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The Housing Ladder and Hong Kong Housing Market's Boom and Bust Cycle*

Lok Sang Ho and Gary Wai-chung Wong

Abstract

This paper presents evidence, based on the recent Hong Kong experience, for the existence of a “housing ladder effect.” An increase of housing equity at the bottom of the ladder tends to translate into a trading up activity that will both increase housing market turnover and buoy up the entire housing market. Based on a natural experiment through the introduction of a public housing privatization scheme, this papers presents evidence supporting this story using a logit model and a price-volume causality test.

1. Introduction

Although Hong Kong is well known as a bulwark of free market capitalism, the government plays a major role in the housing market of Hong Kong. As **Table 1** shows, over 46% of Hong Kong's households live in “public housing,” which is a rather misleading term considering that some 36% of this “public housing” are privately owned. “Public housing” in Hong Kong refers to all publicly subsidized accommodations. The government also controls the new supply of land, which used to be put up for auction periodically but since the Asian Financial Crisis developers have been asked to apply for auction any plot of land put on the “Application List” announced every year. The government, through its Planning Department, also directly controls land use types and land use intensity through zoning regulations. In addition its Building Department scrutinizes and approves building plans, carries out audit checks on construction works and issues occupation permits upon completion of new buildings. Obviously, then, the Hong Kong government has much direct control of the new housing supply. Moreover, because any purchase of housing is typically financed through the banking sector, the Hong Kong Monetary Authority's “guidelines” about loan ratios, which it expects all local banks to follow, will have big impact on the demand side. The Hong Kong Monetary Authority is also instrumental to the setting up of the Hong Kong

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Mortgage Corporation in 1997, whose mission is “to enhance the stability of the banking sector by offering a reliable source of liquidity, to promote wide homeownership, and to facilitate the growth and development of debt security and mortgage-backed security in Hong Kong.”

Just as Bardhan *et.al.*(2003) pointed out about Singapore, private sector housing in Hong Kong cannot be understood without a good grasp of the role the public sector plays in the housing market. In this paper, we are particularly interested in the role public housing plays in the household savings and “trading up” activities.

Table 1. Households by Types of Accommodation

First Quarter	1995	2000	2005
Total(thousands)	1,755	2,014	2,265
	%	%	%
Permanent Public Housing	46.8	45.9	46.3
- rental Units	36.4	31.4	29.6
- subsidized for-sale units	10.4	14.5	16.7
Private Permanent Housing	50.2	52.4	52.4
Public Temporary Housing	1.1	0.1	-
Private Temporary Housing	1.9	1.6	1.3

Source: Hong Kong Housing Authority

The history of public housing in Hong Kong began with the famous 1953 Shek Kip Mei fire that destroyed the homes of some 50,000 people who lived in the squatter huts there. Largely as a stop-gap measure, temporary housing was constructed for them and in the following year the government decided to construct low-cost rental housing that were then called “resettlement estates.” The low cost rental housing program was expanded and improved, culminating in the completion of the Wah Foo Estate in 1971, which was the first public housing development planned using a “new town” concept. Subsidized for-sale housing did not begin until 1978. From then on “Home Ownership Scheme”(HOS) housing as it is called became very popular. Public housing tenants were given priority to buy these units. HOS housing not only provided an avenue for these tenants to improve their living conditions but also to vacate their units to make way for people waiting in the queue for the rental units. As it happens, HOS housing also provided the Housing Authority with a steady stream of profits that more than offset the losses for running the rental housing program.

A major policy change was approved in 1986. In order to make sure that public resources are used effectively to help the needy, the Housing Authority began to implement a policy of charging double rents for tenants who had

resided in public rental housing for over 10 years and whose incomes had breached the “subsidy income limit.” The policy was to be implemented in 1987. As it happens, this policy has far-reaching consequences both on the government’s finances and on the private housing market. The Hong Kong experience with this policy change, and with still another policy change announced in December 1997 that effectively overturns this earlier policy, provides an interesting case study and insight into the working of the housing market.

In the next Section, we will offer a sketch of the quality continuum of the Hong Kong housing market, and explain how the policy of charging higher rents for richer tenants may affect the trading up activities of homeowners. We will argue that the “housing ladder effects,” which will be defined in that section, are very much behind the booms and busts of an economy. Two working hypotheses will be developed, which will then be tested in Section 3 and Section 4. In Section 3, we present a logit model that takes advantage of a natural experiment resulting from a policy change that allows us to examine how the propensities of different households to trade up change after home equity values have changed. Section 4 presents further statistical evidence, indicating that housing prices generally drive transactions in existing homes, providing further support to the housing ladder hypothesis. Finally, Section 5 concludes the paper.

2. The Hong Kong Housing Market and the Nature of the Housing Ladder

The Rating and Valuation Department distinguishes five types of housing from A to E. Category A refers to housing with an area below 40 square meters. E refers to housing with an area 160 square meters or above. But private housing in Hong Kong is extremely diverse, from much run-down premises dating back to pre-war times to very well decorated luxury villas with gardens and club facilities, and they are located in various locations with a huge degree of variations in accessibility and desirability. Prices per square foot could vary from less than 2,000 dollars a square foot to over 20,000 dollars a square foot.

In Hong Kong although private housing is generally more costly than public housing, many private housing units are in poor shape, and people often live in overcrowded conditions with several households sharing one small flat. While many private housing units continue to deteriorate over the years with little or no maintenance, there has been an ongoing effort to improve the quality of public housing. The standard in terms of space per tenant has been rising(See

Appendix Table 1), and older buildings are demolished with tenants to be moved in newer, better equipped buildings.

