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Land-Supply Restrictions, Developer Strategies and Housing Policies: The Case in Hong Kong

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The Hong Kong residential market is unique in several aspects: restricted land supply, high price volatility, high appreciation rate, a small group of large developers, and a huge public housing sector. Assuming that higher price appreciation and volatility can be attributed to the limited land supply, this study examines the relationships among developers' housing-supply decisions, government land-supply decisions, and public housing policies. Using data for the 1973-1997 period, our result shows that an increase in land supply by the Hong Kong government may not be a solution to the perceived shortage of housing supply in Hong Kong. This finding indicates that it is important to examine developers' profit maximization strategies when enacting public policies related to property markets.

Keywords

Land supply, land bank, public housing.

Introduction

The Hong Kong housing market has a combination of five features that might be of interest to researchers. First, land supply is very limited and is at the discretion of the government. Second, housing prices are extremely volatile.

Third, the average price appreciation rate is among the highest in the world in the past two decades.¹ Fourth, developments are concentrated among a few large developers. Finally, in term of percentage, the public housing sector of Hong Kong is the second largest in the capitalist world, after Singapore (see Peng and Wheaton (1994)).

This study focuses on the supply side of the Hong Kong housing market. We will analyze whether the perceived shortage in housing supply is a consequence of the perceived shortage in government land supply. We will also address whether the government can solve the housing problem by simply increasing the land supply. In our analyses, we will examine the developers' land bank and housing supply strategies in relation to the government's land supply decision. The impact of public housing policies on housing supply is also studied.

This paper is organized as follows. Section 2 briefly discusses the housing demand and supply situations in Hong Kong. Section 3 describes the data used. Section 4 presents the empirical results and section 5 concludes the study.

The Hong Kong Housing Market

Demand

Lau (1992) suggests that Hong Kong is one of the most densely populated cities in the world. Strong demand for housing has been created from the reduction of household size. (The average household size has fallen from 4.64 in 1961 to 3.4 in 1996.) The decline in the average household size together with a significant increase in population (from 4.2 million in 1973 to 6.5 million in 1997) means that there has been a strong demand for housing in Hong Kong during the past decades (see Table 1).²

¹ This might prevent a large number of people from owning houses. The home ownership rate of 52% reported by the Hong Kong Housing Bureau for 1996 and 1997 is comparatively lower than that of other countries. As reported by the Hong Kong Housing Bureau, the owner-occupation rates are 88% for Singapore (1995), 82% for Thailand (1994), 67% for the United Kingdom (1995), 65% for the United States, and 60% for Japan (1993). The situation in Hong Kong has already improved from the 42% in 1986.

² For more information on housing prices and demand situations in Hong Kong, see, for example, Cheung, Tsang, and Mak (1995), Chou and Shih (1995), Mok, Chan and Cho (1995), Peng and Wheaton (1994) and Tse (1994 and 1997).

There is widespread speculation that the demand for housing in Hong Kong is not only for consumption, but also for investment (and, to a certain extent, speculation). This widespread speculation is based on the observation that the rate of return on property investment in Hong Kong is higher than that in other countries and/or other types of investment opportunities (see Kwok (1983), Fung (1996), and Dua and Rashid (1996)).

Price Appreciation and Volatility

The Hong Kong housing market has experienced a few major booms (see Table 1). Real estate prices in 1996 were found to be even higher than that of Tokyo (see Fung, 1996). For example, the average property price for a premise between 40 and 69.9 square meters on Hong Kong Island was HK\$20,976 per square meter in 1990, HK\$86,271 in the second quarter of 1997, and HK\$63,872 in the same quarter of 1998. In just the nineteen-month period between February 1996 and September 1997, the property price index rose by over 50% (see the February 25, 1998 Executive Summary of the Hong Kong Monetary Authority).

