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Availability, Affordability and Volatility: The Case of the Hong Kong Housing Market

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Housing prices in Hong Kong have gained international attention. This study suggests that the housing supply may be insufficient. Consistent with previous studies, we confirm that merely increasing the land supply may not increase the housing supply. We also find preliminary evidence for widening income inequality, which, when combined with unavailability, can lead to unaffordability in the housing market. Given the current housing supply elasticity with respect to price, Hong Kong is not more volatile than major cities in the United States. Thus, by improving housing availability and thereby increasing housing supply elasticity, this could effectively decrease housing price volatility.

Keywords

Land Policies, Housing Availability, Housing Affordability, Housing Volatility, Granger Causality

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1. Introduction

Despite its small size, which is less than 10% of New York City in area, Hong Kong has attracted international attention for its economic activities. Praise from Friedman (1997) of the “free market practice” in Hong Kong is one example.¹ However, housing prices in Hong Kong have recently reached new heights. In response, Chief Executive C. Y. Leung proposed several measures to “stabilize the housing market”. As the Wall Street Journal (2013) reported,

“Free market policies transformed Hong Kong from a city of refugees to a prosperous regional hub in the space of a generation. Now Chief Executive Leung Chun-ying thinks he knows better than the market...The most serious example concerns the property market, which was a focus of this week’s speech. Mr. Leung is bowing to populist pressure to label fast-rising house prices a market failure and do something about it...”

In Mr. Leung’s view, the market is failing to correctly match supply of apartments to the demand, which also incorrectly pricing apartments that are on the market. So he proposes an expansion in public-housing units (building 100,000 units for the five years starting 2018), the

¹ Friedman (1997) claims, “...Economists and social scientists complain that we are at a disadvantage compared with physical and biological scientists because we cannot conduct controlled experiments. However, the experiments that nature throws up can be every bit as instructive as deliberately contrived experiments. Take the fifty-year experiment in economic policy provided by Hong Kong between the end of World War II and this past July, when Hong Kong reverted to China.... In this experiment, Hong Kong represents the experimental treatment; Britain, Israel, and the United States serve as controls. Immediately after World War II, Hong Kong had a population of about 600,000. A colony of Britain, it did not receive its freedom after the war as most other colonies did.... After the Communists took control of mainland China, a flood of refugees came to Hong Kong. Over the next fifty years, the population exploded. Today it is more than six million.... I take Britain as one control because Britain, a benevolent dictator, imposed different policies on Hong Kong from the ones it pursued at home.... Nonetheless, there are some statistics, and in 1960, the earliest date for which I have been able to get them, the average per capita income in Hong Kong was 28 percent of that in Great Britain; by 1996, it had risen to 137 percent of that in Britain. In short, from 1960 to 1996, Hong Kong’s per capita income rose from about one-quarter of Britain’s to more than a third larger than Britain’s. It’s easy to state these figures. It is more difficult to realize their significance. Compare Britain—the birthplace of the Industrial Revolution, the nineteenth-century economic superpower on whose empire the sun never set—with Hong Kong, a spit of land, overcrowded, with no resources except for a great harbor. Yet within four decades the residents of this spit of overcrowded land had achieved a level of income one-third higher than that enjoyed by the residents of its former mother country....I believe that the only plausible explanation for the different rates of growth is socialism in Britain, free enterprise and free markets in Hong Kong. Has anybody got a better explanation? I’d be grateful for any suggestions.”

creation of massive development areas near the border with China, and reclamation projects that would create new islands on which to build apartment towers...”

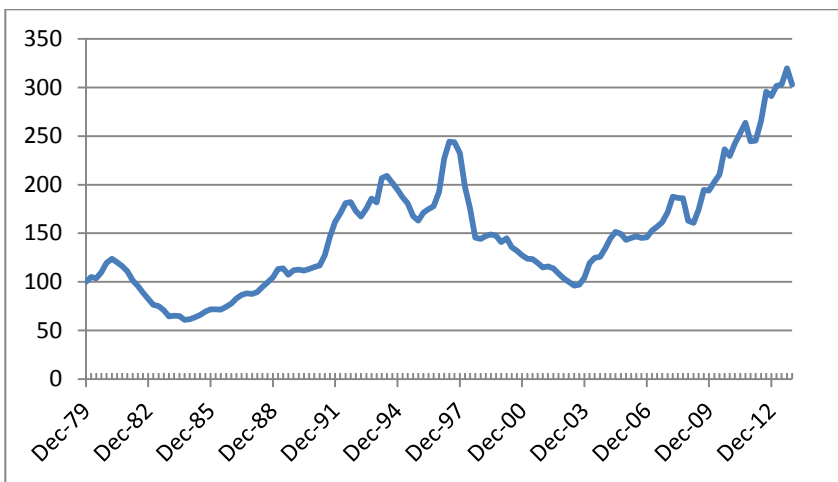
In fact, the Hong Kong government may have some empirical grounds for its worries. Here we present some intuitive graphs and delay more formal analysis to later sections. Figure 1a demonstrates that Hong Kong house prices reached a new height in 2013Q3, even after correcting for inflation. Figure 1b shows that the house price-to-wage ratio has rapidly increased since 2004. In comparison, the U.S. market is much more stable.² As the house price-to-wage ratio is often used as a measure of affordability, Figure 1b might suggest that housing affordability is an issue that needs to be considered in Hong Kong. Clearly, it is dangerous to draw any conclusion with one data plot. We will re-examine the affordability issue in more detail in a later section. It suffices to say that based on our econometric analysis, unaffordability is indeed an issue. Furthermore, it will be shown that unaffordability, along with other stylized facts in the Hong Kong housing market, is linked to the fact that there is a limited housing supply.

Housing policy discussions in the context of Hong Kong are interesting for several reasons. First, as housing supply is related to the land market, and land ownership in Hong Kong is public, any “housing supply deficiency” or “land shortage” is apparently the responsibility of the Hong Kong government. Thus, it is reasonable for the Hong Kong government to consider policy options to “correct” problems in the housing market. Second, Hong Kong’s boundary is fixed by the Basic Law of Hong Kong, and in that sense, the supply constraint is potentially a very binding constraint.³ More generally, Hong Kong, like many growing cities, is confronted with the following set of questions. Does the housing market function effectively? Will house prices become “too high”? Should the government intervene in the housing market? If so, what kind of interventions should the government use? Thus, the lessons drawn from Hong Kong might also be relevant to other cities, especially other Asian cities.

² However, the Hong Kong government is not alone. Roubini (2013) claims that “In emerging markets, bubbles are appearing in *Hong Kong, Singapore, China...*” Even Dr. Chang-Yong Rhee, the director of the Asia and Pacific Department of the IMF, asserted in a press conference held in Hong Kong that “Some adjustments are necessary” for the Hong Kong housing market (The Standard, 2014b). More discussion on this point is provided in later sections.

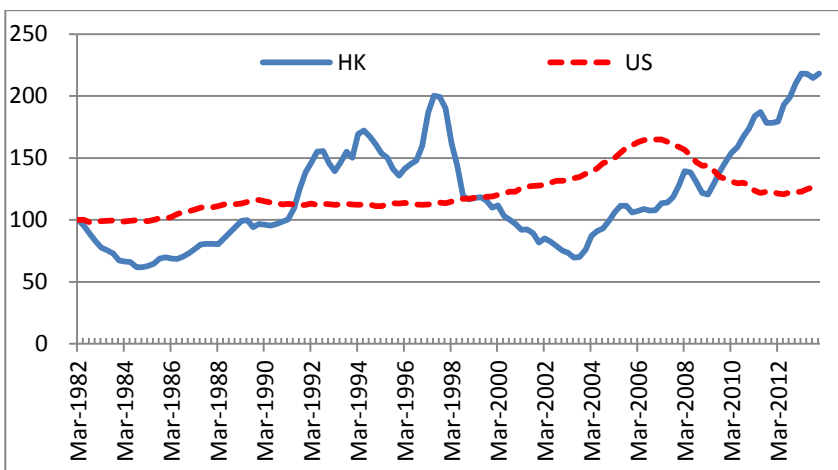
³ For the description of the boundary, please refer to the Basic Law (Instrument 11): http://www.basiclaw.gov.hk/en/basiclawtext/images/basiclaw_full_text_en.pdf For a discussion of supply constraint in the economics literature, see Saiz (2010), among others.