When the Tenant Purchase Scheme(TPS) was announced in December 1997, the Housing Authority claimed that by providing an opportunity for sitting tenants to buy their own units cheaply, the TPS provided tenants with the first step in the home ownership ladder so that they could begin to move up to better and better quality housing. However, in fact the first step in the homeownership ladder for many is actually a place in the heavily subsidized public rental housing. This has become increasingly evident in the early 1990s. As shown in Table 2a and Table 2b, public housing tenants(PHT) generally saved more than households in HOS housing, private rental housing(PRT), and private owner-occupied housing(PRO). The discrepancy has enlarged tremendously from 1989/90 to 1994/95. The Tables listed the monthly savings, in dollars, by income brackets. It should be pointed out that these income brackets refer to the general Hong Kong population.

Table 2a. Mean Monthly Household Savings by Type of Living Quarters by Income Group (1989/90)

Income Group	Mean Household Savings(HK \$, Monthly)				
	PHT	HOS	PRT	PRO	Overall
Bottom 25%	-503	n.a.	-174	-631	-451
25-49%	714	-277	-6	202	425
50-74%	2924	1880	2187	2410	2499
75-89%	6459	3552	5788	4989	5212
Top 10 %	16635	15746	17915	14770	15845

Table 2b. Mean Monthly Household Savings by Type of Living Quarters by Income Group (1994/95)

Income Group	Mean Household Savings(HK \$, Monthly)				
	PHT	HOS	PRT	PRO	Overall
Bottom 25%	-713	-2091	-724	-2773	-1041
25-49%	2059	396	469	439	1221
50-74%	6749	4103	1445	4225	4621
75-89%	15716	11700	10981	12365	12565
Top 10 %	40933	26217	26117	28229	27929

Sources of both Tables 2a and 2b: Household Expenditure Survey 89/90, 94/95, Census and Statistics Department, reported in Watanabe (1998, Table 6.6)

From the Tables, it is clear that some of the richest households in Hong Kong continued to live in public housing, and they saved huge amounts of

money. The Tables do not show the number of households in each income bracket, and it will be expected that most probably there were relatively fewer households in the richest 10% of households who lived in public rental housing than in private owner-occupied housing. Nevertheless the figures highlight the validity of the belief that many of the tenants who had been living in public housing and had been enjoying the subsidized rents no longer needed such subsidies—this belief evidently was behind the policy of imposing higher rents on the so-called “rich tenants.”

The homeownership ladder refers to the tendency for homeowners to trade their existing homes for more expensive, better homes when they have accumulated sufficient equity in their homes and other savings, and when their ability to service larger loans has gone up. Ortalo-Magne and Rady(2006) provided a theoretical framework explaining the working of the homeownership ladder. For a tenant to become a homeowner, he must accumulate enough savings to pay the down-payment, which is not only often required but will help reduce the mortgage payments down the road. This process will be faster if their rents are lower or if nominal incomes rise faster. An official survey by the Hong Kong Housing Authority showed that in 1992-1993 as much as 24 per cent of housing transactions were due to public housing tenants and as much as 13 per cent of public housing tenants owned one or more homes.¹ This provides some evidence that a public rental housing program, by allowing households to pay low rents, also boosts their savings and hence the ability to buy a home. Although hard to verify, there is a good likelihood that the increased interest in buying a home among public housing tenants may be related to the “public housing subsidy policy” that began to be implemented as of 1987. If the subsidy is reduced through being charged double rent, the attractiveness of staying in public housing will be reduced. Since the talk of the day had been raising the rents for the rich tenants even higher to eliminate any subsidy, it made sense to get prepared.

Prior to 1998, HOS homeowners would always make a very good profit when they sell their units, at which point they must repay the Housing Authority the land cost subsidy implicit in their purchase price. They could sell their

¹ “[A]bout 13% of PRH (public rental housing tenants) or 74 000 out of 580 000 households covered by a survey in July 1993 owned private domestic properties. Another survey on tenants in North Point Estate showed that 18% of them owned private domestic properties in the urban areas alone. Some one-third of these households owned more than one property and a small number even owned up to five properties. An independent exercise revealed that PHT tenants accounted for as much as 24% of all purchases of private flats by local individuals in the period October 1992 - March 1993. The survey results point to the prevalence among PRH tenants in private property ownership.” (HK Housing Authority, 1994)

units in the open market after having lived in their units for over 10 years. Starting in June 1997, however, there was a new arrangement that is called the HOS Secondary Market, which is a market with buyers restricted to “Green Form Applicants,”² who are predominantly public rental housing tenants. HOS owners were allowed to sell from the fourth year after purchase and they did not need to repay the implicit land cost subsidy to the Housing Authority.³ The fact that such transactions in the “secondary market” in 1997 were at very high prices (see **Table 3**) suggest that many public housing tenants were really cash-rich and that they had indeed played an important part in the very strong housing market in 1996 and 1997.

Table 3. Actual Transactions of HOS Units in the Secondary Market, Fu Keung Court*

Usable floor area	High, Middle, or Low Floor	Date of Agreement to Purchase	Price US\$,000	Land Premium Discount Rate (%)
644	Middle	09/1997	506.4	29
644	High	11/1997	461.2	29
645	Middle	04/1998	328.2	29
645	Middle	10/1998	253.8	35

* Fu Keung Court in Wang Tau Hom. An exchange rate of HK\$7.8 to 1 US dollar is assumed. Sellers do not have to pay the land premium discount when they sell in the secondary market that is restricted to public housing tenants. The buyer will however have to repay the land premium discount upon resale in the future. The land premium discount is calculated from the formula (Market Price – Sale Price)/Market Price at the time of original purchase.

Source: Downloaded from Housing Authority website at the time of writing from: http://www.housingauthority.gov.hk/chi/hd/hos/s_market/index.htm

The policy to deny well-off tenants the benefits of housing subsidies was further stepped up in June 1996. Tenants paying double rent were required to declare their assets and would be required to pay market rent if the values of these assets exceeded specified limits. This policy provided a big incentive for the well-off tenants to buy in the private market and gave much impetus to housing prices through 1997.

