Housing wealth effects for private and subsidized homeowners

Abstract

Purpose – To examine the effect of housing wealth on household consumption when there are resale and refinancing constraints that prevent housing assets from being cashed out.

Design/methodology/approach – Based on Household Expenditure Survey data in Hong Kong from 1999 to 2010, regression analysis is applied to compare the housing wealth effects of private and subsidized homeowners. Propensity score matching is adopted to ensure that the two groups of homeowners share similar household income. Further regression analysis is conducted to examine private homeowners' consumption when their recourse mortgages are in negative equity.

Findings – Subsidized homeowners, who are not allowed to resell their units before sharing their capital gain with the government, experienced an insignificant housing wealth effect. While private homeowners experienced a significant housing wealth effect, the effect was weakened in the presence of a resale constraint induced by negative equity. The results remain robust after the application of more rigorous sample selection through propensity score matching.

Research limitations/implications – The analyses are subject to two potential data limitations. One is a relatively small sample size. The other is that data on financial assets and mortgages are unavailable and have to be indirectly controlled through household characteristics. Nevertheless, our estimated marginal propensity to consume out of housing wealth is 0.03 of the annual household consumption for private homeowners, which is within the range of estimates reported in previous literature.

Social implications – This study shows that the housing wealth effect enjoyed in the private sector does not necessarily apply to the subsidized sector where resale and refinancing constraints exist. This is not to suggest that the constraints be removed. Rather, policymakers should be aware of the tradeoff: while the constraints ensure that government subsidies are used to assist home ownership, not capital gain, they also bring about consumption inequality in a society, especially in a booming housing market.

Originality/value – Our findings extend the literature on the housing wealth effect, which has been exclusively focusing on private homeowners, to subsidized homeowners. This study also adds to the literature on housing welfare by highlighting that the resale constraints of subsidized housing can weaken the housing wealth effect.

Keywords: Household consumption, house value, market liquidity, propensity score matching, housing policy, Hong Kong

1. Introduction

The ups and downs of a housing market can have a significant impact on the economy in which it operates. The downs can trigger financial crises like the 2008 economic meltdown that began in the United States. The ups can promote economic growth, notably through the housing wealth effect, in which non-housing consumption increases with an increase in housing wealth. Ando and Modigliani (1963) explained the wealth effect through the life-cycle hypothesis. Given that most households intend to smooth their consumption over their lifetimes and that adjusting housing consumption is costly, an increase in housing wealth tends to stimulate households to spend more by borrowing more through home equity loans or reducing the amount of precautionary savings. An extensive body of empirical literature has supported the existence of the housing wealth effect (Benjamin et al. 2004, Bostic et al. 2009, Carroll et al. 2011, Case et al. 2005, Kishor 2007).

The well-established housing wealth effect literature provides a potential justification for the government to promote home ownership over rental subsidies in formulating housing policies. Doling and Ronald (2010) emphasized that home ownership has provided opportunities for individuals to build wealth. As housing wealth expands, their capacity to tap into this wealth for buying welfare goods or offsetting retirement needs also increases. This leads to the notion of a 'property-based' approach to restructuring the current 'transfer-based' welfare system. In fact, various subsidized home ownership schemes have been implemented in different countries.[1] All of them come with resale constraints. For instance, in the United States, the Department of Housing and Urban Development (HUD) permits local public housing authorities to sell HUD housing units to low-income families. But the subsidized households are subject to certain anti-speculative and resale restrictions.[2] They have to pay back the initial subsidy if they resell the units; and have to pay at least part of the capital gains in addition if they resell within five years. In the United Kingdom, the affordable housing ownership schemes help low-income families by providing equity loans or allowing shared ownership.[3] Subsidized households can only sell to buyers designated by the housing association unless they pay back the equity loans provided by the government. In Asia, home ownership assistance is even more commonplace. Subsidized ownership housing in Singapore accommodates 84 percent of its homeowners.[4] The

Singaporean Government builds new flats and sells them at subsidized prices to eligible buyers. The resale of these flats is subject to a minimum occupation period of five years.[5] Similarly, in Hong Kong, eligible households can purchase flats from the government at a discount. To sell the flats, the subsidized homeowners have to share the capital gain (based on the initial discount percentage) with the government. Beside this resale constraint, there are also restrictions on refinancing. The details will be given in Section 3.

Can one take for granted that the housing wealth effect, which is solely based on observations of the private housing sector, will carry over to the subsidized housing sector? As pointed out above, a salient common feature of subsidized home ownership schemes is the resale (including refinancing) constraint, which presents an obstacle to converting housing assets into cash. Subsidized households have to either pay back the subsidies or own the homes for a minimum required period of time before they can resell or refinance them. This implies that subsidized housing is much less liquid than private housing. As a result, banks, which take housing assets as collateral, are more cautious about offering additional mortgages or loans to subsidized households backed by home equity appreciation (Cornett et al. 2011). Subsidized households are also less willing to scale down their precautionary savings because they cannot easily turn their housing assets into cash in case of emergency. Therefore, the resale constraint is expected to prevent subsidized households from fully enjoying the housing wealth effect. In other words, the responses of household consumption to home equity appreciation would be weakened. This study will test this proposition by econometrically analyzing household data, particularly through a comparison of the housing wealth effect in the private and subsidized housing sectors.