Figure 1a Real Housing Price Index (Dec 1979 = 100)



Sources: Rating and Valuation Department and Census and Statistics Department, Hong Kong SAR Government.

Figure 1b Time Plot of Housing Price Index Relative to Wage Index

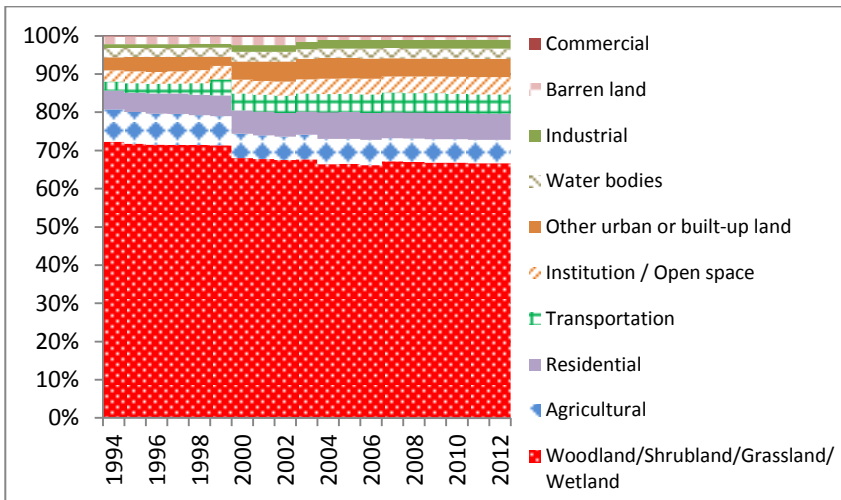


Sources: Rating and Valuation Department and Census and Statistics Department, Hong Kong SAR Government; International Monetary Fund; Federal Housing Finance Agency.

Clearly, we are not able to address all of these questions in one paper. Here, we clarify some of the “stylized facts” with regard to the Hong Kong housing market, and hopefully separate the “facts” from the “myths” that are present in

the media.⁴ For instance, as we mentioned earlier, due to the Basic Law, Hong Kong cannot expand her boundary like other cities. Some people therefore assert that the resulting limited supply of land drives the high house prices. Interestingly, Figure 1c shows that only 5% of the land in Hong Kong is currently used for residential purposes, whereas more than 60% is categorized as “woodland/wetland”.⁵ As land is a major input of housing construction, severe land use restrictions could be translated into high land prices, and hence high house prices. This paper addresses that point by examining the land supply issues in Hong Kong. As explained below, simply developing more land for residential and commercial purposes may not be sufficient to immediately “cool down” the property market.

Figure 1c Land Utilization in Hong Kong

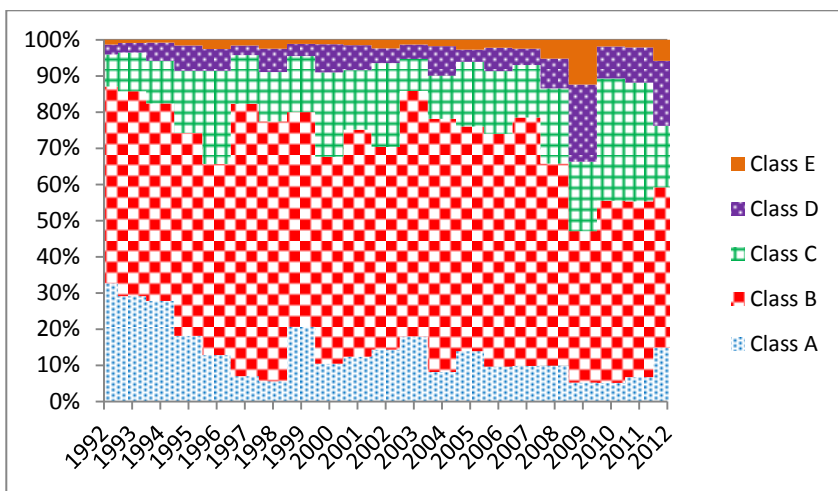


Source: Planning Department, Hong Kong SAR Government.

Another popular explanation for the high house prices in Hong Kong focuses on the composition of the new housing supply. Figure 1d shows that the supply of small units (Class A) as a share of new housing units has significantly dropped over the years. More generally, there is a tendency for developers to allocate more weight to larger and more luxurious housing units, whereas the “need for smaller units” may be under-served, and hence overall house prices increase. Below, we discuss why profit-maximizing developers may not supply “enough” small units to the market even if the demand is there.

⁴ It is common in economics to clarify “stylized facts”. Among others, see Ambler et al. (2004), and Jones and Romer (2010).

⁵ Among others, refer to Turner et al. (forthcoming) for a discussion of land use regulation and welfare.

Figure 1d Composition of New Housing Units

Key: Class A – Flats with a saleable area smaller than 400 square feet; Class B – Flats with a saleable area from 400 to 699 square feet; Class C – Flats with a saleable area from 700 to 999 square feet; Class D – Flats with a saleable area from 1000 to 1599 square feet; Class E – Flats with a saleable area larger than 1600 square feet.

Source: Rating and Valuation Department, Hong Kong SAR Government.

The last explanation is related to the unique position of Hong Kong as a regional financial center. As the Hong Kong dollar is pegged to the U.S. dollar, the very low nominal interest rate imposed by the U.S. translates into a low nominal interest rate in Hong Kong. In contrast, inflation in Hong Kong is often imported, such as the effect of the continuous appreciation of the renminbi, as many goods sold in Hong Kong are imported from China. This leads to a very low, even negative, real interest rate environment that encourages home purchasing. In addition, more funds from China are speculating in the Hong Kong real estate markets.⁶ As a whole, these factors create an expectation that house prices will go up (Clayton (1996)). We will return to this point in a later section.

Overall, the new housing supply is jointly determined by the government and developers. The government plays a key role in redevelopment projects, scheduling land sales, and the conversion of land usage. The developers can determine the date of completion and primary selling prices. In the following section, we discuss each party in turn, and address the following questions.⁷

⁶ See Leung and Tang (forthcoming) and Dieci and Westerhoff (2012) for details.

⁷ Note that our sequence is to discuss the availability issue first, followed by affordability and volatility. The idea is that housing units must be somehow “insufficiently” supplied (availability issue) first. Then the market price can become

- (1) Housing availability: Are housing units now under-supplied? Can and will the government increase the housing supply?
- (2) Housing affordability: Can and will the government and developers make private housing “more affordable” by lowering the house price-to-wage ratio?
- (3) Housing volatility: Can and will the government reduce the volatility of the housing market?

Among others, Malpezzi (2012) highlights several common issues in the housing market policy considerations. We hope that some of the lessons drawn from this paper, which focuses on Hong Kong, will be applicable to other Asian cities, especially fast-growing cities in China.