Peng and Wheaton (1994) find that the housing demand in Hong Kong is price inelastic, but income elastic. In 1995, the ratio between the monthly mortgage payment for a medium-sized flat and the median monthly household income was as high as 73% (see the Hong Kong Consumer Council, 1996). Table 1 clearly reveals that the rate of income increase is much less than the upsurge in property prices. Furthermore, as shown in the last column, the deflated percentage change in price index fluctuates severely over the 1975-1997 period. This provides additional evidence for high housing price volatility. By comparing the housing appreciation rate to the Consumer Price Index (CPI) in panels A and B of Figure 1, it is apparent that the housing appreciation rate far exceeds the inflation rate during the period examined.

Supply

The Hong Kong government owns all the land in Hong Kong. The major sources of land for new housing developments are new towns, reclamation, as well as urban renewal and redevelopment. The methods of disposal include public auction, tender, and private treaty. (See Leung (1986) for a more detailed discussion on this issue.) Since 80% of the 1,092 square kilometers of land is mountainous, land supply in Hong Kong is very restricted. In 1997, around 60% of the population lived in only around 80 square kilometers of land that is extremely densely developed (see Renaud *et.al.* (1997)). Table 2 shows the amount of land-supply for the 1979-1997 period.

Concerning public housing, since the end of the 1980s, the public sector has supplied about half of the total housing stock. In April 1987, the Hong Kong government announced a Long-Term Housing Strategy, with the objectives of ensuring adequate housing for all households at affordable prices and rents and satisfying home ownership demand. The government target is a rate of 70% home-ownership in Hong Kong.

Table 1. Statistics Related to Demand for the Period 1973 to 1997

Year	HSBC		Real Interest Rate	Population (Mid-Year Estimates)	Number of Households	Average Real Wage Index ^a (Mar. '82=100)	Property Price Index ^b (1989=100)	Deflated % Change in Property Price
	Average Best Lending Rate (%)	Inflation Rate (%)						
	(1)	(2)	(1) - (2)				(7)	
1973	8.31	5.85	2.46	4212600	N/A	76.1	N/A	N/A
1974	10.57	6.63	3.94	4319600	N/A	70.6	N/A	N/A
1975	6.89	4.15	2.74	4395800	N/A	72.8	15	N/A
1976	6.29	3.48	2.81	4518000	999390	81.5	17	9.85
1977	4.94	5.77	-0.83	4583700	N/A	85.2	20	11.88
1978	5.90	5.91	-0.01	4667500	N/A	91.0	26	24.09
1979	12.74	11.59	1.15	4929700	N/A	93.9	38	34.57
1980	13.84	15.38	-1.54	5063100	N/A	94.6	53	24.09
1981	17.50	14.33	3.17	5183400	1244738	96.8	64	6.42
1982	14.02	10.50	3.52	5264500	1311600	98.6	55	-24.56
1983	12.25	10.03	2.22	5345100	1334300	95.8	44	-30.03
1984	12.41	8.15	4.26	5397900	1378700	97.2	40	-17.24
1985	8.063	3.10	4.96	5456000	1417700	99.4	44	6.90
1986	7.06	2.80	4.26	5525000	1452576	103.9	48	6.30
1987	6.68	9.41	-2.73	5580000	1496100	107.7	65	26.00
1988	7.99	7.46	0.53	5628000	1532600	109.2	79	14.08
1989	10.54	10.14	0.40	5686000	1549000	112.4	100	16.44
1990	10.48	9.69	0.79	5704000	1559000	115.3	111	1.31
1991	9.40	7.51	1.89	5755000	1601900	114.4	153	30.33
1992	7.29	9.45	-2.16	5812000	1633500	114.2	217	32.38
1993	6.50	8.51	-2.01	5919000	1677700	117.3	237	0.71
1994	7.23	8.07	-0.84	6061000	1729100	118.8	293	15.55
1995	8.96	8.64	0.32	6156100	1783000	117.7	272	-15.81
1996	8.52	5.99	2.53	6311000	1839300	118.1	298	3.57
1997	8.83	5.75	3.08	6502100	1918500	119.3	418	34.52

Note: "N/A" indicates that data is not available.