This is the first study to examine if resale constraints weaken the housing wealth effect. Previous studies have examined other factors that affect the size of the housing wealth effect. The most studied factors are household characteristics such as the age of household head (Campbell and Cocco 2007), credit constraints (Bostic et al. 2009), wealth composition, income level (Guo and Hardin III 2014), and risk attitudes (Liao et al. 2014). Other factors are market conditions and structure. For example, Disney et al. (2010) reported on asymmetric responses of consumption to housing wealth's rises and falls. Ashley and Li (2014) showed that the response depends on the persistence of housing wealth fluctuation. Other studies found that the maturity of financial

markets (Aoki et al. 2004, Iacoviello 2011) and the distribution of wealth among the population (Benjamin et al. 2004) matter. A more recent study highlights that institutional differences such as subsidies for homeownership, privatization of social housing, and mortgage finance liberalization are likely to have influenced the distribution of housing wealth across countries (Wind et al. 2016). This study can be regarded as an extension of the literature on market structure, which hitherto did not take into account the resale constraint that can arise from a subsidized home ownership policy or, more generally, similar institutional restrictions in the private housing sector. For the latter, a good example is recourse mortgage contracts, which allow lenders not just to seize collateral in case of default, but also to go after borrowers' other assets if their collateral is insufficient to cover their loans. This means in the case of negative equity, a homeowner cannot simply walk away as if his home were sold to the lender; he still has to pay the shortfall if he wants to sell his home – exactly like what a subsidized household would have to pay in order to resell its home.

In this study, we selected Hong Kong as our laboratory to develop empirical tests for several reasons. First, a significant share of its population is housed in subsidized housing units. Two parallel housing sectors in Hong Kong, namely subsidized and private housing, provide us with different resale constraints for comparison. Second, housing prices in Hong Kong are highly volatile – they dropped by 70 percent after the 1997 Asia Financial Crisis and have gone up by more than 200 percent since 2009. These substantial changes in housing prices facilitate the testing of the housing wealth effect. In particular, the sharp fall in housing prices, coupled with the litigious nature of mortgage contracts in Hong Kong, give us another angle to test the impact of resale constraints. Last, residential properties in Hong Kong, typically in the form of condominiums, are highly homogeneous. This homogeneity reduces measurement errors in housing wealth and makes our estimates of the housing wealth effect, or the lack thereof, more reliable.

This study came up with two major findings. One is that the housing wealth effect was present only among private homeowners, but not subsidized homeowners. This was robust across different empirical specifications, including more rigorous sample selection through propensity score matching. The other concerns a peculiar form of resale constraint in the private housing sector.

As mentioned before, recourse mortgages impose a resale constraint on private homeowners when the values of their homes go below their mortgage values – private homeowners find it difficult to sell their homes as if they were subject to a resale constraint. A further test confirmed that under this circumstance, the housing wealth effect weakened even for private homeowners.

This paper is structured as follows. The next section reviews the literature on the housing wealth effect, followed by a brief overview of the institutional background of Hong Kong's subsidized housing sector with a particular focus on the resale restrictions to be investigated. The specification of our models and a description of the Household Expenditure Survey (HES) data are then given, followed by a discussion of the empirical results. Last is the conclusion.

2. Literature Review on the Housing Wealth Effect

Keynes (1936) first equated consumption to current income and showed that people tend to increase their consumption in proportion to an increase in their disposable incomes. This proposition was then developed into a life-cycle hypothesis (Ando and Modigliani 1963, Modigliani and Brumberg 1954) which connects consumption to lifetime wealth rather than current income. The life-cycle hypothesis states that consumption comprises a proportion of the present value of the total lifetime wealth. People tend to maximize their lifetime utility by spreading their consumption throughout the lifetime. When unexpected changes in wealth occur, consumption will be adjusted accordingly. This is called the wealth effect.

A big literature has been devoted to exploring what determines the size of the wealth effect. Although the empirical literature starts with the stock market, Case et al. (2005), being the first to compare housing and stocks, found a much stronger wealth effect from housing assets than from stocks. This is largely supported by subsequent empirical studies (Benjamin et al. 2004, Bostic et al. 2009, Carroll et al. 2011, Kishor 2007). Case et al. (2005) suggested that institutional innovations in the real estate market, such as second mortgages, have facilitated households to consume more out of their housing wealth. According to the survey by Paiella (2009), the size of the housing wealth effect, measured by the marginal propensity to consume due to housing wealth,

ranges from 0.02 to 0.15. Part of this variation can be explained by such household characteristics as household size and the age of the household head (Campbell and Cocco 2007). Iacoviello (2004) and Mian and Sufi (2011) showed theoretically and empirically that households with limited access to credit are more likely to borrow against their housing wealth in the form of home equity loans. Hence, their consumption is more sensitive to housing wealth shocks. Similarly, the consumption of households with larger portions of their wealth in housing is more sensitive to property value fluctuations (Guo and Hardin III 2014). However, risk-averse households are less likely to consume more due to an increase in their housing wealth (Liao et al. 2014).

Apart from household characteristics, market conditions and structure also matter. Engelhardt (1996) found asymmetrical effects that arise from housing price gains and losses. While households generally consume more as their housing wealth increases, they tend to reduce their savings to keep consumption stable as their housing wealth shrinks. Such asymmetry, however, depends on two conditions. One is that a drop in housing wealth does not turn one's home into negative equity, in which case Disney et al. (2010) found that households saved much more at the expense of stable consumption. The other condition is that households have access to refinancing as their property values go up. A well-developed refinancing market can tempt households to convert their housing assets into cash and, hence, amplify the housing wealth effect (Aoki et al. 2004).

From the review above, we identified two research gaps. First, although previous studies found a number of wealth-effect determinants in the literature, they ignored the resale constraints that some homeowners face, such as those who own subsidized housing. It is important to know if the same wealth effect can be found in this type of homeowners. Second, the literature showed that the size of a housing wealth effect depends on whether housing equity is positive or negative. Instead of using the ad hoc explanation that households' saving behavior has changed peculiarly, we believe resale constraints provide a more general yet refutable explanation: in the case of negative equity, the housing wealth effect is weakened because recourse mortgages have greatly restricted the ability of homeowners to convert their housing assets into cash.