2. Housing Availability

Following the tradition of economics to discuss quantity allocation before price determination, this section is a discussion on the availability of housing in Hong Kong. The availability and volatility issues are related to house price and hence will be discussed in later sections. As shown in Figure 2, on average, each household has more than one housing unit (public or private). Thus, if housing units were evenly distributed, many issues would be resolved. Unfortunately, housing units are not evenly distributed. Some households have multiple units for investment or other purposes.⁸ Hence, the demand for both public and private housing is still unfulfilled. The following paragraphs briefly describe the institutions and the current situation of public rental, subsidized and private housing in Hong Kong.

First, we focus on the public rental market. In 2012, there were 727,800 households, 30.7% of the total households in Hong Kong, who were living in public rental housing (Figure 3). To be eligible for public rental housing, the income and assets of a household cannot exceed a certain limit.⁹ A 1999/2000 survey by the Hong Kong Housing Authority collected information on 108,300 applicants in that period. If the Authority commits to keep the

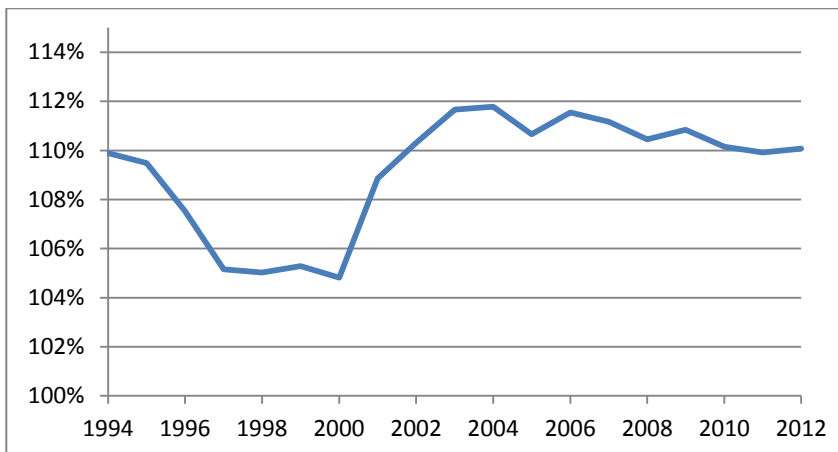
“too high” (affordability issue) when economic agents try to purchase units from the constrained market. Volatility, the third issue, is also related to price, and hence naturally placed after the discussion on affordability. This sequence is also consistent with the tradition in microeconomics that the allocation goods are first considered, and then the market price is interpreted as a “mechanism” to “implement” that (constrained) optimal allocation. Among others, see Mas-Colell et al. (1995) and McKenzie (2002), for more discussion.

⁸ Clearly, this points to the distribution of home ownership, or more generally, the income or wealth distribution issue. This is further discussed in later sections.

⁹ The income and asset limits are subject to renewal regularly. For the latest information, please visit <http://www.housingauthority.gov.hk/en/flat-application/income-and-asset-limits/index.html>

average waiting time for general applicants at around three years, it has to build at least 36,100 units a year.¹⁰ For various reasons, the Hong Kong government is unable to meet this target, and hence there is a prolonged average waiting time for applicants (Table 1).¹¹ More importantly, this figure does not take into account people who are rehoused because of redevelopment.¹² It may be fair to say that there is strong evidence that the Hong Kong government has not fully accommodated the public's need of housing.

Figure 2 Housing Units Relative to Number of Households



Source: Census and Statistics Department, Hong Kong SAR Government.

One might argue that very few governments can meet the housing needs of their citizens in any case. Although this statement may be true, it is still important to note the magnitude of the “supply shortage” in Hong Kong. For example, in 2012/2013, the Housing Authority received 40,000 new applications, and the accumulated applications reached 229,000. However, the annual new supply of public rental housing was only 13,114 units. It has been estimated that an applicant has to wait 17 years for a public housing unit. This is consistent with the conventional wisdom in economics that when a private good is provided at a subsidized rate, it will be over-subscribed and result in rationing.¹³ Even though the government’s policy address in 2013/14 stated

¹⁰ C. W. Tung, the first Chief Executive after Hong Kong was handed over to China, made such a promise. Among others, see Lau (2002) for more details.

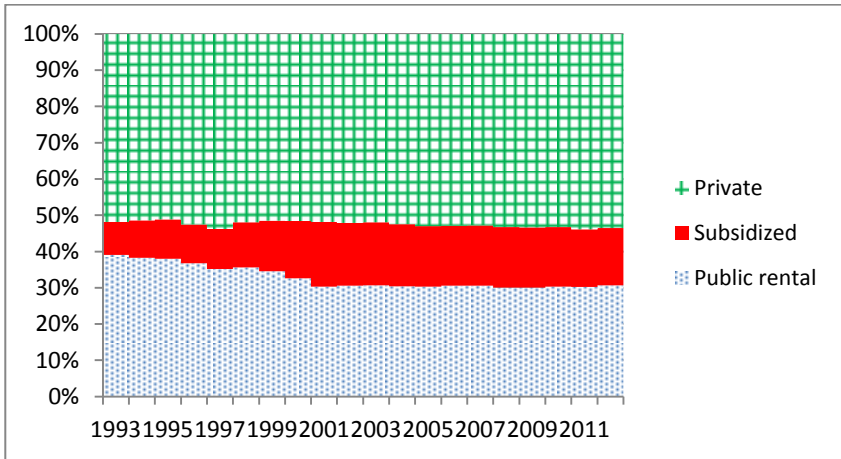
¹¹ According to Goodstadt (2013), such delays are interpreted as beneficial by some government officials because a shortened waiting time could encourage even more people to join the queue, making the “excess demand” of public housing units even more unmanageable. Among others, see Wong (1998) for a related discussion.

¹² In 1999/2000 there were 14,601 houses allocated to this category.

¹³ Among others, see Banerjee (1997), Friedman (2002), and Wong (1998) for more

that the new public housing supply will further increase to about 20,000 units a year, the annual number of new applications is twice that of the new supply, and hence the average waiting time may not be shortened for at least the next few years.

Figure 3 Domestic Households by Type of Housing



Source: Census and Statistics Department, Hong Kong SAR Government.

Table 1 Number of Applications for Public Rental Housing

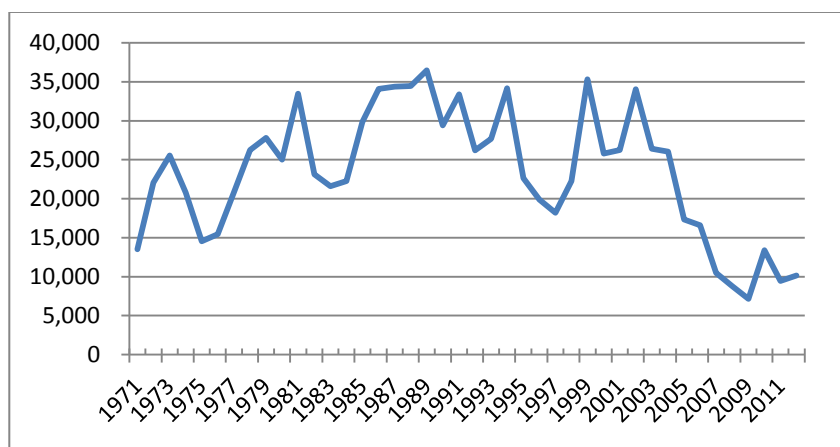
	Total Public Rental Housing Applications	New Public Rental Housing Supply
1999/2000	108,300	27,665
2000/2001	108,400	46,756
2001/2002	86,400	29,817
2002/2003	91,900	20,390
2003/2004	91,000	15,148
2004/2005	91,400	24,682
2005/2006	97,400	17,153
2006/2007	107,300	7,192
2007/2008	111,600	13,726
2008/2009	114,400	19,050
2009/2010	129,100	15,389
2010/2011	152,400	13,672
2011/2012	189,000	11,186
2012/2013	229,000	13,114

discussion on this point. See also Leung et al. (2012) for a discussion of how the introduction of public housing could affect the rent gradient, the population composition across communities, labor supply, and social welfare.

