in housing value within one year, respectively. As can be seen from Table 4, the estimated results are not different from the baseline results, where the coefficients on housing equity are still insignificant while those on non-housing wealth are significant at 5%.

For the second robustness check, we used 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 on a yearly basis. We retained household fixed effects but not age and marital status since the averages for these two variables are not economically meaningful. The results which are shown in Table 5 again suggest that housing value does not have a significant impact on non-durable consumption. Non-housing wealth, on the other hand, increases non-durable consumption by

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3.30% and 2.41%, and the impact is significant at the 1% and 5% level for the quarterly-average and the half-yearly average values, respectively.

For the third robustness check, we exclude households that reported no change in their housing value across three waves of survey. The subsample includes 1525 out of 1876 households. Results are reported in Table 6, where the coefficient on housing equity value is still not significant.

4.3 Heterogeneity analysis

In this section, we consider the heterogeneity of households. We first divide the sample into HDB households and non-HDB households and run separate regressions. We find that change in housing equity value has no significant impact on non-durable consumption for both types of households. For HDB households, the coefficient for non-housing wealth is significant at 5%, and it remains significant at 10% for non-HDB households. We then divide the households into two groups based on the age of the household head. Since the minimum 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 the households that either remain in work or in retirement throughout the three surveys. In other words, households that switched from work to retirement are excluded from the analysis. As shown in Table 8, no matter if the sample is limited to the households at age 50-63 or at age 64-70, housing equity does not have a significant impact on non-durable consumption. Yet the impact of non-housing wealth is significant for households at age 64-70. Finally, we categorise households into those who own only one property and those who own more than one property and report the results in Table 9. Again, housing equity value does not have a significant impact on non-durable consumption. The coefficient on non-housing wealth for households owning more than one property is now insignificant, which may be due to the predominance of wealthy households in this category, or to the small sample size.

4.4 A scenario analysis

We are unable to discern whether the LBS will be effective from the results presented in Table 3, 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 the households take up the LBS. Therefore, we analyze the potential consumption impacts of the LBS in this subsection using scenario analysis.

This scenario analysis revisits the LBS example provided by the HDB described in section 2. As the information on the household's income, home equity and net non-housing wealth before and after the take-up of the LBS is not provided, we 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

$$\log C_{it} = const + \beta_1 I_{i,t-1} + \beta_2 HE_{i,t} + \beta_3 NNH_{i,t}$$
$$+\beta_4 Family_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t} \tag{2}$$

where the variables are as defined for model (1). The regression results are reported in Table 10. Based on model (2), we obtain

$$\Delta \log C_{it} = \beta_1 \Delta I_{i,t-1} + \beta_2 \Delta HE_{i,t} + \beta_3 \Delta NNH_{i,t} + \Delta \delta_t + \Delta \varepsilon_{i,t}, \tag{3}$$

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

As described in Section 2, 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 $73,300 and their income each month from the CPF annuity will increase by $1,000. After we plug the estimates into equation (3), 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 in 2018. An increase of 0.69% translates to an increase of about $15 per month, an economically insignificant value, which may explain the low take-up rate for the LBS.

4. 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 has allowed us to analyse whether housing wealth has a significant impact on household consumption.

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 age of household head and housing type. Again, for all subsample regressions, we do not see 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 Sinai and Soules (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, can potentially increase consumption by about only 0.69%. The magnitude of the potential increase in consumption is rather low, which may explain the low take-up rate for this scheme.

Given the strong homeownership bias and importance of housing equity in 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 an insurance against retirement contingencies? Are there other institutional or behavioural 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. At another level, the relative inelasticity of consumption behavior of elderly households as the population ages rapidly has implications for economic growth and macroeconomic policy.

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Table 1. Average assets and housing wealth per household (S$), 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.