3. Resale Constraints on Subsidized Homeowners in Hong Kong

Promoting home ownership is one of the major housing policy goals that the Hong Kong Government pursues. The Home Ownership Scheme (HOS), under the administration of the Housing Authority and funded by the government, aims to build and sell affordable housing units to low-to-middle income households. Since its establishment in 1987, the HOS now boasts over 395,000 subsidized housing units, which house about 30 percent of home owner-occupiers in Hong Kong (Hong Kong Housing Authority, 2017).

Under the HOS, eligible families can purchase flats from the government at discounts ranging from 7 to 60 percent below market prices (Subsidized Housing Committee, 2010), but subject to restrictions on not only their resale, but also their refinancing, according to the Schedule to the Housing Ordinance (Cap. 283). Within the first two years of an HOS flat's purchase, its subsidized owner is not allowed to sell it.[6] From the third to fifth years, the owner may sell it to a selected group of eligible public rental housing tenants. From the sixth year onwards, the owner can also sell the flat to anyone in the open market after sharing a percentage of the resale price with the government, like a shared equity home ownership arrangement between the owner and government. The percentage is the initial discount provided by the government, equivalent to her initial capital contribution. For example, if the market price grows by 10% during the holding period, both the subsidized owner and government enjoy 10% capital gain from their respective initial investments. Yet, for the subsidized owner, taking the 10% gain would mean he has to forgo the future subsidy from the government.[7] This implies that subsidized homeowners are less likely to sell their units and so subsidized housing is much less liquid than private housing.

Subsidized homeowners are also subject to refinancing constraints. According to the regulations, they are not permitted to remortgage their flats unless they obtain the government's prior approval, which is only granted in extreme cases of financial hardship.[8] The Housing Authority figures show that, during the fiscal years 2010/11 to 2014/15, only 1,771 refinancing applications were approved (Legislative Council, 2015). This was very modest compared to the 121,032 approvals in the private housing sector during the same period (Hong Kong Monetary Authority, 2015). The

approval for subsidized homeowners usually takes over eight months. Likewise, it is very costly to prepare the required legal documents to launch a case. The restrictions on re-selling and refinancing an HOS unit have resulted in lower liquidity for subsidized homeowners than for private homeowners. During the study period, the annual turnover (i.e., trading volume divided by the total stock of subsidized units) of the subsidized housing market is around 1.2 percent, which is much lower than the 4.0 percent turnover for the private housing market. This sharp contrast between subsidized and private homeowners facilitates our tests on the effect of the resale constraint on the housing wealth effect.

4. Hypotheses and Models

A simple reduced form model of the life-cycle hypothesis (Ando and Modigliani 1963, Modigliani and Brumberg 1954) can be formulated as Equation (1):

$$C = aY + bW \tag{1}$$

where C is consumption; Y is the present value of the expected total lifetime income; W is the value of asset wealth with full liquidity; and a and b are the elasticities of consumption to income and wealth, respectively. Since not all kind of wealth has full liquidity, W can be broadly divided into two components:

$$W = \rho W_H + W_N \tag{2}$$

where W_H is the market value of the illiquid assets (minus debt, if any); ρ represents the ease of converting W_H into cash ($0 \leq \rho < 1$) – the presence of a resale constraint will lower the value of ρ; W_N is the value of other household wealth that is fully liquid (such as stock and bank deposits) and can be converted into cash with minimal transaction costs.

For the purpose of this study, we assume that housing is a household's only illiquid asset, while all other assets are fully liquid. Substituting Equation (2) for Equation (1) gives the elasticity of

consumption to housing wealth ($b\rho$).

This model leads to our key argument: when the resale constraint of housing assets is strong (ρ is small), the elasticity of household consumption to housing wealth will decrease. As mentioned in Introduction, there are two channels through which the housing wealth effect can be realized. One is that an increase in housing value relaxes a household's borrowing constraint. But when the housing asset used to secure the loan is under a resale constraint, the bank would be more cautious about granting a request to refinance, as it will be costlier to reclaim the loan in case the holder defaults. Another channel is that an increase in housing value reduces precautionary savings by households. However, when there is a restriction on selling the housing asset due to emergency, a household would be more cautious in scaling down its precautionary savings. Either way, when the housing asset cannot be cashed out easily (ρ is small), consumption would be less responsive to changes in housing wealth and the housing wealth effect would be weakened.

Two hypotheses are developed from cross-sectional and intertemporal variations of ρ, respectively. The first hypothesis is based on the distinct degrees of resale constraints between the subsidized and private housing sectors. A resale constraint induced by institutional arrangements is a prominent feature of subsidized housing in many markets around the globe. While Hong Kong's private housing sector is notably a free market, its subsidized housing sector is not because of the resale and refinancing restrictions explained in Section 3. As a result, subsidized homeowners have lower ρ than private homeowners. Their non-housing consumption should be less responsive to housing wealth shocks. We hypothesize that:

Hypothesis 1 *Ceteris paribus,* the elasticity of households' non-housing consumption to housing wealth for private homeowners is higher than that for subsidized housing owners.

To test Hypothesis 1, Equation (3) is estimated separately for private and subsidized homeowners.[9]

$$C_j = \alpha_{0,j} + \beta_j W_H + \boldsymbol{X}\boldsymbol{\alpha}_j + \varepsilon_j \quad (3)$$

where j equals *private* for private homeowners and *subsidized* for subsidized homeowners; C_j is a household's non-housing consumption; W_H is housing wealth; $\boldsymbol{X}$ is a vector of control variables, including various household characteristics and year dummies used to capture W_N;[10] β_j and $\boldsymbol{\alpha_j}$ are the coefficients to be estimated; $\alpha_{0,j}$ is the constant; and ε_j is the error term. The more specific definitions and measurements of the variables are given in Table 1. After estimating Equation (1) separately with the subsidized owner and private owner subsamples, Hypothesis 1 predicts that $\beta_{private} > \beta_{subsidized}$.