In addition to public rental housing, the Hong Kong government has tried to promote home-ownership. For instance, there is the attempt to provide subsidized home ownership to families who cannot afford a private unit through the Home Ownership Scheme (HOS). Usually, the subsidized units are sold at about 70% of the market value. If a homeowner sells the subsidized unit in the secondary market, they have to pay the “premium”¹⁴ back to the government. The availability of subsidized housing is controlled by the government. In November 2002, the government attempted to stabilize the housing market by ending the HOS. In 2011, it launched an enhanced program to subsidize home ownership called the “My Home Purchase Plan”.¹⁵ Under the current housing target, the government plans to build 8000 HOS units per year.

In an economy based on a *laissez faire* philosophy, the private housing market plays an important role in the whole sector. As Figure 3 shows, the proportion of households who are living in private housing has remained steady at around 50% since 1993. Since 2005, the number of new private housing units has been below 20,000 units a year (Figure 4). The government believes that the “housing shortage” is mainly due to wrangles over land use, and plans to increase the supply of land, in both the short and the long term, to satisfy housing and other needs.

Figure 4 Completions of Private Housing Units



Source: Rating and Valuation Department, Hong Kong SAR Government.

¹⁴ The calculation of the premium is as follows:

Premium =

$$(\text{market value at selling time}) * \frac{(\text{market value at purchasing time} - \text{actual purchase price})}{(\text{market value at purchasing time})}$$

¹⁵ In the 2012/2013 policy address, the government did not pledge to undertake any projects for the My Home Purchase Scheme. The land originally earmarked for the scheme was set aside for new HOS development instead.

Table 2a Granger Causality between Land Sale Area (LSA) and Completions of New Private Housing (CNPH) (F-statistics)
(Sampling period: 1980Q4 – 2013Q1)

	LSA does not granger cause CNPH	CNPH does not granger cause LSA
Lag = 1	0.016	1.773
Lag = 2	0.843	1.949
Lag = 3	0.796	1.434
Lag = 4	0.975	0.939
Lag = 8	0.877	0.962
Lag = 12	0.809	0.964

Note: The cyclical components are used. ***, ** and * denote 1%, 5% and 10% significance respectively.

Table 2b Lead Lag-table between Land Sale Area (LSA) and Completions of New Private Housing (CNPH)
(Sampling period: 1980Q4 – 2013Q1)

	CNPH(-20)	CNPH(-16)	CNPH(-12)	CNPH(-8)	CNPH(-4)	CNPH(-3)
LSA	-0.130	-0.055	-0.025	0.145	0.101	-0.097

	CNPH(-2)	CNPH(-1)	CNPH	CNPH(+1)	CNPH(+2)	CNPH(+3)
LSA	0.059	0.102	0.168	-0.026	-0.109	0.027

	CNPH(+4)	CNPH(+8)	CNPH(+12)	CNPH(+16)	CNPH(+20)
LSA	-0.007	0.131	0.202	0.160	0.140

Note: The cyclical components are used.

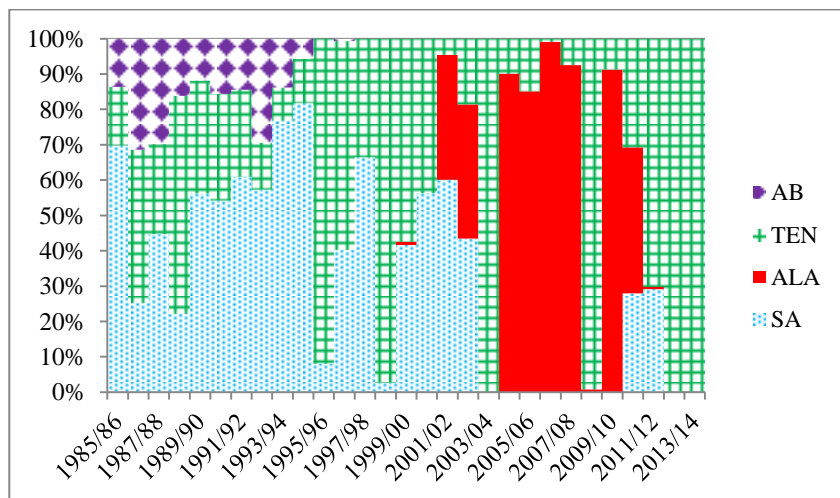
For the government policy to be effective, an increase in the land supply must lead to an increase in the new housing supply. Statistically, this statement can be tested by running a Granger causality test for the effects of an increase in the area of land sold on the new supply of private housing units. Clearly, the causality could run the other way: because the government and the market anticipate a high demand for housing, the amount of land area sold by the government to the private developers would increase. In that case, the causality would be from the new supply of housing to the area of land sold. Again, this is a statement that we can statistically test. The results reported in Table 2a¹⁶ show that the total area of land sales, which is designated for residential purposes only, *does not Granger-cause* the number of new completions of private housing units, and the new completions of private housing *do not Granger-cause* the land sale area.¹⁷ In other words, simply by

¹⁶ In fact, Lai and Wang (1999) have done some related analysis. The results presented here can be interpreted as an update and extension of their research.

¹⁷ Among others, see the Local Research Community (2013) for a related analysis.

increasing the land supply, either through auctions or tendering (Figure 5), does not guarantee that there will be more private housing available in the market. This observation is further confirmed by the results reported in Table 2b that no strong lead-lag relationship exists between the two variables over ± 20 quarters.¹⁸ The main “missing piece” is the profit-maximization strategies of the real estate developers¹⁹ (Lai and Wang (1999)). In Hong Kong, the new supply of housing is dominated by a few developers. They are large corporations listed on the Hong Kong Stock Exchange. As their policies are to maximize shareholder wealth,²⁰ their strategies may not maximize the supply of private housing. Although in the 2010/11 budget speech, the Financial Secretary announced that the government was prepared to specify conditions for land sales, including the minimum number of flats to be constructed and their size restrictions, the developers still choose the time in which to complete and sell the units.

Figure 5 Land Sale by Area



Key: SA – Scheduled Auction; ALA – Application List Auction; TEN – Tender; AB – Letter A/B21

Source: Lands Department, Hong Kong SAR Government.

¹⁸ The authors are grateful for the suggestion by an anonymous referee to use Johansen’s cointegration test to study the long-term relationship between the LSA and CNPH. However, the LSA is an $I(0)$ series and the CNPH is an $I(1)$ series. Therefore, this test may not be applicable to this case.

¹⁹ For a list of developers in Hong Kong, please refer to Appendix 2.

²⁰ For the behavior and price strategy of developers, refer to Henderson and Thisse (1999), Gillen and Fisher (2002) and Ching and Fu (2003).

²¹ See Appendix 1 for details.

The agricultural land policy in Hong Kong illustrates how developers may influence the new housing supply. To fully understand the agricultural land policy in Hong Kong, some discussion of the Hong Kong land ownership system may be very helpful. We present a few key points below, and interested readers can refer to the Appendix for further details.