² Other “Green Form Applicants” include: Authorized occupants of Interim Housing (IH) of the HA, Allowance recipients of the HA's Rent Allowance for Elderly Scheme (RAES); Applicants on the Waiting List, Junior civil servants applying for the HALS under the Civil Service Public Housing Quota, Clearerees and victims affected by clearance and natural disaster respectively, or Domestic tenants affected by Urban Renewal Authority's redevelopment programme. or Divorcees / splitting households of the HA estates who are issued with Green Form Certificates.

³ From June 1999, HOS owners can sell after two years from the date of purchase in the secondary market without repayment of the land premium subsidy. The open market resale date was also reduced from 10 years to 5 years.

Strangely, however, this policy was inadvertently reversed in December 1997, when the Housing Authority announced the Tenants Purchase Scheme (TPS). Sitting tenants, regardless of whether they were “well-off” or not, were allowed and encouraged to buy their units at as much as 88% discount from the estimated market price. Although well-off tenants were later denied the “discount upon discount” offered other tenants buying within the first year of announcement that their units were for sale, by allowing the richer tenants to buy their own units at any discount is still tantamount to giving away the future subsidies as a gift in a one-off deal. It will reduce the incentives of the richer tenants to buy in the private market.

From this discussion, we propose two groups of hypotheses that may be tested. The first is based on the differential effects of the TPS on the probabilities of different households to buy a private sector home. The introduction of the TPS is like a natural experiment. The offer of deep discounts available for sitting tenants to buy their own flats—whose quality has been steadily improved over the years relative to HOS housing—effectively lured public housing tenants to stay in public housing even though they can afford to buy HOS or private housing. We expect therefore that there will be a marked change in the probabilities of the richer public housing tenants to buy a home following the announcement of the TPS. The same cannot be said of the poorer tenants, whose probabilities to buy a private unit had always been low. Results of an empirical test based on these hypotheses are presented in Section 3.

The second group of hypotheses is based on the effects of housing price changes on transactions in existing homes, as discussed in Stein (1995). While Stein’s model is static, the consideration that transactions at the lower tiers of the housing ladder that are related to price movements will lead to more transactions “up the ladder” would imply that when housing prices rise, trading up activities will be transmitted throughout the housing market. Similarly, when housing prices decline, trading up activities decline that decline in the first instance will lead to further declines in transactions. We therefore hypothesize that housing prices will “Granger-cause” transactions in existing homes. Section 4 will present evidence in Hong Kong.

3. Tests Using A Logit Model

3.1 Data and Descriptive Statistics

The work reported in this section is based on a survey conducted by the authors in September 2002 using the facilities of the Survey Research Program of Lingnan University. It was a telephone survey using the

random-digit-dialing sampling method. The target respondents were heads of households (HD) aged 25 or above. **Table 4** presents the distribution of the 2031 sample households by key characteristics. These are domestic households by type of quarters, tenure of accommodation, and monthly household income. At the sample size of our survey, we more or less duplicated the distribution by key characteristics in the official data supplied by the Census & Statistics Department, lending credence to our results. We should, however, add the caveat that the household income categories are as reported at the time of the survey, and that there must have been some upward or downward mobility during the 10 years covered in our study. If there are no major systematic effects on the upward or downward mobility of households in different income categories, our results would still stand.

3.2 Variables and the Model

Table 5 presents the list of dummy variables and their definitions. The dependent variable – Ownership of a Private or an HOS unit - is a qualitative variable which was coded as 1 if the respondent answered positive to the question about ownership of a home (other than a TPS unit) acquired either within the five year window before or within the five year window after December 31, 1997. The number of observations for the dependent variable is based on valid responses only (i.e. all missing values were excluded from the analysis). As a result the sample size for this variable was reduced by 24.

Table 4. Comparison of Sample and Official Statistics

	Sample Statistics** (%)	Official Statistics* (%)
Domestic Households by Type of Quarters:		
Public rental flats	36.3	31.1
Government subsidized sale flats	18.9	17.3
Private residential flats	44.8	51.7
	(n=2024)	
Domestic Households by Tenure of Accommodation:		
Owner-occupier	58.3	52.9
Sole tenant	40.3	39.4
Co-tenant	1.2	2.6
Provided by employer	0.2	2.5
	(n=2021)	
Domestic Households by Monthly Household Income:		
Below \$10,000	31.8	28.6
\$10,000 - \$25,000	40.9	39.4
\$25,000 or above	27.3	32.0
	(n=1659)	

*Source: Distribution based on Quarterly Report on General Household Survey, July to September 2002, Census and Statistics Department of HKSAR government and ignores temporary housing.
 **Note: Percentages are based on valid responses. Responses “Don't Know” and “Refuse to Answer” to the question about tenure were excluded from the calculation.

The explanatory variables Age and Income were coded as categorical variable with three groups. Here we treat “Don't Know” responses and “Refuse to Respond” as “Not Available” and use a dummy variable (=1) to capture such responses. “Public Housing Tenant” (PHT) is a dummy variable which assumes the value of unity for both current and past public housing tenants. We then created three interactive dummy variables by multiplying the PHT to the three income dummies (see **Table 5.**). The coefficients on these interactive terms would capture the effect of public housing tenancy for any given income category.