As regards the intertemporal variations of ρ, we exploit the big housing market downturn from 1999-2000 after the onset of the Asian Financial Crisis. Hong Kong's housing market peaked in October 1997, right before the crisis exploded throughout Asia. It dropped 50 percent by May 2001 and 70 percent by the time the market bottomed out in May 2003. Due to the huge housing market collapse and substantial price decreases, many mortgaged home buyers who bought before the crisis experienced negative equity (i.e. underwater mortgages), in which case the market values of their homes used to secure the loans dropped below the outstanding balances of their mortgages. In 2000, the number of negative equity cases reached 115,000[11], which was much more than the 8,700 and 310 cases observed in 2005 and 2010.[12]

There are three options for homeowners stuck in negative equity. First, in most markets outside of Hong Kong, an owner with negative equity may choose to default. However, this is not common in Hong Kong because most if not all mortgages are recourse loans, which allow a bank to collect the borrower's personal assets in addition to the housing asset as collateral upon default. An individual can only default due to personal bankruptcy, which was rare even during the housing market's nadir. Despite the sizable negative equity of mortgage loans, the delinquency ratio in 2001 was only 1.28 percent – compared to around ten percent in the U.S. at its peak.[13] Second, a homeowner stuck in negative equity can choose to sell her housing unit after repaying the outstanding balance on her mortgage. In this case, repaying the mortgage requires her to pay its unsecured portion along with the proceeds from the property sale to the bank. The net cash outflow from this transaction serves as a disincentive to sell. This leaves the homeowner with one last option: hold the property with a resale constraint. In this case, housing wealth cannot be easily cashed out for consumption. The bank would not grant a second mortgage, even after a slight

increase in housing wealth, because its mortgage is still underwater. Neither would the household reduce its precautionary savings for consumption because in the case of emergency, the housing asset cannot be sold for net cash inflow. Therefore, we hypothesize that:

Hypothesis 2 *Ceteris paribus,* when the housing market overflows with negative equity (*NE*), non-housing consumption is less responsive to housing wealth movements.

Hypotheses 2 is tested with Equation (4):

$$C = \alpha_0 + \beta W_H + \beta^{NE} W_H \times NE + \boldsymbol{X}\boldsymbol{\alpha} + \varepsilon \quad (4)$$

where $W_H \times NE$ is the interaction term of *housing wealth* and *negative equity* and β_j^{NE} is the coefficient for the interaction term. All other variables are defined in the same way in Equation (3). The subscript j is removed because we test hypothesis 2 with only private homeowners – as we will show, no wealth effect is observed for subsidized homeowners in general. *NE* is measured by two variables. As will be discussed in detail in Data, our household survey data consists of three rounds of surveys conducted. The data from the first round was collected from 1999-2000, when negative equity prevailed and the resale constraint was strong. The other two rounds were conducted during periods without much resale constraint. The first measurement of *NE* is a time dummy, *Year2000*, which equals 1 if the survey was conducted in 1999 or 2000 and 0 if otherwise. If Hypothesis 2 is correct, we expect a weakened housing wealth effect given by $\beta_{private}^{NE} < 0$. The second measurement of *NE* is market illiquidity (i.e., 100 minus the annual trading volume as a percentage of housing stock). When negative equity creates a resale constraint for a homeowner, he would be less willing to sell his property. Hence, market illiquidity is expected to be higher. Again, we expect $\beta_{private}^{NE} < 0$.

5. Data

We rely on the Household Expenditure Survey (HES) data to test the hypotheses. The HES is an

expenditure survey conducted regularly by the government's Census and Statistics Department (C&SD) with the intention to track households' spending behaviors. It provides detailed household-level information on demographic characteristics as well as spending patterns categorized into different consumption accounts. The HES dataset runs from 1999 to 2010, consisting of three rounds of surveys with a five-year interval in between, namely 1999-2000, 2004-2005, and 2009-2010. Each round of survey covers four quarters over two years. For instance, the first round was conducted during the four consecutive quarters from 1999 Q2 to 2000 Q1. The total sample size of the HES dataset is 1,670, including 1,067 private and 603 subsidized homeowners.

Panels A and B in Table 1 presents the definitions of the variables and their descriptive statistics. First, private homeowners in general spend more than subsidized homeowners; their non-housing consumption (i.e. the variable C in Equations (3) & (4)) averaged at HK$20,347 and HK$16,656, respectively. The non-housing consumption here has already excluded such durable consumption as vehicle purchases to avoid any one-off spending influencing our consumption estimations (Galí, 1993; Kaplan et al., 2016).