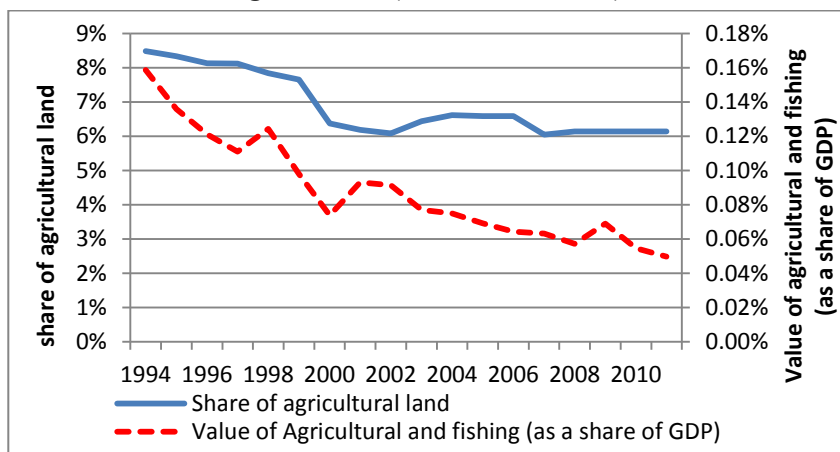
- After a battle in 1898, the British government, which had already occupied and developed Hong Kong Island for decades, took a 99-year lease on the New Territories. At that time, the New Territories area was in sharp contrast with the Hong Kong Island.
- When the British took over the New Territories, they attempted to understand the land ownership structure and raise taxes. They found the land-ownership system to be significantly different from that of their expectations. For instance, as Hase (2008, p. 31) observes, “*Besides the fact that there were no accurate survey records and that the district land registers were out of date, it was of even greater concern that much of the tax revenue was in the hands of intermediaries, who collected their rents from those farming the land and forwarded what was due to the authorities*”.
- Before the British takeover, the New Territories unfortunately experienced hardship due to population growth and “inter-village wars” that led to many casualties, which might have made the native residents more distrustful.
- The British takeover was not warmly welcomed, and misunderstandings and fears were abound. Taxes and the Sanitary Board were two important concerns. Some local landlords who had clear vested interests might have encouraged the spread of the misunderstandings.
- This situation eventually led to the disastrous Six-Day War. Several thousand poorly equipped Chinese villagers surrounded and attacked the well-equipped British Army. Apparently, several hundred Chinese villagers were killed in that war.
- To maintain the security of Hong Kong with limited forces, Sir Henry Blake, British Governor of Hong Kong at that time, adopted a “forgive and forget” policy. Blake even established district councils and invited the leaders of the villages to join the councils. Blake’s policy had a long-term effect on Hong Kong.

As a result, although land ownership is technically public in Hong Kong, the government faces several constraints when developing “agricultural land”, which is “effectively owned” by the native people. To develop those lands, the government can directly trade with the locals, obtain the agricultural land, and then ask the Town Planning Board, whose members are appointed by the Hong Kong government, to “convert” agricultural land into commercial and residential land. Alternatively, developers who purchase agricultural land from locals could submit a similar land-use conversion request. Usually, to obtain permission to convert land use, developers need to pay a “land premium”

(LP). The exact amount of the LP is decided on a case-by-case basis, and typically determined in confidential negotiations between the government and the involved developers.

In light of this process, it is relatively easy to understand why the share of agricultural land has remained above 6% (Figure 6a), with most of the land abandoned (Figure 6b) even though the contribution of agricultural activities to Hong Kong’s GDP has been less than 0.1% since 2000. The conversion of agricultural land to residential land could potentially increase the housing supply, but a substantial amount of the agricultural land is held by developers. From 2002 to 2011, the agricultural land bank of the four major developers increased from 79.6 to 101.2 million square feet (Figure 6c). In this period, about 25% of the abandoned agricultural land was in the hands of developers. Clearly, developers are not interested in agricultural production. They simply wait for the “right market” and then apply for government permission to convert their agricultural land to residential or commercial land. Thus, although the government needs the developers to purchase land and develop new commercial and residential areas, the developers need the government to approve their land use conversion requests, at a “reasonable” LP so that the whole development project remains profitable. The relationship between the government and the major developers may thus be similar to a “bilateral monopoly” economic model.²² Some time-consuming bargaining is inevitable. Unfortunately, economic science may not be able to provide much useful guidance for that.

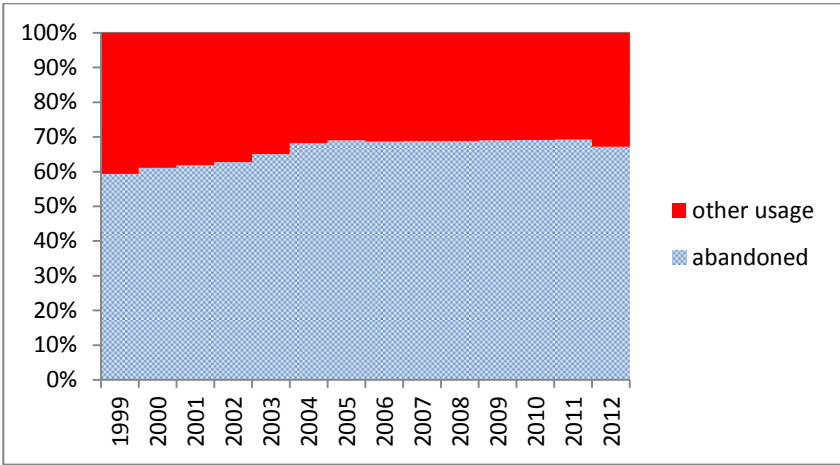
Figure 6a Share of Agricultural Land and Value of Agricultural and Fishing Industries (As a Share of GDP)



Sources: Census and Statistics Department and Planning Department, Hong Kong SAR Government.

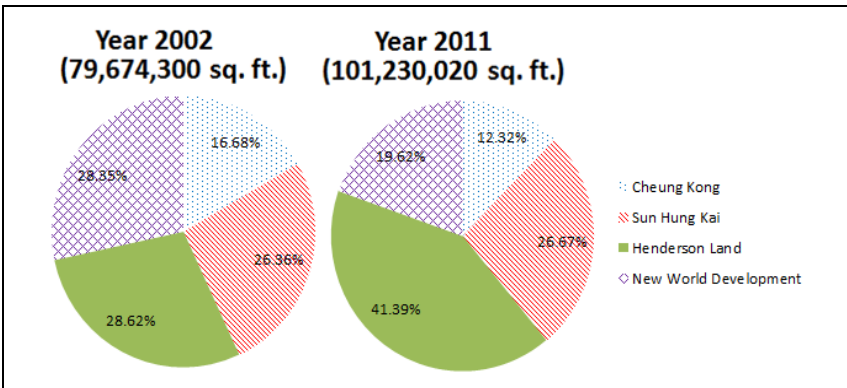
²² The study of bilateral monopolies has a long history in the economics literature. Among others, see Morgan (1949).

Figure 6b Agricultural Land Utilization



Source: Agriculture, Fisheries and Conservation Department, Hong Kong SAR Government.

Figure 6c Agricultural Land Holding



Source: Hong Kong Exchanges and Clearing Limited

Even if both the government and developers agree to increase the new housing supply, there may be additional constraints. As Hong Kong is open to international trade, those constraints come from “non-tradable sectors” of the economy.²³ The first constraint is the supply of land. Severe land use regulations are imposed in Hong Kong.²⁴ In particular, as we have discussed, a

²³ Clearly, this is an application of the Balassa-Samuelson effect. Among others, see Bardhan et al. (2004) and the reference therein for a discussion.