Table 5. Definitions of Qualitative Variables

Variable	Value
Dependent Variable	
<i>Ownership of Either Private or HOS Unit</i>	1 = acquisition of a private or HOS flat within the specified 5 year window, 0 = renter or TPS owner
Independent Variable	
<i>Household Income</i>	
Less than \$10,000	1 = yes, 0 = no
\$10,000 - \$25,000 (reference group)	1 = yes, 0 = no
\$25,000 or above	1 = yes, 0 = no
Not available*	1 = not available, 0 = other income groups
<i>Tenancy in Public Housing (PHT)</i>	
Have you ever been a public housing tenant?	1 = yes, 0 = no
<i>Age</i>	
25 - 39	1 = yes, 0 = no
40 - 49	1 = yes, 0 = no
50 or above (reference group)	1 = yes, 0 = no
Not available*	1 = not available, 0 = other age groups

Not available, including “don't know” responses and “refusals”, is a dummy variable (=1)

The logistic regression model that we use to estimate the probability of owning a private or HOS unit takes the following form:

$$Y_i = \beta' \alpha_i + \varepsilon_i \text{ ----- (1)}$$

where $Y_i = 1$ denotes homeownership (other than TPS units), α_i is a vector of observable characteristics (i.e. age, income and residence of public housing) for the Head of Household \mathbf{i} and β is the associated coefficients (including a

constant). ε_i denotes the error term. The estimated logistic regression coefficients can be used to calculate the probability of i 's being a buyer of a housing unit in the respective time “windows” before and after the TPS. The standard equation (Greene, 1993, p.638) is as follows:

$$Prob(\text{homeowner}_i = 1) = \frac{e^{\beta' \alpha_i}}{[1 + e^{\beta' \alpha_i}]} \quad \text{-----} \quad (2)$$

The logit model allows us to determine if the probability of purchasing private residential flats or HOS housing would be affected by a household's having lived in public rental flats or not. In principle there are two effects. The first is that, since tenancy in public housing is fairly secure and is very economical, tenants may perceive less need for purchase of a private or HOS flat (“the substitution effect”). The second is that, since public housing tenants pay less rent, they receive an extra income in kind and therefore would accumulate more savings and thus will be in a better position to buy (“the income effect”). We expect that the latter effect is stronger for the richer tenants who may perceive their tenure as less secure, and weaker for the less well-off tenants. We hypothesize, in particular, that richer public housing tenants had the highest probability to buy a home before TPS and that with TPS this group's propensity to buy a home other than TPS would decline.

To determine these effects we introduce three interactive dummies - dummies for the low, middle and high income groups multiplied to the PHT dummy - into our model.⁴ The coefficients on these interactive terms depict, for the respective income brackets, the additional effects of tenancy in public rental housing. We expect that the coefficient on the interactive term for the group with highest household income (i.e. \$25,000 or more, who are threatened with double or higher rent) to be positive, while that for the middle and lower income groups to be smaller or even negative. Since the TPS was announced in December 1997 and launched in January 1998, we consider two “windows” for the home purchase decision: the five years up to the end of 1997 and the five years from January 1998. In particular, the regressions were run against the dependent variable of having bought a private or an HOS flat in these two respective periods. These tests will allow us to determine if the TPS had produced differential effects on the incentive to buy in the private/HOS flats among the different income groups. To highlight the possible different effects of the TPS on repeat buyers and first time homebuyers, we add age dummies, in Model 2 and 2', to see if the coefficients on the age dummies had changed after the launch of the TPS and if so how. It should however be noted that all the information was collected in September 2002. As a result the latter window is

⁴ See the caveat noted at the end of Section 1.

slightly smaller than the earlier window. In addition all income and age information reported pertain to the time of the survey, i.e., September 2002.

Empirical Results

Table 6 indicates that all of the variables were of the expected signs and were significant. In particular, for Model 1, which did not control for age effects, generally higher income households are more likely to buy a flat (32.8% more likely for those with household income at HK\$25000 and above than the reference group, as compared with only 25.7% more likely for those in the middle income range). Moreover, the relative sizes and signs of the interactive income/tenancy status dummies are also as expected. Before TPS, high income households who also live in public housing were about 19.2% *more* likely to buy than similar income households who do not live in public housing, indicating that the income effect dominates the substitution effect. Middle range income households, who perceive their tenures as secure, on the other hand, are less likely to buy if they lived in public housing. (roughly 24.7% and 38.6% *less* for those with monthly incomes between HK\$10,000 and HK\$25000, and those with incomes below HK\$10,000 respectively⁵)

Table 6 shows that in 1998 and beyond, the *marginal probability* of buying a home apparently increased for all income categories. This might have been due to the large decline in housing prices after 1997, which rendered homes much more affordable. Note, however, these marginal probabilities may be misleading in that they do not by themselves indicate the projected probabilities of particular groups of people, which must be estimated based on the actual characteristics of such groups. We will present these in **Table 7**.

Most noteworthy is the fact that from 1998, after TPS had been implemented, richer tenants living in public rental housing became no longer more likely to buy homes than their counterparts in the private rental housing market. Prior to 1998, **Table 6** shows that the marginal probability for “well off public housing tenants” to buy a home, holding all other characteristics at their mean values, stood at 19.9%. After 1997, i.e., after the announcement of the TPS in December 1997, this marginal probability almost vanished to zero.

Again, Model 2 and 2' in **Table 6** show that, after 1997, the marginal probability to buy for households headed by someone aged 25-29 rose

⁵ These marginal effects reported in Table 4 were evaluated for a household with household income between \$10000 - \$25000, age of head of household at 50-59, and with other interactive variables held at their respective means. Mathematically, they were the derivatives of the probabilities with

respect to a particular explanatory variable i : specifically, $\frac{e^{(\beta' \alpha_i)}}{[1 + e^{(\beta' \alpha_i)}]^2} \beta_i$

noticeably from 7% to 9% per cent and turned significant. This is clearly related to the fact that home prices had dropped so much so that buying a home became within reach of such young households. There is anecdotal evidence, frequently reported in newspapers, that developers were selling an increasing percentage of their new flats to first time buyers.