[Table 1 here]

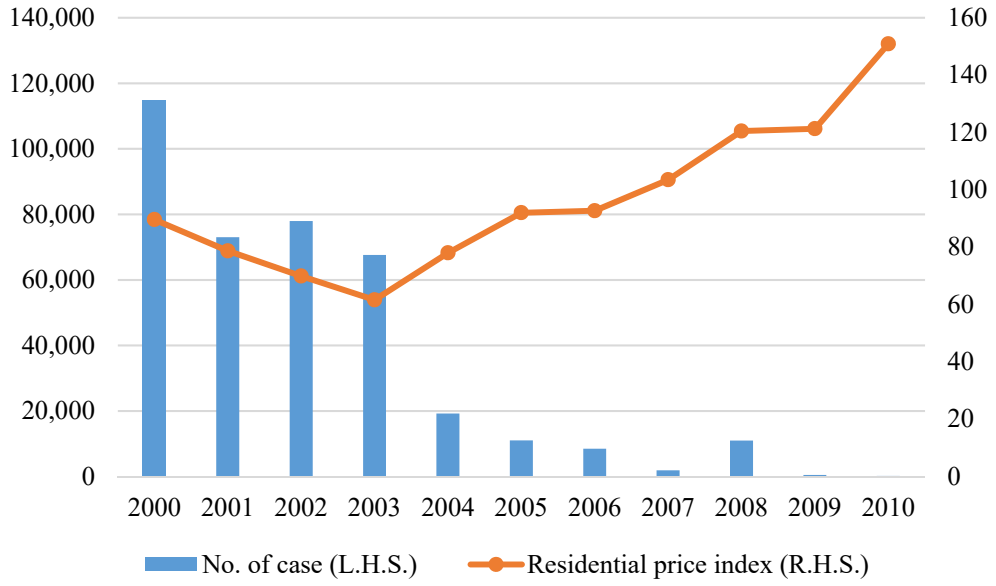
Second, the housing wealth (W_H) of subsidized and private households is measured as the household living area times the district-level average unit price (per square meter) of subsidized and private residential properties, respectively. The HES dataset provides information on the household living area, but no additional information on individual household's housing wealth. We therefore estimate the district-level average unit housing price from the property transaction records in the Economic Property Research Centre (EPRC) database. Housing value is expressed in real terms to avoid any impact of general inflation. On average, a private housing unit was worth HK$2.977 million, while a subsidized one rated much lower at HK$0.732 million with a smaller spread. An important part of the gap in housing wealth comes from the resale constraint: from our statistics, HOS units without the resale constraint were sold for HK$1.67 million on average, which is more than double of the average price of HOS units with the resale constraint.[14] The other part of the housing wealth gap is attributed to the differences in housing quality and

quantity. As will be introduced later, these differences will be captured by such control variables as living area and length of residence in the empirical model.[15]

As Panel C of Table 1 shows, both groups of homeowners are basically evenly distributed over time during the study period. As to the cross-sectional distribution, households from all of the 18 council districts in Hong Kong were repeatedly covered in all of the three rounds of surveys. In our sample, private homeowners are distributed in all of the 18 council districts in Hong Kong, while subsidized homeowners are distributed in 16 of them. In general, subsidized homeowners live in close vicinity to private housing estates without being highly segregated. The sampling of the HES dataset is temporally consistent and can be considered representative of the population in Hong Kong in the cross-sectional dimension.

As discussed in Section 4, negative equity (*NE*) is measured at the aggregate level in two ways, namely a time dummy of the year 2000 and market illiquidity. It cannot be measured at the household level due to unavailability of housing debt data, but many homeowners got caught up in the Asian Financial Crisis. Referring to Figure 1, the number of loans that fell into negative equity peaked in 2000, with about 115,000 borrowers underwater. When the market was saturated with negative equity loans, reselling properties was more difficult. The temporal variation of the degree of illiquidity of the private housing market presented in Panel C of Table 1 gives a consistent picture. The market illiquidity was at the peak around 2000, and dropped gradually over the years, which provides an alternative measurement of *NE* for the private homeowners. In contrast, the illiquidity of the subsidized housing market was stable during the study period. The private housing market is more liquid than the subsidized market in general. When negative equity prevents private owners from easily reselling their properties in 2000, both markets were highly illiquid. However, when the resale constraint due to negative equity was relaxed, the subsidized market was still as illiquid due to the additional resale restrictions imposed by the institutional arrangements of the HOS.

Figure 1: Mortgage Loans in Negative Equity and Housing Prices



Source: Hong Kong Monetary Authority and Rating and Valuation Department
Note: The number of negative equity cases in 2000 was estimated by Midland Property.

In addition, a number of household characteristics (vector **X** in Equations (3) & (4)) enter into the estimation as control. Variations in household characteristics can generate different nondurable consumption. For example, a bigger family should obviously consume more food than a smaller family. Discussion of the empirical and theoretical considerations in specifying life-cycle consumption models can be found in the literature (e.g. Blundell, 1988) and is not repeated here. We simply adopt the relevant household variables identified in the literature to capture households' preferences on spending and their unobservable financial wealth (W_N).[16] Subsidized households earned an average monthly income of about HK$39,000, which was markedly less than that for private homeowners at about HK$52,000. This was mainly attributed to restrictions on the eligibility of subsidized housing beneficiaries. Moreover, private households usually lived in more spacious homes with flat areas averaging about 57 square meters, which was ten square meters larger than that for subsidized households. Since subsidized housing in Hong Kong is built with a standard design, the variations in its living area were much smaller than that for private flats. On average, both household types consisted of approximately three family members[17] with a household head who was about 47 years old. Subsidized households usually lived longer in their

units, with over 87 percent of them residing in them for over 20 years. Without information on mortgage payments, the length of residence is regarded as a rough proxy for the remaining period of a mortgage payment.

6. Empirical Results

6.1. Private versus subsidized homeowners

The estimated results of Equation (3) are presented in Table 2. Column (1) and (2) present the regression estimates for samples of subsidized and private owners, respectively. Both types of households consume more when the household income is higher and the family has more members. The coefficients for both variables are consistent across the two samples. Age of household head is negative for both types of households, but only significant for subsidized owners. This implies that private homeowners can flexibly adjust their consumption based on their age profiles, yet subsidized homeowners do not enjoy the same flexibility. While both living area and length of residence do not exert any significant impact on non-housing consumption, they are retained in the equation to control for any potential effects of quality differences between subsidized and private housing units.