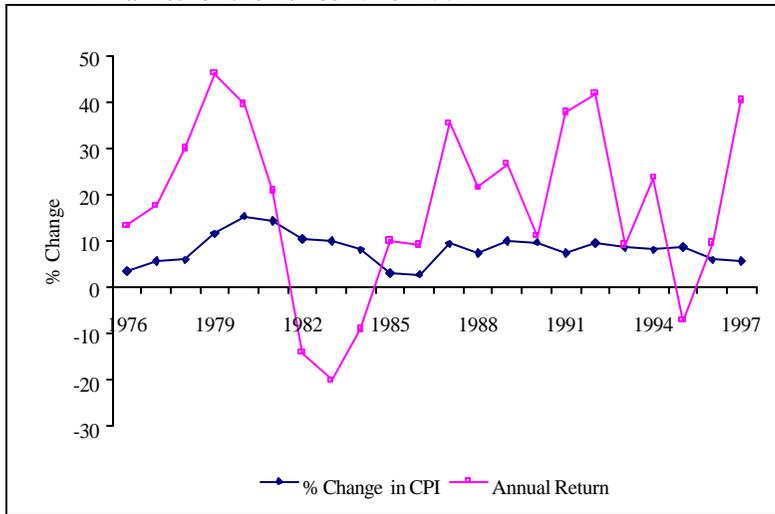
- (a) The average real wage index series consists of the means of the quarterly and semiannual real wage indices of craftsmen and other operatives, supervisory, technical, clerical and miscellaneous non-production workers for overall industries. The base is March 1982.

(b) The average property price indices are the overall price indices of private domestic premises, with a base year of 1989.

Sources : Hong Kong Housing Bureau and the Hong Kong Monthly Digest of Statistics by the Hong Kong Census and Statistics Department.

The quantity of private housing units supplied each year is not only limited but fluctuates wildly depending on market conditions and sentiments. The private sector is primarily made up of a few large companies such as the Cheung Kong (Holdings) Limited, Henderson Land Development Limited, New World Development Limited, and Sun Hung Kai Properties Limited, and other smaller companies³.

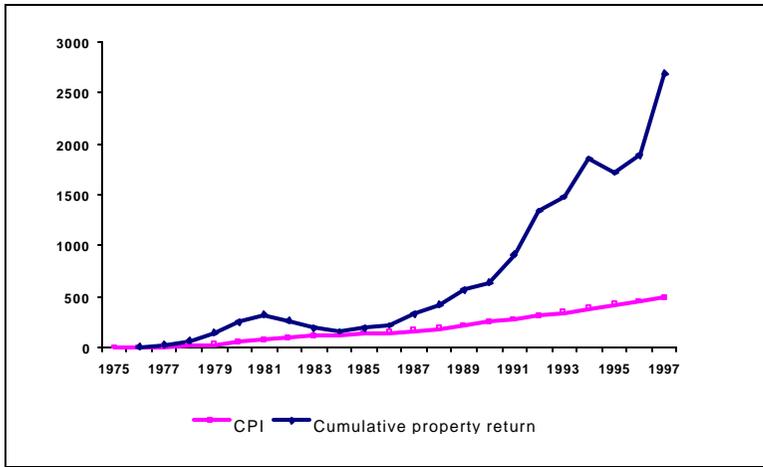
Figure 1. Movements of Consumer Price Indices and Return on Housing Market for the Period 1976–1997



A. Percentage Change in Consumer Price Index versus Annual Property Return

B. Consumer Price Index versus Cumulative Property Return

³ These private developers are categorized as “large” based on their capitalization value in the stock market. The Hong Kong Consumer Council (1996) finds a high degree of market concentration among developers from 1991-1994. Specifically, 55% of the new private housing came from four developers.