In contrast, those aged 40-49 who used to be 21.6% (marginal probability, Model 2, **Table 6**) more likely than those in their 50's to buy lost their differential incentive(3.7%, Model 2', and no longer significant). The Chi-square statistics, which test whether a model as a whole predicts occurrence better than chance (testing of the joint significant of all i), are all highly significant. This suggests that older buyers, who were more likely to be repeat buyers, suddenly became inactive. This is consistent with the suggestion that the loss of buyers willing to pay a good price for existing homes had effectively "incapacitated" their trading up. The introduction of the Tenants Purchase Scheme not only meant a decline in the number of buyers in the HOS and private homes market, but also had caused a dramatic decline in transactions volumes. For the first time in all the history of the HOS since 1978, 1998 recorded thousands of cases where committed buyers of new HOS units(who were chosen by a lottery mechanism) forfeited their down-payments. The over-subscription rate dwindled. Even though most of the supply was nevertheless absorbed, prices had to be cut. In the earlier years those potential buyers from among the public housing who failed to get a place in the HOS lottery would spill over to the second hand HOS market and the private market. Now this stream of buyers either completely lost interest or were willing to pay only much lower prices. With some 218,000 HOS owners suddenly finding that their units lost a major source of buyers, homeowners who had depended on them to buy their units found difficulty trading up to better homes in the private housing market. Transactions in the existing home market plunged, in turn freezing transactions in the new homes market, which in the earlier years almost exclusively depended on buyers trading up (see **Table 6**).

Table 7 presents the simulated probabilities of a home purchase for public housing tenants and private housing tenants whose heads of households were aged 30 to 39. It shows that the probability of a private or HOS flat purchase for public housing tenants within 5 years before 1998 was over 84% for those with a monthly household income at \$25,000 or more. This compares with the 66.6% probability for tenants of private flats. After 1998, the probability of buying a private or HOS flat for public housing tenants in this income bracket fell to 66%.

In contrast, tenants in private flats with similar incomes and in the same age group saw only a marginal decline in the probability of home purchase. This revelation, combined with the evidence of strong purchasing power of green form applicants prior to 1998, who were paying top prices for HOS units sold in the secondary market (**Table 3**), supports the theory that the Tenants Purchase Scheme has played an important role in reducing the interest of the richer public housing tenants to buy private homes and hence in the reversal of the housing market in 1998. As **Table 8** indicates, coinciding with the announcement of the TPS on December 8 1997, housing transactions plummeted in December 1997.

The next section will provide evidence, using time series techniques, that housing prices is an important driver of housing transaction volume, which will provide further evidence about the “down-payment effect” or “equity effect”⁶ on home purchases.

⁶ “Equity effect” is a more general term that refers to the greater readiness of households to trade up the housing ladder as the equity in their homes rises. It is more general because even if no down payment is needed, an increase in the equity of a home is still expected to raise the propensity to trade up.

Table 6. Logistic Regression Estimates of Ownership of Private Residential Flats

Variables	Pre-Dec.31 1997 5 Yr. Window						Post-Dec.31 1997 5 Yr. Window					
	Model 1			Model 2			Model 1'			Model 2'		
	Coefficient	Standard error	Marginal effect	Coefficient	Standard error	Marginal effect	Coefficient	Standard error	Marginal effect	Coefficient	Standard error	Marginal effect
Constant	-1.168***	0.306	-	-1.546***	0.326	-	-2.197***	0.471	-	-2.343***	0.480	-
Household Income												
<\$10,000 (ref. group)	-	-	-	-	-	-	-	-	-	-	-	-
\$10,000 - \$25,000	1.281***	0.363	0.257	0.757**	0.381	0.149	1.949***	0.518	0.289	1.690***	0.526	0.249
\$25,000 or above	1.631***	0.368	0.328	1.087***	0.386	0.214	2.628***	0.514	0.390	2.310***	0.526	0.340
Not available*	0.654**	0.340	0.131	0.343	0.352	0.067	1.443***	0.496	0.214	1.346***	0.499	0.198
Interactive Dummy												
<\$10,000 X PHT	-1.920***	0.417	-0.386	-2.085***	0.426	-0.410	-1.259***	0.570	-0.187	-1.286**	0.573	-0.189
\$10,000-25,000 X RRH	-1.232***	0.240	-0.247	-1.195***	0.245	-0.235	-1.110***	0.256	-0.165	-1.040***	0.259	-0.153
> \$25,000 X PHT	0.957***	0.291	0.192	1.010***	0.297	0.199	0.039	0.298	0.006	0.053	0.301	0.008
Age												
25 – 29	-	-	-	0.358	0.316	0.070	-	-	-	0.607**	0.282	0.089
30 – 39	-	-	-	1.149***	0.213	0.226	-	-	-	0.642***	0.213	0.095
40 – 49	-	-	-	1.098***	0.208	0.216	-	-	-	0.251	0.215	0.037
50 or above (ref. group)	-	-	-	-	-	-	-	-	-	-	-	-
Not available*	-	-	-	0.756	0.555	0.149	-	-	-	-0.856	0.807	-0.126
Chi-square	261.23 (df=6)***			397.45 (df=10)***			357.28 (df=6)***			274.85 (df=10)***		
Observation (n)	1181			1181			1161			1161		

Note: (1) ** & *** denote significance at 5% and 1% respectively. 2) The sample size is smaller than is shown in Table 4 because (a) there are missing values, (b) only flat owners who bought their flats within the 5 year window before 1998 (1993-1997) or within the 5 year window after December 1997 were included in the analysis,(c) owners were divided into two groups – before and after 1998 d) those owners who forgot which year(s) that they bought their flat(s) were treated as missing values.

Table 7. Estimated Probability of Ownership of Private Residential Flats for Household Head aged at 30-39

	Prob. of Purchase in pre-Dec.31 1997 5 Yr. Window			Prob. of Purchase in post Dec.31 1997 5 Yr. Window		
	PHT = 1	PHT=0	Ratio	PHT = 1	PHT=0	Ratio
<\$10,000	0.0771	0.4020	0.19	0.0480	0.1543	0.31
\$10,000 - \$25,000	0.3026	0.5890	0.51	0.2590	0.4973	0.52
\$25,000 or above	0.8455	0.6660	1.27	0.6597	0.6477	1.02

Notes: PHT=1 implies household is public housing tenant; PHT=0 implies household is private tenant.