As hypothesized in Section 4, the housing wealth effect for subsidized homeowners is expected to be less than that for private homeowners because of resale constraints. The size of the housing wealth effect is indicated by the coefficient of *housing wealth* (β_j). Column (2) of Panel A shows that for private homeowners, an increase of HK$1,000 in housing wealth significantly boosts the monthly household consumption by HK$2.491. This is equivalent to a marginal propensity to consume of 0.03 in terms of annual household consumption. On the contrary, the housing wealth of subsidized homeowners only show insignificant effects on their non-housing consumption, as presented in Column (1). Hypothesis 1 is confirmed.

One concern over this test is that the results, which is consistent with Hypothesis 1, have an alternative explanation. Recall from Table 1 that, due to the distinct levels of household income

between the two groups, private homeowners have higher non-housing consumption than subsidized homeowners. This implies a systematic difference in the consumption basket of the two groups. Everyday necessities, which cannot be further reduced and hence should be insensitive to variations to housing wealth, account for a higher percentage of consumption of subsidized homeowners. This line of reasoning also predicts that the sensitivity of subsidized homeowners' consumption in relation to their housing wealth should be lower than that of private owners.

To single out the effect of the resale constraint from the necessity hypothesis, we conducted propensity score matching to construct a subsample of private homeowners that share the same distribution of household income with the subsidized homeowners. This ensures that the composition of goods in the consumption basket are comparable between the two matched groups of households. If resale constraints had the expected weakening effect on housing wealth, Hypothesis 1 should remain valid in the matched sample.

[Table 2 here]

The complexity is that even though private homeowners tend to have higher income, subsidized homeowners tend to enjoy greater subsidies in their housing consumption, which free up part of their income for other expenditures. A subsidized owner who has bought a flat with identical quality to that of a private owner only need to pay a much smaller mortgage installment than the private owner. If we directly matched the gross household income of the subsidized and private owners, the matched private owners would have much lower disposable income than the subsidized owners. The non-housing consumption of the matched private owners would then become less flexible, as their consumption basket mainly consists of daily necessities. Lower consumption flexibility means their non-housing consumption may not respond to any further decrease in their housing wealth, a situation we wanted to avoid in the first place. Therefore, instead of directly matching the gross household income of the two samples, we match their disposable household income. In order to do so, we firstly adjust the household income of subsidized homeowners by adding the imputed monthly rental subsidy to their monthly income, denoted by adjusted household income. Then, the two groups of homeowners are matched through

the following probit model:

$$Pr(sub = 1) = \Phi(\alpha_0 + \alpha_1 income + \alpha_2 hhsize + \alpha_3 Age) \quad (5)$$

where Pr means probability; *sub* is a dummy variable equal to 1 for subsidized homeowners and 0 for private homeowners; *income* is the adjusted household income of homeowners; *hhsize* is the household size; *Age* is the age of the household head; and Φ is the cumulative distribution function of the standard normal distribution.. This model helps identify and match private and subsidized homeowners with similar adjustable income, household size, and household head's age.

We conduct the propensity score matching through the nearest neighbor matching method. The regression result of the first stage probit model is reported in Panel B of Table 2. In the matched sample of subsidized and private owners, the mean monthly income levels for each group were HK$40,458 and HK$41,645, respectively, with a statistically insignificant difference (t-statistic = -1.03; p-value = 0.30). The mean household income of private homeowners in the matched subsample was significantly lower than that in the original private owner sample (HK$52,455). The empirical estimation for the subsidized owners with the matched sample is reported in Columns (3) of Table 2. Consistent with our hypothesis, even with household income matched between the two groups, the non-housing consumption of private homeowners still shows a statistically significant housing wealth effect. Hypothesis 1 is again confirmed.

6.2. Negative equity

As hypothesized in Section 4, refinancing constraints are also expected to weaken the housing wealth effect. Table 3 tabulates the tests of Hypothesis 2, estimated with only private homeowners. All control variables yield the same results as discussed in the previous section. The key independent variable is *NE*, which is measured by *Year2000* in Column (1) of the table. We expect the wealth effect to be smaller during 1999-2000, when there was a strong prevalence of negative equity during the market downturn. This is tested by including an interaction term of *housing wealth* and *Year2000* as an additional variable in Equation (4). Column (1) shows that the

coefficient for *housing wealth*, which gives the size of the housing wealth effect for private owners during the 'positive equity' years, is positive. An increase of HK$1,000 in housing wealth was accompanied by an increase of monthly household consumption by HK$2.366. Again, this indicates a marginal propensity to consume around 0.03 in terms of annual household consumption. On the contrary, during the 'negative equity' years, the coefficient for the interaction term is negative and significant as expected. During 1999-2000, when a significant percentage of private homeowners were subject to refinancing constraints caused by negative equity, the average size of the wealth effect enjoyed by private owners was substantially mitigated. An F-test shows that the sum of the coefficients of the *housing wealth* variable and interaction term is insignificant (F = 0.195; probability = 0.659). The wealth effect is entirely eliminated.

Similar to the alternative explanation for the tests of Hypothesis 1, the insignificant wealth effect around the year 2000 for private homeowners can also be explained by the necessity hypothesis. More specifically, due to the property market's collapse, household consumption dropped significantly. The consumption of goods that are subject to flexible adjustment is sharply reduced. The consumption of the remaining goods and services become rigid and insensitive to housing wealth changes. The necessity hypothesis generates the same prediction that household consumption should be less sensitive to housing wealth shocks in the gloomy market circa 2000.