It is speculated that developers may hold land as inventory for the purpose of reducing housing supply, as is evident from the sizes of their land banks. They also appear to control the timing of their launch schedules by raising the housing supply at the peak season and delaying it otherwise to maximize the selling price. Table 2 presents the amount of land banks and the amount

Table 2. Land and Housing Supply Statistics for the Period 1973 to 1997

Year	New Land Supply (in m ²)	New Public Units Completed	Usable Floor Area* (in m ²)	Developers Land Bank in Gross Floor Area (in m ²)	Developers Supply in Gross Floor Area (in m ²)
1973	N/A	N/A	973,000	1,021,546	133,858
1974	N/A	N/A	993,000	924,665	43,365
1975	N/A	N/A	639,000	1,198,314	15,842
1976	N/A	N/A	616,000	1,303,326	149,775
1977	N/A	13743	732,000	1,229,892	265,174
1978	N/A	16306	907,000	3,898,275	153,197
1979	170,545	20875	847,000	1,659,100	350,546
1980	432,284	33553	850,000	1,669,508	227,595
1981	651,379	32494	1,084,000	2,685,360	159,119
1982	455,091	48581	785,000	2,601,788	436,935
1983	154,223	35531	1,102,000	2,496,802	260,158
1984	434,452	41135	625,000	2,293,737	377,609
1985	411,725	49804	1,461,000	2,363,804	537,949
1986	212,960	34912	1,178,000	2,847,079	566,236
1987	264,730	33950	1,378,000	3,781,695	477,137
1988	354,521	40503	1,260,000	4,639,067	664,251
1989	321,239	65169	1,770,500	4,633,197	586,651
1990	190,680	50403	1,367,000	4,589,783	546,858
1991	330,876	42212	1,814,000	4,556,511	652,685
1992	230,286	16779	956,000	9,283,985	733,213
1993	281,951	65749	1,427,000	9,986,897	798,642
1994	279,900	21692	1,255,000	9,734,211	1,042,509
1995	662,468	33573	885,000	10,348,246	774,367
1996	641,165	29083	769,000	11,315,436	589,395
1997	649,629	37581	712,000	11,492,622	587,400

Note: "N/A" indicates data is not available.

* Usable floor area series, in square meters, are the lump sums of residential flats categorized in "residential", "residential/commercial" and "others" buildings. The usable floor area of a flat is the total floor area within the flat excluding any staircases, lavatories, water closets, kitchens and other common areas of the building.

Sources: Hong Kong Housing Bureau and the Hong Kong Monthly Digest of Statistics by the Hong Kong Census and Statistics Department; and Annual Reports of the four major developers.

of housing supplied by the four major developers. Given the land bank practice, it is reasonable to suspect that, even if the government releases more land to the developers, the supply of housing units might not necessarily increase accordingly.

Sample Description

This paper examines the impact of limited land supply and government policies on the developers' land bank and housing supply strategies. The twenty-five-year period from 1973 to 1997 is chosen for our analyses, as the earliest annual reports of developers begin from 1973. We obtain the housing supply and land bank information of Cheung Kong (Holdings) Limited, New World Development Limited, Sun Hung Kai Properties Limited, and Henderson Land Development Limited from their annual reports. Since Henderson Land Development Limited started its listing on the Stock Exchange in 1981, information for the period 1973-1980 is not available.

We define housing supply and land bank as the sum of the area completed during that year and the sum of all the land held and sites under construction during the period, respectively. Both are measured as gross floor area for residential and residential/commercial purposes. We use the usable-floor-area-completed as the proxy for the overall market housing supply.⁴ This is the lump sum of the areas of residential flats categorized under "residential", "residential/commercial" and "others" building activities completed in the private sector.

We then define the land supply variable as the amount of site area for residential purposes disposed by the government through public auction, tender and private treaty grant. We also employ the number of public-flats-completed, whose availability begins in 1977, to represent annual public housing supply. All the above-mentioned data are measured in square meters.