Table 8. Monthly Transactions of Private Homes

Year/Month	First Hand Homes	Monthly Changes (%)	Second Hand Homes	Monthly Changes (%)
97/07	2,147	-	17,227	-
97/08	2,044	-4.8	8,595	-50.11
97/09	1,396	-31.7	7,800	-9.25
97/10	2,174	55.73	8,315	6.60
97/11	1,343	-38.22	8,653	4.06
97/12	364	-72.9	3,804	-56.04
98/01	2,334	541.21	3,598	-5.42
98/02	868	-62.81	2,883	-19.87
98/03	2,636	203.69	5,501	90.81
98/04	649	-75.38	4,683	-14.87
98/05	2,429	274.27	4,364	-6.81
98/06	3,871	59.37	3,413	-21.79
98/07	1,880	-51.43	3,337	-2.23
98/08	2,603	38.46	3,427	270
98/09	824	-68.34	3,303	-3.62
98/10	3,724	351.94	2,681	-18.83
98/11	6,203	66.57	4,974	85.53
98/12	3,578	-42.32	5,946	19.54
99/01	1,999	-44.13	5,012	-15.71
99/02	1,951	-2.4	3,268	-34.80
99/03	2,589	32.7	3,640	11.38
99/04	3,507	35.46	4,313	18.49
99/05	4,173	18.99	5,063	17.39
99/06	1,516	-63.67	4,517	-10.78
99/07	1,394	-8.05	4,317	-4.43
99/08	777	-44.26	3,871	-10.33
99/09	568	-26.90	3,072	-20.64
99/10	1,400	146.48	2,797	-8.95
99/11	661	-52.79	3,422	22.35
99/12	1,022	54.61	3,273	-4.35

Source: Centaline Property Agency Ltd.

4. Impact of Property Price on Second Hand Transactions Volume

In this Section, we present the results of a causality test between the property price (LnPPI) and second hand home transactions volume (LnSTran). We first test the stationarity properties of the variables (LnPPI and LnSTran) by using the ADF test. The results are presented in **Table 9** which indicate that both are I(1) variables. This shows that the Johansen procedure is appropriate for testing long run relation between these two variables. **Table 10** shows that they are indeed cointegrated. With the long-run coefficient for the LnSTran positive and significant (see **Table 11**), an increase in property prices will boost the second hand transactions volume. We use the long-run cointegrating equation to generate the error correction term to be used in the causality test equations. Two regressions are to be run:

$$\Delta LnSTran_t = \eta + \sum_{i=1}^{p-1} \alpha_i \Delta LnSTran_{t-i} + \sum_{j=1}^{p-1} \beta_j \Delta LnPPI_{t-j} + \theta ECM_{t-1} + \gamma_t \quad \text{-----} \quad [3]$$

$$\Delta LnPPI_t = \eta + \sum_{i=1}^{p-1} \alpha_i \Delta LnPPI_{t-i} + \sum_{j=1}^{p-1} \beta_j \Delta LnSTran_{t-j} + \theta ECM_{t-1} + \gamma_t \quad \text{-----} \quad [4]$$

where ECM is the lagged error term obtained from the cointegrating equation between LnPPI and LnSTran. Short-run Granger causality from LnPPI to LnSTran will be demonstrated if the coefficients of the lagged independent variables are found to be jointly significantly different from zero (Ho: $\alpha_1 + \alpha_2 + \alpha_3 + \dots = 0$ -- based on the F-statistic). Long-run Granger causality from LnPPI to LnSTran will be demonstrated if the coefficient on the lagged ECM term is negative and statistically significant (Ho: $\theta = 0$ -- based on the t-statistic). The second channel of causation represents the adjustment of the dependent variable to its long-run value.

Table 9. Augmented Dickey-Fuller Test of Unit Root

Variable name	Test on	No Trend	Trend	Conclusion
LnPPI	Level	-1.2264	-2.8597	I(1)
	1 st diff	-5.6593***	-5.6401***	
LnSTran	Level	-1.9880	-2.4257	I(1)
	1 st diff	-13.1256***	-13.0912***	
LnFTran	Level	-8.9940***	-8.9949***	I(0)

Notes: (1) The optimal lag in ADF test is determined by the Akaike Information Criterion. (2) 95% CV for the ADF statistic with trend and without trend are 2.8903 and -3.4548 respectively (3) *** indicates significance at 1% level.

Table 10. Testing Cointegration between LnPPI and LnSTran

Null Hypothesis	Alternative Hypothesis	Test Statistics	5% Critical Value
Trace tests:		Trace Value	
$r = 0$	$r > 0$	50.51***	17.86
$r = 1$	$r > 1$	2.03	8.07
λ max tests:		λ max Value	
$r = 0$	$r = 1$	48.49***	14.88
$r = 1$	$r = 2$	2.03	8.07

Notes: (1) the lag length of the VAR (=3) is determined by Akaike's Information Criterion (2).*** denotes significance at 1% level and r indicates the number of cointegrating vectors. (3) As individual series clearly exhibits trending pattern, we consider regressions with unrestricted constant.

Table 11. Estimated Long-Run Coefficients Using Johansen Cointegration

Regressors	Coefficient (t-ratio)
Intercept	3.8619
LnPPI	1.0212 (-1.7665)*

* denotes 1% and 10% significance level respectively.