To test against the necessity hypothesis, we further included an interaction term of *housing wealth* and a *Year2005* dummy. *Year2005* equals 1 for survey data collected for the 2004-2005 year and 0 otherwise. Figure 1 shows that the property market was in a sharp downward trend in the year 2000 and kept growing in 2005 and 2010. As a result, massive negative equity was only present in 2000. Consistently, the number of residential loans in negative equity was about 115,000 by July 2000, but dropped sharply to 8,700 by June 2005. Therefore, the effects of negative equity should only have been present in 2000. But it is different for the necessity effect. As Figure 1 shows, the housing market price index levels were about the same in 2000 and 2005, but substantially higher in 2010. For private owners, the average household income bottomed out in 2005 at HK$51,542 and peaked in 2010 at HK$53,161. The differences between these years are statistically insignificant. If the necessity hypothesis holds, one should expect the housing wealth effect to be similar in both 2000 and 2005. Consistent with our resale constraint hypothesis

(Hypothesis 2), but defying the necessity hypothesis, the regression shows that the coefficient of *housing wealth* × *Year2005* is insignificant. In other words, the housing wealth effect in 2005 was larger than that in 2000.

Column (2) of Table 3 displays the test results regarding *NE* measured by *illiquidity*. High *illiquidity* reflects difficulties in selling a property due to negative equity. Consistent with Hypothesis 2, we find a negative coefficient of the interaction term of *housing wealth* and *illiquidity*, indicating that the housing wealth effect is weaker when the market is less liquid. The marginal effects of housing wealth on household consumption increased from 0.599 to 2.383 when *illiquidity* decreased from 98.385 to 93.799. Consistent with the previous test, in the most illiquid market conditions, the housing wealth effect of the private homeowners disappeared.

Taken together, the empirical findings show that resale constraints weaken the housing wealth effect. In the private sector, homeowners are constrained when negative equity creates a strong refinancing constraint. Among households with subsidized home ownerships, the resale constraints due to institutional arrangements block the channels from housing wealth shocks to non-housing consumption.

[Table 3 here]

7. Conclusion

This study adds to the literature on housing welfare by highlighting that the resale constraints that accompany subsidized housing can weaken the housing wealth effect. Our findings also extend the literature on the housing wealth effect, which has been exclusively focusing on private homeowners, to subsidized homeowners. With the use of household-level expenditure data in Hong Kong, this study finds a significant housing wealth effect for private homeowners but not for subsidized homeowners. More specifically, the marginal propensity to consume out of housing wealth regarding in terms of annual household consumption is 0.03 on average for private home

owners but insignificant for subsidized homeowners. We explain this by the resale constraints subsidized homeowners face. As a robustness check, we employ the method of propensity score matching to construct two groups of private and subsidized home owners that are comparable in their consumption baskets. After the matching, the difference in the housing wealth effect between the two groups of homeowners remains consistent with our hypothesis. Moreover, we show that private homeowners could also be financially constrained when their recourse loans are underwater. During periods with 'positive equity', we observe positive and significant marginal effects of housing wealth on household non-housing consumption. However, during periods with 'negative equity', the housing wealth effect of private homeowners disappeared. This result reinforces our hypothesis that the housing wealth effect would be weakened by resale constraints. The notion of resale constraint *per se* serves as a more general yet refutable explanation for the relationship between the household equity position and housing wealth effect than any *ad hoc* explanation in the literature that household saving behaviors change peculiarly with fluctuations in housing wealth.

Our findings are also highly useful to policymakers in assessing or evaluating the benefits of subsidizing homeownership. Before our study, one may take for granted that any form of homeownership would boost consumption as housing wealth accumulates. However, we show that the housing wealth effect identified by other studies in the private sector does not necessarily apply to the subsidized sector where resale and refinancing constraints exist. This is not to suggest that the constraints be removed. Rather, our study reminds policymakers of the tradeoff: while the constraints ensure that housing subsidies cannot be easily converted into capital gain, they also lock up any non-housing consumption power that could have been generated by a higher disposable income (e.g. through a smaller mortgage repayment). As housing price increases over the long run, a larger difference in consumption between subsidized and private owners could further segment their social statuses, thereby impeding social mobility. This side effect is perhaps most pertinent to emerging markets, such as China, India, and Indonesia, who are developing their subsidized homeownership systems to improve housing affordability on the one hand and enhance social mobility on the other.

[1] These subsidized home ownership programs are given many different names. In recent years the term 'shared equity homeownership' has been increasingly used to describe these programs (Temkin et al., 2013).

[2]http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/centers/sac/homeownership/.

[3] https://www.gov.uk/affordable-home-ownership-schemes/overview.

[4] http://www.singstat.gov.sg/publications/publications-and-papers/cop2010/census10_stat_release2

[5] http://www.hdb.gov.sg/cs/infoweb/residential/selling-a-flat/eligibility.

[6] Subsidized homeowners may choose to opt out of the program by returning their flats to the government at their original purchase prices. However, since the competition to obtain an HOS unit is fierce, there is little incentive for a household to give up its flat within the first two years after its purchase.

[7] The government, despite having an equity stake, does not charge the subsidized owner any rent for occupying the property. This is effectively a subsidy to the subsidized owner's imputed rent.

[8] Vide Housing Ordinance (Cap, 283; section 27A).

[9] For the ease of illustration, all equations suppress the subscript that represents individual households.

[10] While we could not directly measure W_N due to data limitations, we have included other variables that can potentially control for it. On the one hand, the year dummies could capture temporal changes in W_N. On the other hand, household characteristics could partly capture household preferences in allocating their investments between W_H and W_N.

[11] "Property losses played down", South China Morning Post, July 18, 2000. Official statistics on negative equity cases of residential mortgage loans were not available until 2001, when the Hong Kong Monetary Authority started to release relevant information.