Property price indices for the 1975-1997 period represent the overall price indices for the four types of private domestic premises categorized by size, with 1989 as the base year. Finally, we choose the yearly average of the Hang Seng Index for analyzing the effects of economic conditions on the housing

⁴ The usable floor area of a flat is the total floor area within the flat excluding any staircases, lavatories, water closets, kitchens and other common areas of the building.

market. Most of the data series mentioned in this section are obtained from various issues published by the *Hong Kong Monthly Digest of Statistics* of the Hong Kong Census and Statistics Department.

Empirical Results

Effects of Government Land Supply on Housing Supply

In this section, we explore the common belief that an increase in land supply can be a remedy for the shortage of housing supply. If the government land supply and housing supply are positively related, then increasing land supply will bring about an increase in housing supply. Alternatively, a positive association between land supply and land banks of developers will imply that when more land is released, developers will absorb it into their reserve.

To examine those relationships, we run regressions with different lags. The percentage changes in land bank are regressed on percentage changes in land supply with none and one lag. We also use different lags of percentage changes in land supply in the tests of percentages in housing supplies in order to capture development and presale decisions of developers. Since the housing supply series include only figures of completed flats, their lagged values can proxy the units from pre-sale (which is usually one or two years before the buildings are actually completed).

Table 3 reports the results of regressing percentage changes in the land bank, the housing supply of developers, and the overall market supply on variables representing the percentage changes in land supply. None of the coefficients are significant. Even with an R^2 of 0.1632 for the percentage changes in market supply equation, the t-statistics of the government land supply variables are all insignificant. Hence, it is apparent that major developers make decisions on their land banks and housing supplies independent of the government's decisions on land supply. This is true also for the overall market supply. In other words, government land supply has little effect on housing supply.

We further analyze whether major developers supply more houses when their land banks increase by regressing the percentage changes in housing supplies of each of the four major developers on the percentage changes in their own land banks. The results are reported in Table 4. None of the

Table 3. Regression Results of Overall Market Supply, Land Banks and Housing Supply of Major Developers on Government Land Supply for the Period 1979 to 1997

<i>Independent Variables</i>	<i>Dependent Variable</i>		
	% Δ Developers' Land Bank _{<i>t</i>}	% Δ Developers' Housing Supply _{<i>t</i>}	% Δ Market Supply _{<i>t</i>}
Constant	11.591 (1.472)	10.634 (0.604)	5.505 (0.247)
% Δ Land Supply _{<i>t</i>}	-0.021 (-0.185)	0.121 (0.548)	-0.104 (-0.371)
% Δ Land Supply _{<i>t-1</i>}	0.131 (1.280)	0.034 (0.134)	0.221 (0.689)
% Δ Land Supply _{<i>t-2</i>}		0.035 (0.147)	-0.042 (-0.138)
% Δ Land Supply _{<i>t-3</i>}		-0.108 (-0.526)	0.049 (0.190)
R ²	0.1200	0.1044	0.1632

Note: t-statistics are in parentheses

coefficients of percentage changes in land banks are significant.⁵ It is interesting to note that two out of the four equations have negative slope coefficients. These negative coefficients, though insignificant, might indicate that developers tend to reduce the growth rate of their housing supplies when they increase the growth rate of their land banks. This contradicts the intuition that developers might increase their land bank to re-stock the land they used to build more houses.

In order to capture the construction lag (two or three years) problem, we also run regressions with one-, two- and three-year lags of land banks. Our results

⁵ When we use the 1973-1997 period for the regression equation of the New World Development Limited, both the *t*-statistic and magnitude of the coefficient of percentage changes in land bank are significant. The coefficients (*t*-statistics in parentheses) of the constant and the land bank variable are 3981800 (2.873) and -72293 (-2.427) respectively. This is probably due to the fact that the developer supplied few flats in some of the years during the 1973-1984 period, thus generating big swings in the first part of the data. Therefore, we run the regression using the 1985-1997 period for New World Development Limited.

indicate that, except for the one-year lag equation for Sun Hung Kai Properties Limited (with a significant t -statistic of 2.135 for the land bank variable and an R^2 of 0.1783), none of the other regressions are significant (and thus, not shown). Given the results reported in Table 4, we conclude that the construction decisions of major developers might be independent of the levels of the land bank they hold. An increase in the land bank reserve might not necessarily increase developers' housing supply.