Table 12. Causality Tests between LnSTran and LnPPI using the VECM Approach

	H_0 : LnPPI does not cause LnTran		H_0 : LnTran does not cause LnPPI	
	$\alpha = 0$: F-stat	$\alpha = 0$: t-stat	$\alpha = 0$: F-stat	$\alpha = 0$: t-stat
Coefficient	5.9117	-0.5692	-0.0040	0.0437
(p-value)	(0.000)***	(0.000)***	(0.390)	(0.005)***

Notes: The lag length (=3) of the VAR is determined by Akaike's Information Criterion

The results of the causality test using the VECM approach are presented in **Table 12**. The ECM coefficients enter significantly both when the LnPPI and LnSTran are treated as the dependent variable. We can conclude that there is a bi-directional positive causal relation between the LnSTran and LnPPI in the long run through the equilibrium mechanism. However, the F-test showed that only those Δ LnPPI lagged dynamic terms (in equation 1) are jointly significant. Therefore, we can conclude that there is uni-directional causality in the short-run from LnPPI to LnSTran through the dynamic terms but not the other way round. If TPS reduced the interest of public housing tenants to buy a private or HOS unit, as demonstrated in the previous section, and if this contributed to a decline in

housing prices, the finding here lends support to the argument that TPS had a significant negative impact on transactions volumes.

5. Conclusions

We have presented two sets of statistical results to support the thesis that a “housing ladder effect” exists whereby an increase in equity at the bottom of the ladder readily transmits through the housing ladder and the second hand or existing housing market to the top, while a decline in equity at the bottom would similarly transmit through the housing ladder up. This result is significant as it increases our understanding about the booms and busts of the housing market. We found that prior to the launch of the Tenants Purchase Scheme public housing tenants who were reasonably well off had a much higher probability of home purchase compared to private housing tenants with similar incomes, and that they had been paying high prices for homes in the secondary HOS market. The purchase activities of public housing tenants certainly had played a role in the housing market boom prior to 1998. With the launch of the TPS the relative higher propensity to purchase for public housing tenants disappeared. Their reduced demand for HOS and private flats again appear to have played a part in the housing market wind-down after 1997.

The first set of statistical tests, based on data collected by the authors in a survey at the end of 2002, represents cross-sectional analysis using the logit regression approach. The results show a clear and interesting pattern. The propensity to purchase always increases with household incomes, and for high income households only, was higher among public housing tenants than private housing tenants prior to 1998. After 1997, the propensity to purchase fell for all households, but it fell particularly hard for the well-off public housing tenants. Both the timing of this change and economic theory suggest that the Tenants Purchase Scheme announced on 8 December 1997 played a role. The other set of statistical tests, based on official published data, represent time series analysis using modern cointegration-cum-causality test approach. It shows that housing prices have a positive impact on second hand(existing home) transactions. This is consistent with the theory that the housing ladder effect works through existing homes. Because many things happen in 1997, and in particular, the Asian Financial Crisis broke out in July of that year, it is not possible to definitively disentangle the effects of the Asian Financial Crisis from those of the TPS, and it is probably inappropriate to blame all the collapse of the

housing market in 1998 to the TPS.⁷ But it seems clear that the housing ladder effect has a part to play both in the boom and in the bust of the Hong Kong housing market. The Hong Kong story lends support to Ortalo-Magne and Rady's hypothesis about the "critical role of marginal first-time buyers in housing market fluctuations," and underscores the symmetric effects that changes in the purchasing activities of first time buyers may have on the entire housing market.

Table 13. Indicators of Changes of Confidence 1997:4-2000:4

	Hang Seng Index At End of Period	The US\$ Premium on the HK Dollar in the 1-Year Forward Market
2000:4	15095	-154
2000:3	15649	-142
2000:2	16156	-9
2000:1	17406	48
99:4	16962	396
99:3	12733	909
99:2	13532	959
99:1	10942	1547
98:4	10049	1512
98:3	7883	4235
98:2	8543	4201
98:1	11519	2396
97:4	10807	4036

Source: Hong Kong Monetary Authority and <http://beta.finance.yahoo.com/q/hp?s=%5EHSI>
 Negative values in the US\$ premium on the HK\$ in the forward market suggest an expectation that the Hong Kong dollar would *appreciate*. The Table shows a clear RISE in confidence from 1997Q4 to 1998Q1.

⁷ **Table 13** indicates that confidence, though damaged to some extent by the Asian Financial Crisis, had actually been restored to some extent in the first quarter of 1998, but prices and transactions fell most dramatically in the first quarter of 1998.

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Appendix Table A1: Developments of Living Space and Living Density Standards on Public Rental Housing

Pre-1973	Group A Estates (i.e. Government Low Cost Housing and Housing Authority estates): The allocation standard was that the Net Living Area (NLA) which is the net living space excluding kitchen, toilet and balcony would not be less than 35 sq. ft. (3.25m ²) per person. Children were counted as adults or, for those under 10 years of age, to be counted as half an adult. Group B Estates: The allocation standard was that the NLA would not be less than 24 sq. ft. (2.23m ²) per person.
Nov. 1973	The Housing Authority decided to adopt a uniform standard at 3.25m ² .
1974/75 to 1981/82	The NLA would steadily increase beyond the standard of 3.25m ² per person and reached an average of 4.43m ² per person in 1981/82.
1982	Following a review on the allocation standards, the Housing Authority decided to raise the allocation standard to 4.0m ² per person NLA or 5.5m ² Internal Floor Area (IFA) per person.
1987	The Housing Authority further raised the allocation standard for new lettings to provide each person with no less than 4.2m ² per person NLA or 5.5m ² per person IFA.
1991	Following a review, the Housing Authority approved in September 1991 the dual allocation standard; i.e. all tenants would be given a choice of two allocation standards with two correspondingly different Median Rent-Income Ratio (MRIR) limits. Hence, a tenant could choose between the allocation standard of 5.5m ² per person IFA with rent set at the MRIR limit of 15% or a new standard of 7m ² per person IFA with MRIR limit at 18.5%.
1992	After reviewing the dual allocation standards, the Housing Authority decided that the allocation standards of 5.5m ² per person IFA and 7m ² per person IFA should remain unchanged.

Source: Office of the Commissioner for Administrative Complaints, *Report of the Investigation on Overcrowding Relief in Public Housing*.