[12] Information source: http://www.hkma.gov.hk/eng/key-information/press-releases/2005/20050805-3.shtml.

[13] Source of Hong Kong statistic: http://www.hkma.gov.hk/eng/key-information/press-releases/2001/20011029-3.shtml; source of U.S. statistic: https://www.federalreserve.gov/releases/chargeoff/delallsa.htm.

[14] A few HOS units have no resale constraint because the owners have 'privatized' their units by paying a land premium to the government. The statistics are compiled from housing transaction records extracted from the EPRC database.

[15] It would be ideal if the comparison were made without any quality difference between HOS and private units. However, the HES dataset does not permit us to do so. This is another reason why we carry out a further test using private units only – their quality should not have changed a lot over time while their refinancing constraints did change with economic conditions.

[16] In fact, the HES survey provides information on households' financial asset value. But as instructed by the guideline of HES data use, households tend to substantially underreport their financial assets.

[17] As HES data does not provide specific household sizes for households of over five members, we discarded those observations from their estimations.

References

Ando, A. and Modigliani, F. (1963) The" life cycle" hypothesis of saving: Aggregate implications and tests. *The American Economic Review, 53*(1), pp. 55-84.

Aoki, K., Proudman, J. and Vlieghe, G. (2004) House prices, consumption, and monetary policy: a financial accelerator approach. *Journal of Financial Intermediation, 13*(4), pp. 414-435.

Ashley, R. and Li, G. (2014) Re-examining the impact of housing wealth and stock wealth on retail sales: Does persistence in wealth changes matter? *Journal of Housing Economics, 26*, pp. 109-118.

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

Blundell, R. (1988). Consumer behaviour: theory and empirical evidence - a survey. *The Economic Journal*, 98(389), 16-65.

Bostic, R., Gabriel, S. and Painter, G. (2009) Housing wealth, financial wealth, and consumption: New evidence from micro data. *Regional Science and Urban Economics, 39*(1), pp. 79-89.

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

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

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

Cornett, M. M., McNutt, J. J., Strahan, P. E. and Tehranian, H. (2011) Liquidity risk management and credit supply in the financial crisis. *Journal of Financial Economics*, 101(2), pp. 297-312.

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

Doling, J. and Ronald, R. (2010) Home ownership and asset-based welfare. *Journal of Housing and the Built Environment, 25*(2), pp. 165-173.

Engelhardt, G. V. (1996) House prices and home owner saving behavior. *Regional Science and Urban Economics, 26*(3), pp. 313-336.

Galí, J. (1993). Variability of durable and nondurable consumption: Evidence for six OECD countries. *The Review of Economics and Statistics*, 418-428.

Guo, S. and Hardin III, W. G. (2014) Wealth, composition, housing, income and consumption. *The Journal of Real Estate Finance and Economics, 48*(2), pp. 221-243.

Hong Kong Housing Authority (2017) *Housing in Figures*. Retrieved August 22, 2017 from: http://www.thb.gov.hk/eng/psp/publications/housing/HIF2017.pdf

Hong Kong Monetary Authority (2015) *Residential Mortgage Survey Results*, Retrieved August 22, 2017 from: http://www.hkma.gov.hk/eng/key-information/press-release-category/residential-mortgage-survey.shtml

Iacoviello, M. (2004) Consumption, house prices, and collateral constraints: a structural econometric analysis. *Journal of Housing Economics, 13*(4), pp. 304-320.

Iacoviello, M. (2011) Housing wealth and consumption. *FRB International Finance Discussion Paper 1027*.

Kaplan, G., Mitman, K., & Violante, G. L. (2016). *Non-durable Consumption and Housing Net Worth in the Great Recession: Evidence from Easily Accessible Data* (No. w22232). National Bureau of Economic Research.

Keynes, J. M. (1936) *The general theory of interest, employment and money,* London: Macmillan.

Kishor, N. K. (2007) Does consumption respond more to housing wealth than to financial market wealth? If so, why? *The Journal of Real Estate Finance and Economics, 35*(4), pp. 427-448.

Legislative Council (2015) Background brief on refinancing of Home Ownership Scheme flats with premium unpaid, *Panel on Housing Meeting on 6 July 2015*, LC Paper No. CB(1)1037/14-14(04).

Liao, W.-C., Zhao, D. and Sing, T. F. (2014) Risk attitude and housing wealth effect. *The Journal of Real Estate Finance and Economics, 48*(3), pp. 467-491.

Mian, A. and Sufi, A. (2011) House Prices, Home Equity-Based Borrowing, and the US Household Leverage Crisis. *American Economic Review, 101*(5), pp. 2132-56.

Modigliani, F. and Brumberg, R. (1954) Utility analysis and the consumption function: An interpretation of cross-section data. . in *The Collected Papers of Franco Modigliani*,Cambridge, Massachusetts: The MIT Press.

Paiella, M. (2009) The stock market, housing and consumer spending: a survey of the evidence on wealth effects. *Journal of Economic Surveys, 23*(5), pp. 947-973.

Subsidized Housing Committee (2010) Revitalizing the Home Ownership Scheme Secondary Market, *Memorandum for the Subsidized Housing Committee of the Hong Kong Housing Authority*, Paper No. SHC 32/2010.

Temkin, K. M., Theodos, B., & Price, D. (2013). Sharing Equity with Future Generations: an evaluation of long-term affordable homeownership programs in the USA. Housing Studies, 28(4), 553-578.

Wind, B., Lersch, P. and Dewilde, C. (2016) The distribution of housing wealth in 16 European countries: accounting for institutional differences. *Journal of Housing and the Built Environment*, pp. 1-23.