²⁴ It is well known that land use regulations can lead to severe distortions in the housing market. Among others, Bertaud and Malpezzi (2001) study the case of Malaysia. Leung and Teo (2011) present a multi-region, dynamic stochastic general

substantial amount of land in Hong Kong is classified as “agricultural land” and most of it is held by “native people”, who are given special privileges, including the “New Territories Small House Policy” (SHP). The original idea was to ensure that the descendants of the native people would be given land and the right to build small houses for themselves if the Hong Kong government takes the land for development. However, it has been repeatedly reported that these rights have been abused in different ways, thus leading to many controversies.²⁵ According to the results of a survey conducted by Lao (2013), issues that surround the SHP are still unresolved. At the same time, both the Hong Kong government and developers need to have a certain level of agreement with the native people if they intend to develop more “agricultural land” for residential and commercial purposes. Thus, reaching an agreement with the native people may be an additional issue in the further development of Hong Kong.

The second constraint comes from the labor supply. Clearly, an increase in the housing supply implies an increase in the demand for trained and licensed construction workers. According to the latest consultation document of the Public Engagement Exercise on Population Policy,²⁶ the number of job vacancies in construction sites rose by 74.3% in June 2013. The document recommends the importing of workers to complement the existing workforce, but has received a range of feedback. Although the Labor Advisory Board took action in April 2014 to speed up the importation of workers through the Supplementary Labor Scheme that covers 26 categories of jobs in the construction sector, this may not significantly increase the new housing supply within the next several years. Hence, the increase in new housing supply may be moderate.

3. Housing Affordability

It is not surprising that when the public housing supply cannot meet the demand, the demand will be channeled to the private market. Hence, the “affordability” of private housing becomes a crucial issue (Mukhija (2004); Tiley and Hil (2010); Wang and Murie (2011); Gurran and Whitehead (2011)). We follow Malpezzi (1999)²⁷ to provide a benchmark for house prices. Malpezzi’s model relates the changes in house price-to-income ratio to the

equilibrium (DSGE) model to study the general equilibrium impacts of related distortions.

²⁵ For the official statement of the SHP, see the website provided by the Hong Kong Government, <http://www.landsd.gov.hk/en/legco/house.htm>. Among others, Hopkinson and Lao (2003) provide a comprehensive review of the issues relating to the SHP.

²⁶ For details, please refer to http://www.hkpopulation.gov.hk/public_engagement/en/doc.html

²⁷ Leung (2014) shows that Malpezzi’s model can be approximated as the reduced form dynamics derived from a DSGE model. For the details of the formula, see Appendix 3.

house price dynamics with several merits. It is simple and easy to implement as it requires only income and house price data. It recognizes that as the house price-to-income ratio deviates from the long-term value, house prices will adjust and the system will eventually return to the long-term value. More specifically, we use the Hong Kong data for the 1980Q2-2009Q1 period as our starting sample. Moving the terminal date one quarter at a time, we then repeatedly re-estimate both the recursive regression and the rolling regression models,²⁸ so that the parameters and model-implied real housing prices are estimated.²⁹ Then, by comparing the actual value with the implied value in each quarter, we can produce the time plot of the following quantity (in percentage terms):

$$\frac{\text{Actual real housing price}}{\text{Malpezzi's implied real housing price}} - 1$$

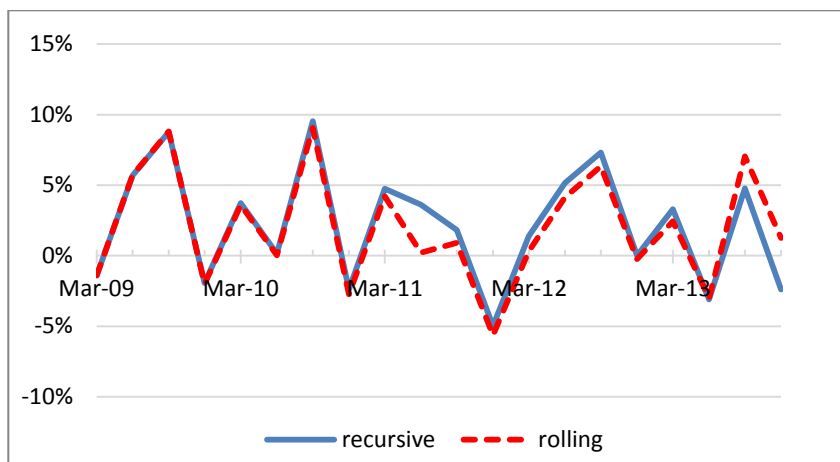
Clearly, a negative (positive) value of this quantity means that the actual house price is lower (higher) than its model-implied counterpart. Figure 7 clearly illustrates several points. First, our result is robust in the sense that the recursive and rolling regressions achieve the same patterns in the implied quantities. Second, since March 2009, there have been many more quarters with positive values than quarters with negative values, which mean that house prices tend to be higher than those implied by the market fundamentals, even when we allow the coefficients to be time-varying. In fact, the deviations seem to be significant. There are several quarters in which the percentage deviations are more than 6%: 2009Q3, 2010Q3, and 2012Q3. This is consistent with the results of Shiller (2007) that the market fundamentals may not fully explain for the movements in housing prices. In fact, Leung and Tang (forthcoming) provide evidence that market sentiment or “animal spirit” is a driving force in the Hong Kong housing market. Again, we are not trying to provide an explanation for this phenomenon. We only intend to establish the “over-pricing of Hong Kong housing” as a stylized fact.

Figure 7 Percentage Deviation of Actual Real House Price Relative to

²⁸ According to Clark and McCracken (2009), the combining of recursive regression (with a sampling period that increases over time) with a rolling regression (with a constant sampling period), can significantly improve forecasting accuracy when the data generation process is (potentially) subject to a structural break. As the Hong Kong housing market may be subject to a “structural break” during the sampling period, we consider it appropriate to use both a recursive and a rolling regression.

²⁹ Note that model parameters are updated in each quarter. Thus, relative to the original model of Malpezzi (1999), our econometric model is more “flexible” in at least two dimensions. First, our model allows the house price-to-income ratio to be time-varying. Second, it allows the house price change to be increasingly (or decreasingly) sensitive to the change of house price-to-income ratio. Yet, in spite of these relaxations, the prediction of house price by our model is still persistently above the actual house price. The only conclusion that one can draw is that the house price itself persistently grows faster than the house price-to-income ratio.

Model-implied Real House Price



Source: Authors' calculations

When we perform the Johansen cointegration test for the U.S. real housing price index and real weekly earnings (both are $I(1)$ variables from Table 3a), the results show a cointegrating relationship (Table 3b). This means that the long-term ratio between the U.S. housing prices and weekly earnings is constant. In the case of Hong Kong, although the variables are also $I(1)$ (Table 3c), the Johansen cointegration test reports that both the trace and the Max-eigen statistics do not exceed the 5% critical values (Table 3d). In other words, the test statistics suggest that there is no constant long-term ratio between the real housing price and real earnings in Hong Kong. This is somewhat at odds with existing economic models, which typically predict the existence of a steady state or some constant long-term value. Thus, there may be significant mispricing in the Hong Kong housing market. To further investigate this mispricing issue, we adopt a few measures to examine whether “housing affordability” in Hong Kong has deteriorated or improved.³⁰

Table 3a Unit Root Test of Real Housing Price Index and Real

³⁰ Clearly, there are other measures of affordability, for example, purchase affordability and repayment affordability, such as in Gan and Hill (2009). Unfortunately, to repeat the analysis of Gan and Hill (2009) in the context of Hong Kong would demand detailed information of the income distribution, which is not accessible to the authors at the moment. In addition, this paper focuses on the dynamic issue and mainly relies on time series techniques, which may have a very different focus than that in Gan and Hill (2009), which is a cross-sectional analysis by nature. Clearly, there are alternative notions of “equilibrium affordability” (or the lack of it). Among others, see Green and Malpezzi (2003), Malpezzi (2012), Ortalo-Magné and Rady (2008), and Ortalo-Magné and Prat (2014).