Appendix Table A2: Development of Public Housing in Hong Kong

1954	Eight permanent six-storey buildings “Mark I” were completed to resettle the victims of the 1953 Shek Kip Mei Fire.
1965	The resettlement blocks became high-rise buildings. For the first time a balcony and a toilet were provided inside each flat in “Mark IV, V and VI” buildings
1978 January	<i>Home Ownership Scheme (HOS)</i> 8373 flats were offered for sale under the Phase I of the Home Ownership Scheme (HOS) and the Private Sector Participation Scheme (PSPS) was introduced as a supplement to the HOS flats in the following year giving private developers a role in developing public housing estates.
1981 October	<i>HOS</i> Land value was excluded from HOS flats prices.
1981	<i>Middle Income Housing (MIH) scheme</i> The Middle Income Housing (MIH) scheme was launched to meet the housing needs for families with income above the limit for HOS/PSPS flats
1983	<i>MIH</i> Discontinuation of the MIH scheme
1985	An “Extended Redevelopment Program” to clear sub-standard blocks built in the 60's began.
1987 April	<i>Housing Subsidy Income Limit Policy</i> The Housing Subsidy Income Limit Policy (the “double rent” policy) was introduced with the objective of reducing housing subsidy to public housing tenants who are no longer in need of it.
1988	<i>Home Purchase Loan Scheme (HPLS)</i> <i>Home Purchase Loan Scheme (HPLS)</i> was introduced by the Housing Authority (HA) to assist eligible families to purchase homes in the private sector. The HA was reorganized to run as a statutory body and a chairman was appointed.
1991 August	A number of public rental blocks were offered for sale to sitting tenants. The response was very poor.
1994 June	<i>Anti-speculation Measures</i> A series of measures to curb speculation were announced.
1994 August	The <i>Sandwich Class Housing Loan Scheme</i> was launched by the Housing Society (HS)

1997 June	<i>HOS/PSPS Secondary Market Scheme was launched</i> Launch of the Secondary Market Scheme. It allowed owners of HOS and PSPS flats to sell their flats to public housing tenants from the fourth year of purchase without repaying the implicit land price subsidy to the HA.
October	Policy Address stated the government's intention to build at least 85 000 flats a year in the public and private sectors; to achieve a home ownership rate of 70% in ten years; and to reduce the average waiting time for public rental housing to three years.
December 8	<i>Tenants Purchase Scheme (TPS)</i> announced offering up to 88% discount from the estimated market price. Scheme was well received.
1998 January	Phase One of the Tenants Purchase Scheme with 27,000 flats in six estates offered for sale to existing tenants began. <i>The Sandwich Class Housing Loan Scheme</i> was abolished
1998 March	<i>TPS</i> A further 27,000 flats in six estates were offered for sale under the TPS Phase 2. By the end of the month, 85% of the tenants concerned had indicated an interest in buying.
1998 February	<i>Relaxation of the resale restriction period (HOS flats)</i> Relaxation of the resale restriction period under the HOS was endorsed by the HA, with effect from June 1999, the ten year resale restriction period has been shortened to five years, while the initial restriction period reduced from three years to two years.
1999 March	<i>The Mortgage Subsidy Scheme (MSS)</i> MSS was introduced as a pilot trial to promote home ownership among residents affected by the Comprehensive Redevelopment and Cottage Area Clearance Programme
1999 February	<i>The Buy or Rent Option Scheme (BRO)</i> The <i>Buy or Rent Option Scheme</i> (BRO) was introduced to help prospective tenants on the Waiting List for Public Rental Housing to purchase their own homes from the outset.
1998 September	<i>HOS and Home Purchase Loan Scheme</i> To meet the community's aspiration for home-ownership, the Authority opened up the HOS and HPLS to single persons.
1999 April	<i>TPS</i> A further 27 400 flats in six estates were offered for sale under <i>Tenants Purchase Scheme</i> Phase 3.
1999 November	<i>Housing Production</i> During the year, public housing production was at an unprecedented peak with an annual average of some 173 000 flats under construction. A total of 48 500 domestic flats and 11 commercial centres were completed.

2000 January	<i>TPS</i> The first batch of TPS flats, which had been sold for 2 years, became mature for re-sale under the Secondary Market Scheme.
2000 March	<i>HOS</i> In response to changes in market conditions, the HA decided to transfer 16000 HOS flats scheduled for completion between 2000/01 and 2003/04 to rental housing
2000 April	<i>TPS</i> A further 26,414 flats were offered for sale under TPS Phase 4.
2000 June	<i>Housing Production Reached New Heights</i> Production of homes reached new heights with the completion of 89,000 flats during this year
2001 February	<i>HOS and PSPS</i> The HA endorsed the moratorium on the sale of HOS and PSPS flats for 10 months until end June 2002
2001 March	<i>Policy to stabilize the housing market</i> Measures in the Statement on Housing Policy included cessation of the production and sale of HOS, PSPS flats as well as the sale of PRH flats under the TPS after phase 6 will cease from 2003 onwards
2001 September	<i>Home Assistance Loan Scheme</i> The <i>Home Assistance Loan Scheme</i> was launched to replace the HA's <i>Home Purchase Loan Scheme</i> and the Housing Society's <i>Home Start Loan Scheme</i>
2002 November	<i>Suspension of the TPS and other measures</i> The Secretary of Housing announced that the TPS would be suspended indefinitely with the exception of the TPS Phase 6A which had been announced, which was being withheld pending the completion of the condition survey on the drainage system and any necessary repair works. He also announced a series of measures to eliminate the excess supply of housing units, including the indefinite suspension of production and sales of the HOS scheme beyond the already produced units.
2003 May	<i>Home Assistance Loan Scheme</i> The HA decided to close all applications for the Home Assistance Loan Scheme with immediate effect, pending a separate review on the scheme

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