Table 4. Regression Results of Housing Supply of Major Developers on their Land Banks for the Period 1973 to 1997.

<i>Developer I</i>	<i>Independent Variable</i>		
	Constant	% D Land Bank, of Developer I	R ²
Cheung Kong (Holdings) Limited	106.540 (2.010)*	-0.134 (-0.383)	0.0066
New World Development Limited ¹	165.040 (0.731)	5.718 (1.241)	0.1335
Sun Hung Kai Properties Limited	55.290 (2.217)**	-0.905 (-1.173)	0.0589
Henderson Land Development Limited ²	31.884 (0.797)	0.833 (0.380)	0.0110

Note: * and ** indicate significance at 90% and 95% confidence intervals respectively; t -statistics are in parentheses

1 The regression of New World Development Limited is done using data from the 1985-1997 period.

2 Henderson Land Development Limited data begins in 1981.

Dominance of Large Developers in the Housing Market

Figure 2 depicts the overall market supply and housing supply of major developers for the period 1973 to 1997. It is obvious that a few developers dominate the housing supply in Hong Kong. (This is especially true after 1992.) To further investigate the relationship between the overall housing supply and the housing supply of major developers, a vector autoregressive (VAR) model is set up for the percentage changes in overall housing market proxy and the percentage changes in supply of developers of up to two lags.

The hypotheses to be verified are whether developers supply Granger-causes market supply, or vice versa.

We first use the full set of data (from the period 1973 to 1997) to analyze the issue. However, the result is not significant (and therefore not shown). The reason is likely to be that the three developers, excluding Henderson Land Development Limited which is not listed until 1981, did not devote their businesses extensively to the residential market in the first portion of the period.

Therefore, we also run the VAR model for the 1983-1997 period. In particular, we use both the structural VAR (that includes both concurrent terms) and the standard form VAR (where the effects of the concurrent terms are incorporated in the error terms). Each of the two forms consists of two equations that are solved simultaneously. Table 5 reports the results. A comparison of the F -statistics (joint tests of unrestricted versus restricted models, passing the 5% critical value of F -distribution) in the last row shows that the developers' supply Granger causes the market supply with a one-year lag. The causality effect is even more significant in the structural VAR model. This is likely because the large developers themselves represent a substantial portion of the overall market. The results indicate that variations in supply from the major developers can be viewed as signals of their beliefs about the housing market conditions. Other developers will likely follow their strategies in making construction decisions. Moreover, the significant (negative) coefficients for the one-period lagged supplies in both models may indicate fast adjustments in the market.

We are also interested in examining whether major developers mimic each other's housing supply and land bank strategies. To do this, we calculate correlations of the growth rates of land bank and housing supply for the major developers. Correlations for Henderson Land Development Limited and others are performed based on the 1981-1997 period. All other correlations are calculated using data from 1973 to 1997. Panel A of Table 6 reports that the land banks of major developers, excluding Henderson, are positively correlated with each other. However, since the coefficients of correlation are generally quite low, it appears that developers' land bank decisions are not related to each other. Panel B of Table 6 reports the correlations of housing supply of major developers during the period. The alternating signs seems to indicate that developers do not move concurrently with their peers in their housing supply decisions.

Furthermore, we suspect that developers' supply decisions are based on economic conditions. That is, they will supply more flats when the economy

is in a boom and fewer flats in a contracting one. If this hypothesis is correct, then it might be difficult to argue that an increase in the government's land supply will lead to an increase in developers' housing supply.