Table 2 Summary Statistics

	Count	Mean	Standard Deviation
Dependent variables			
Non-durable consumption	5,628	3,718.08	3,761.43
Utilities	5,628	358.60	207.01
Food	5,628	790.64	582.41
Clothing	5,628	123.71	216.45
Health	5,628	268.40	719.37
Leisure	5,628	299.56	963.80
Transportation	5,628	673.79	1,933.83
Education	5,628	217.99	1,027.20
Insurance	5,628	163.27	514.28
Contribution	5,628	102.89	315.17
Cash Gift	5,628	238.61	556.54
Other	5,628	134.55	289.58
Explanatory variables			
Income	5,628	7,026.34	7,562.92
Housing Equity	5,628	848,418.80	1,942,401
Non-housing Wealth	5,628	672,230.30	1,007,527
Control variables			
Age	5,628	60.13	5.36
Marital Status	5,628	0.79	0.40

Figure 1 Empirical Distribution of Housing Equity
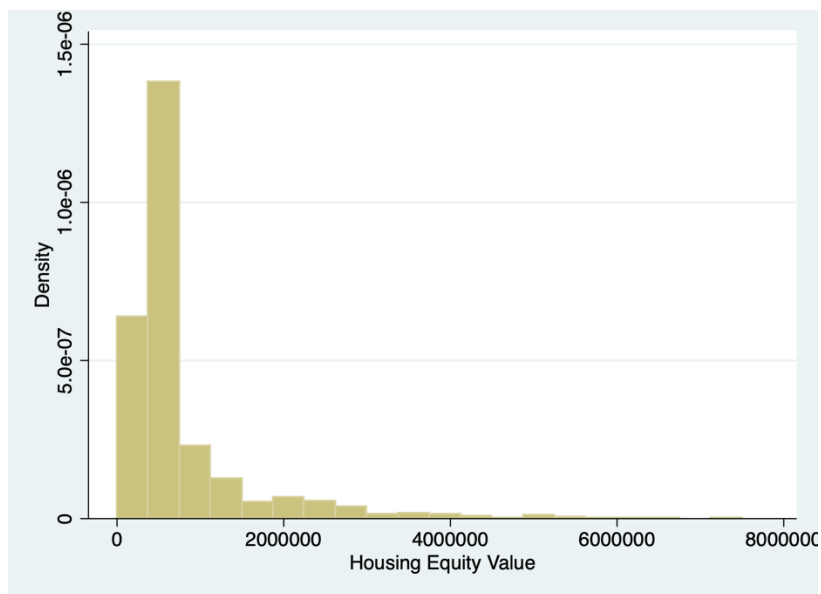
Notes: The graph is capped at 8,000,000, 99 percentile of housing equity value.

Table 3 Baseline Results

	(1) Non-durable consumption	(2) Utilities	(3) Food	(4) Clothing	(5) Health	(6) Leisure	(7) Transportation	(8) Education	(9) Insurance	(10) Contribution	(11) Cash Gift	(12) Other
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
	(5.11)	(2.95)	(4.43)	(1.26)	(1.37)	(3.39)	(3.51)	(-0.19)	(0.98)	(3.06)	(-0.13)	(0.59)
Home equity	0.00721	0.00164	0.0596	-0.0896	0.0358	0.176	0.0769	-0.228	0.0133	0.0268	0.00454	-0.125
	(0.18)	(0.06)	(1.46)	(-0.96)	(0.31)	(0.94)	(1.24)	(-0.70)	(0.09)	(0.30)	(0.03)	(-1.18)
Non-housing wealth	0.0386***	0.00540	0.0567***	-0.0235	0.0322	0.150**	0.0429**	0.158	-0.0402	0.0392	0.0327	0.0813**
	(2.90)	(0.60)	(4.08)	(-0.52)	(0.59)	(2.05)	(2.00)	(1.42)	(-0.66)	(0.92)	(0.60)	(2.04)
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	0.620	0.880	0.792	0.783	0.913	0.763	0.721

Notes: t-statistics are provided in parentheses below the estimates.
* denotes p<0.1, ** denotes p<0.05, *** denotes p<0.01.