Weekly Earnings for United States
(Sampling period: 1979Q1 – 2013Q4)

	Level (trend and intercept)	1st difference (trend)
Real housing price index (seasonally adjusted)	-3.344	-2.892 **
Real weekly earnings (seasonally adjusted)	-3.314	-13.56 ***

Note: The optimum lag is determined by AIC criteria at a maximum lag of 4 quarters.
*** significant at 1% level; ** significant at 5% level

Table 3b Johansen Cointegration Test between Real Housing Price Index and Real Weekly Earnings for United States
(Sampling period: 1970Q1 – 2013Q4)

Panel A: Unrestricted Cointegration Rank Test (Trace)

Hypothesized number of cointegrating equations	Trace statistic	5% critical value
None	20.85	15.49
At most 1	1.72	3.84

Panel B: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized number of cointegrating equations	Max-eigen statistic	5% critical value
None	19.13	14.26
At most 1	1.72	3.84

Table 3c Unit root Test of Real Housing Price Index and Real Wage Index for Hong Kong
(Sampling period: 1982Q1 – 2013Q4)

	Level (trend and intercept)	1st difference (trend)
Real housing price index (not seasonally adjusted)	-1.884	-5.941 ***
Real wage index (not seasonally adjusted)	-1.764	-3.658***

Note: The optimum lag is determined by AIC criteria at a maximum lag of 4 quarters.
*** significant at 1% level; ** significant at 5% level

Table 3d Johansen Cointegration Test between Real Housing Price Index and Real Wage Index for Hong Kong

(Sampling period: 1979Q4 – 2013Q4)

Panel A: Unrestricted Cointegration Rank Test (Trace)

Hypothesized number of cointegrating equation	Trace statistic	5% critical value
None	3.403	15.49

Panel B: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized number of cointegrating equation	Max-eigen statistic	5% critical value
None	3.347	14.26

According to the cross-country data provided by the Central Intelligence Agency (CIA), Hong Kong has the second highest population density in the world (Figure 8), and the related problem of the low affordability of housing has been recently highlighted.³¹ As Figure 9a shows, in 2012, an average person in Hong Kong could only purchase 22 square feet of housing with his or her annual income, which is in sharp contrast with the situation in Japan (103 square feet). If we further classify workers according to the nature of their job, it is clear that the problem of unaffordable housing is not restricted to people with low income. Figure 9b demonstrates that the annual income of people who are working at the supervisory level is worth at most 30 square feet of a typical-sized (Classes A, B, and C) flat, or less than 20 square feet of a luxurious (Classes D and E) flat. Not surprisingly, housing affordability is even lower for individuals with lower income levels (Figure 9c).

Some commentators have attributed the “unaffordability” of housing to the so-called “high land price policy” (HLPP).³² According to this explanation, the government deliberately sells land at a high price. In fact, the proceeds from land sales³³ are one of the major sources of government revenue. In the fiscal year 2012/2013, the LP³⁴ shares were 15.7% of the total government

³¹ According to Bertaud (2014), compared to cities in Australia, Canada, Ireland, Japan, New Zealand, the United Kingdom, and the U.S.A., Hong Kong housing was the least affordable in the year of 2013.

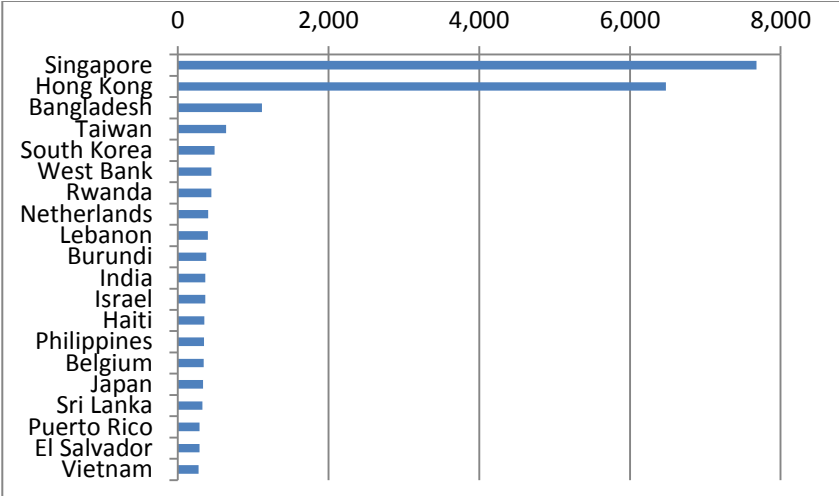
³² Although the Hong Kong government has never admitted to the existence of such a policy, there are clues that it has at least attempted to maintain land prices above a certain level. For instance, Policy Address 2008/2009 (Paragraph 34) explicitly states that land will never be sold below market value.

³³ For the share of land revenue under different disposal types, please refer to Appendix 4.

³⁴ The premiums from land transactions are credited to the Capital Works Reserve Fund. The Fund can only be used in land acquisition, public works programs, capital subventions, and major systems, equipment, and computerization. For details, please refer to the link: www.budget.gov.hk/2012/eng/pdf/cwrf-mem.pdf

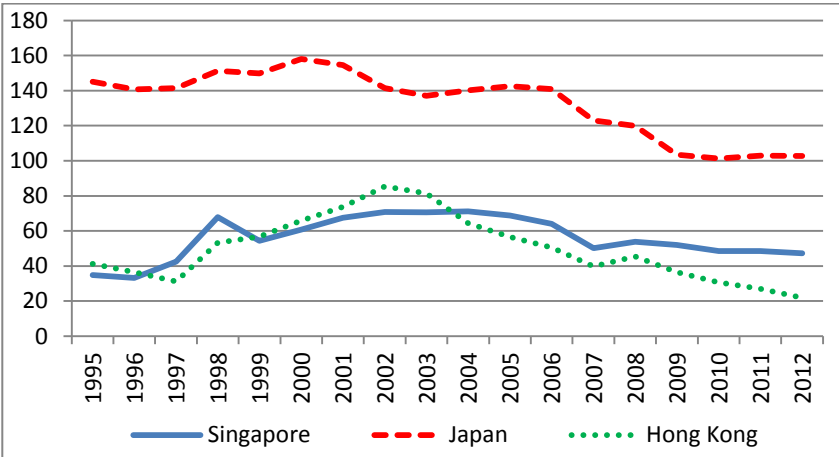
revenue, followed by profit taxes (Figure 10a). As a result, high land prices could be translated into the high selling price of private units.