Table 5. Vector Autoregressive Results between Overall Market Supply and Housing Supply of Major Developers for the Period 1983 to 1997

<i>Independent Variable</i>	<i>Dependent Variable</i>			
	Case 1 : Structural VAR		Case 2 : Standard Form VAR	
	% Δ Market Supply _t	% Δ Developers Supply _t	% Δ Market Supply _t	% Δ Developers Supply _t
Constant	-15.983 (-1.183)	20.501 (1.990)*	5.482 (0.467)	24.447 (2.299)**
% DMarket Supply_t		0.720 (2.887)**		
% DMarket Supply_{t-1}	-0.586 (-1.787)*	0.398 (1.182)	-0.642 (-1.807)*	-0.064 (-0.198)
% DMarket Supply_{t-2}	0.204 (0.678)	-0.255 (-0.981)	-0.055 (-0.176)	-0.294 (-1.046)
% D Developers Supply_t	0.878 (2.887)**			
% D Developers Supply_{t-1}	1.307 (2.527)**	-1.106 (-2.186)*	0.913 (1.687)*	-0.449 (-0.916)
% D Developers Supply_{t-2}	0.170 (0.620)	-0.191 (-0.784)	0.008 (0.027)	-0.185 (-0.701)
F – Statistics	6.724 #	3.270	5.004 #	1.719

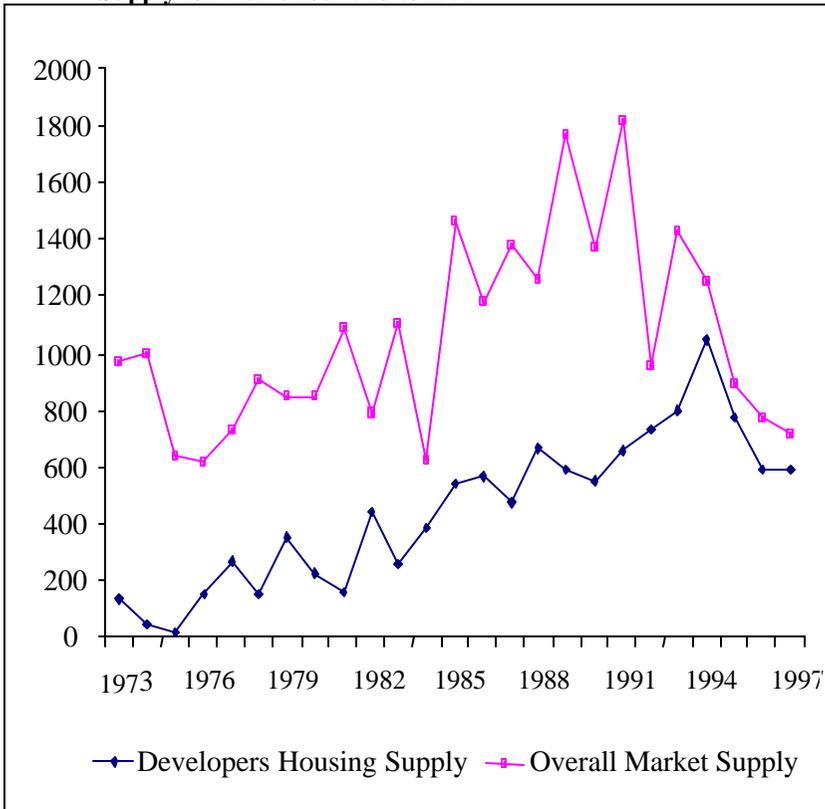
Note: * and ** indicate significance at 90% and 95% confidence interval respectively; t-statistics are in parentheses.

Indicates significance at 5% critical values of F-distribution.

To study the relationship between developers' supply decisions and the economic conditions in Hong Kong, the Hang Seng Index is chosen to proxy economic movements. Table 7 reports the regression results for percentage changes in developers' housing supply regressed on the percentage changes

in Hang Seng Index with no lag and a one-year lag. The results indicate that major developers tend to complete more houses when there is a bull market in the previous year, and fewer in a bear one. Moreover, since developers usually start pre-selling the housing units one year before they are actually completed, the regression results may also imply that developers react promptly to the boom economy by marketing the presale flats immediately. Thus, these results show that the developers' supply decisions are more related to market timing than to the supply level of the land.