Table 4 Robustness Check: Outlier Exclusion

Dependent variable: Non-durable consumption

	(1)	(2)
	Exclude > 150%	**Exclude > 200%**
Income	0.0733***	0.0733***
	(4.94)	(4.98)
Home equity	0.0364	0.0358
	(1.11)	(1.21)
Non-housing wealth	0.0315**	0.0314**
	(2.52)	(2.55)
Controls	Yes	Yes
Family fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
Observations	6030	6132
R-squared	0.874	0.874

Notes: t-statistics are provided in parentheses below the estimates.

* denotes p<0.1, ** denotes p<0.05, *** denotes p<0.01.

Table 5 Robustness Check: Lagging Average

Dependent variable: Non-durable consumption

	(1)	(2)
	Quarter	**Half Year**
Income	0.162***	0.195***
	(8.58)	(10.08)
Home Equity	0.0134	0.00227
	(0.42)	(0.08)
Non-housing Wealth	0.0330***	0.0241**
	(3.17)	(2.56)
Family fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
Observations	5280	4629
R-squared	0.919	0.938

Notes: t-statistics are provided in parentheses below the estimates.
* denotes p<0.1, ** denotes p<0.05, *** denotes p<0.01.

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Table 6 Robustness Check: Exclude Households with Unvarying Housing Value

	Non-durable consumption
Income	0.0807***
	(4.61)
Home equity	0.00731
	(0.18)
Non-housing wealth	0.0398***
	(2.73)
Controls	Yes
Family fixed effects	Yes
Wave fixed effects	Yes
Observations	4575
R-squared	0.869

Notes: t-statistics are provided in parentheses below the estimates.
          * denotes p<0.1, ** denotes p<0.05, *** denotes p<0.01

Table 7 Differential Impact on HDB and non-HDB Households

Dependent variable: Non-durable consumption		
	(1)	(2)
	HDB household	Non-HDB household
Income	0.0805***	0.0745**
	(4.52)	(2.43)
Home equity	0.0362	-0.0311
	(0.67)	(-0.51)
Non-housing wealth	0.0346**	0.0532*
	(2.31)	(1.84)
Controls	Yes	Yes
Family fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
Observations	4386	1233
R-squared	0.855	0.822

Notes: t-statistics are provided in parentheses below the estimates.
          * denotes p<0.1, ** denotes p<0.05, *** denotes p<0.01.

Table 8 Differential Impact on Retirement Group

Dependent variable: Non-durable consumption

	(1)	(2)
	Age 50 - 63	**Age 64 - 70**
Income	0.0372	0.0964***
	(1.23)	(4.96)
Home equity	-0.127	0.0615
	(-1.56)	(1.11)
Non-housing wealth	0.0110	0.0558***
	(0.41)	(3.39)
Controls	Yes	Yes
Family fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
Observations	1257	3882
R-squared	0.858	0.863

Notes: t-statistics are provided in parentheses below the estimates.
* denotes $p<0.1$, ** denotes $p<0.05$, *** denotes $p<0.01$.

Table 9 Differential Impact on Households with 1 or > 1 Property

Dependent variable: Non-durable consumption

	(1)	(2)
	One property	**> One property**
Income	0.0851***	0.0248
	(5.15)	(0.51)
Home equity	0.0188	0.199
	(0.38)	(1.06)
Non-housing wealth	0.0352***	0.0903
	(2.58)	(1.29)
Controls	Yes	Yes
Family fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
Observations	5085	432
R-squared	0.859	0.851

Notes: t-statistics are provided in parentheses below the estimates.
* denotes $p<0.1$, ** denotes $p<0.05$, *** denotes $p<0.01$.

Table 10 Scenario Analysis

	Non-durable consumption
Income	0.00000765***
	(2.66)
Home equity	1.83e-08
	(0.52)
Non-housing wealth	4.54e-08
	(1.47)
Controls	Yes
Family fixed effects	Yes
Wave fixed effects	Yes
Observations	4422
R-squared	
	0.854

Notes: t-statistics are provided in parentheses below the estimates.
* denotes p<0.1, ** denotes p<0.05, *** denotes p<0.01