Figure 2: Annual Major Developers' Housing Supply versus Overall Market Supply for the Period 1973 to 1997



Public Housing Policies

We also investigate if the government increases public housing supply when the supply level of developers is low. A reasonable assumption is that the amount of public housing can be inversely related to private housing supply because the government can stabilize the market supply with the public

housing program. To do this, the percentage changes in public units completed are regressed on unlagged and one-period lagged percentage

Table 6. Correlation Matrices among Four Large Developers for the Period 1973 to 1997.

<i>A. Correlation of % D Land Banks Held by Developers</i>				
	Cheung Kong	New World	Sun Hung Kai	Henderson
Cheung Kong	1.0000			
New World	0.1124	1.0000		
Sun Hung Kai	0.0453	0.0412	1.0000	
Henderson	-0.2596	0.3069	-0.2557	1.0000

<i>B. Correlation of % D Housing Supply by Developers</i>				
	Cheung Kong	New World	Sun Hung Kai	Henderson
Cheung Kong	1.0000			
New World	-0.1528	1.0000		
Sun Hung Kai	0.3847	-0.2316	1.0000	
Henderson	-0.2442	0.5992	-0.0438	1.0000

Table 7. Regression Results of Housing Supply on Hang Seng Index or the Period 1973 to 1997.

<i>Independent Variables</i>	<i>Dependent Variable</i>	
	% Δ Developers' Housing Supply _t	% Δ Market Supply _t
Constant	10.392 (0.206)	-0.825 (-0.069)
% Δ Hang Seng Index _t	-0.024 (-0.025)	0.119 (0.528)
% Δ Hang Seng Index _{t-1}	1.824 (2.073)*	0.101 (0.484)
R ²	0.1837	0.0209

Note: * indicates significance at 90% confidence interval; t-statistics are in parentheses

changes in developers' supply as well as market supply. The results are reported in Table 8. None of the coefficients are significant, indicating that the public housing program has not served the purpose of stabilizing the total supply in the housing market.

Table 8. Regression Results of Public Housing Supply on the Private Market Supply for the Period 1977 to 1997

<i>Dependent Variable</i> : % Δ Public Units Completed _t		
<i>Independent Variable</i>	Case 1 <i>X</i> = % Δ Developers Supply	Case 2 <i>X</i> = % Δ Market Supply
Constant	17.007 (0.810)	25.351 (1.508)
X _t	0.124 (0.339)	0.090 (0.189)
X _{t-1}	0.060 (0.161)	-0.720 (-1.508)
R ²	0.0067	0.1890

Note: t-statistics are in parentheses

Conclusions

The public press in Hong Kong has speculated that high property appreciation rates (and volatile price movements) in Hong Kong could be due to the fact that land supply is limited (and is controlled by the government) and that only a few developers have dominated the housing supply in the past decades. High-level government officers in Hong Kong have also suggested that an increase in the land supply could solve the housing problem in Hong Kong. Our paper, which analyzes developers' land bank and

housing supply decisions in the past, indicates that it might not be the case. We find that developers' housing supply is independent of the amount of land provided by the government. We also find evidence that developers will examine economic conditions in making their housing supply decisions.

Our findings indicate that it is important to examine the profit maximization motive of developers when one tries to enact a housing policy to regulate the housing market. In this particular case, since developers can always adjust their land banks to absorb the increase in land supplied by the government, an increase in land supply might have a minimal effect on developers' construction decisions. (From the same argument, a decrease in land supply might not reduce developers' building activities.) Developers will increase (or decrease) the level of their land banks as long as it is perceived to be a profit maximizing decision. Hence, in order to increase the housing supply, it might be necessary to create an environment in which the best course of action for developers is to develop the land, rather than to hold it. To do this, one must first understand the benefits and costs of holding a land inventory. We propose that the option theory developed in the finance field can be used to address this issue.

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