Figure 8 Population Densities across Countries (People per Square Kilometers of Land)



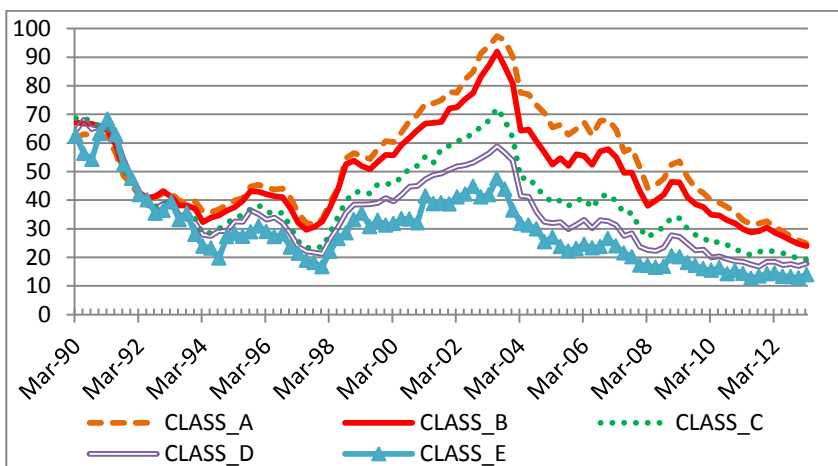
Source: CIA World Factbook (2012)

Figure 9a Purchasing Power of Annual Income (In Terms of Square Feet of Flat)



Source: CEIC

Figure 9b Purchasing Power of Annual Income (Supervisory Level Workers) (in terms of square feet of flat)



Key: Class A – Flats with a saleable area smaller than 400 square feet; Class B – Flats with a saleable area from 400 to 699 square feet; Class C – Flats with a saleable area from 700 to 999 square feet; Class D – Flats with a saleable area from 1000 to 1599 square feet; Class E – Flats with a saleable area larger than 1600 square feet

Sources: Census and Statistics Department; Rating and Valuation Department, Hong Kong SAR Government.

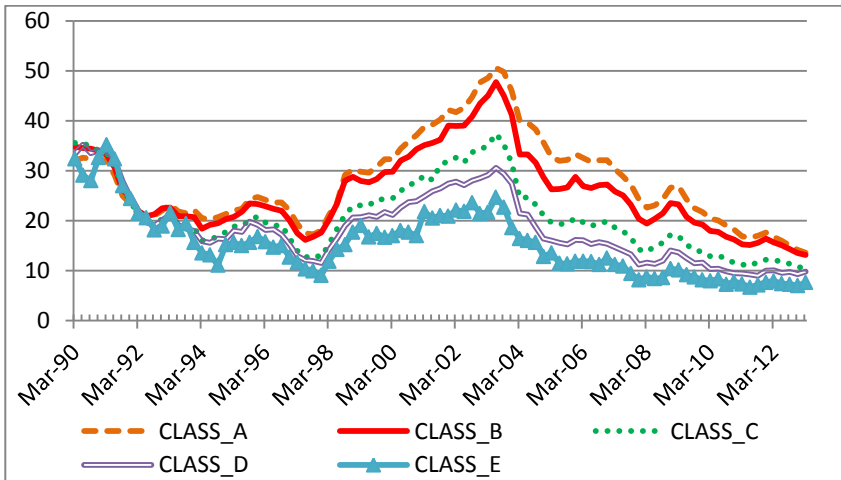
Although this explanation may sound intuitive, and is popular among certain groups, it may not be the complete economic explanation. There are several issues to be addressed. First, as shown in Table 4, land sales do *not* Granger-cause real housing prices.³⁵ Thus, even if the Hong Kong government does practice an HLPP, it is not clear whether high land prices are translated into high house prices. Second, as the Hong Kong government has limited land reserves, selling the land at a slow rate (and hence a high price) may not be a bad policy. The situation is analogous to an oil oligopoly that has limited oil reserves and thus attempts to maximize the present value of the profit. The optimal strategy could indeed be selling a small amount of oil in each period of time, letting the demand drive up the price, and thus maximizing profit (Loury, 1986).³⁶ Moreover, Figure 10b shows that one of the major public expenditures is housing, in the form of below-market-rate public rental housing and subsidized ownership. If real estate constitutes a large fraction of most people's life-time wealth, then more people will demand public housing and subsidized ownership, which in turn increases the government's burden. As the Hong Kong government is constrained by the Basic Law to maintain a

³⁵ See Tse (1988) for a similar finding.

³⁶ This is consistent with Shih's theory of Hong Kong's housing policy. According to Shih (2014), the British government did not devote many resources to the development of Hong Kong. It thus needed to establish the colony as a low income tax and virtually free-trade port. Hence, to finance any public expenditure, the government now needs to sell land at a high price.

balanced budget, the incentive for a rational government to maintain an “excessively high land price” could be over-estimated.³⁷

Figure 9c Purchasing Power of Annual Income (Low Level Workers)
(in terms of square feet of flat)



Key: Class A – Flats with a saleable area smaller than 400 square feet; Class B – Flats with a saleable area from 400 to 699 square feet; Class C – Flats with a saleable area from 700 to 999 square feet; Class D – Flats with a saleable area from 1000 to 1599 square feet; Class E – Flats with a saleable area larger than 1600 square feet

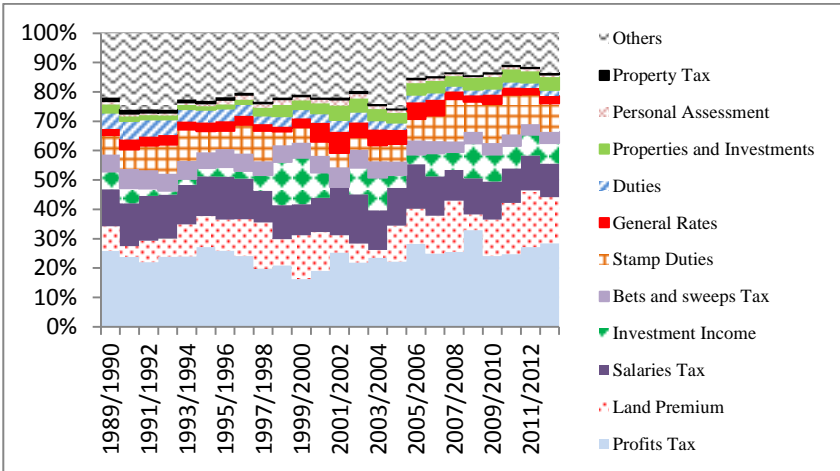
Sources: Census and Statistics Department; Rating and Valuation Department, Hong Kong SAR Government.

We consider two alternative explanations for the “unaffordability” of housing in Hong Kong. First, we conjecture that the developers may be responsible for the high house price in Hong Kong. We follow Glaeser and Gyourko (2008) in using the price-to-cost ratio as a measure of the profit margin of developers. We find that the annual growth rate of price-to-cost ratio over time is always positive (Figure 11a, except for the periods after the Asian and the global financial crises (GFC)³⁸). This suggests that for every dollar of building cost, developers are charging increasing housing prices.

Figure 10a Components of Government Revenue

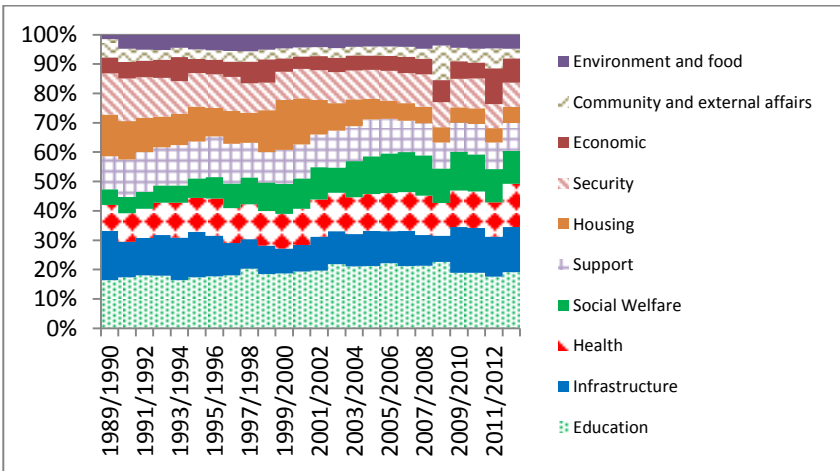
³⁷ Clearly, whether the Hong Kong government is “rational” in the sense of economics is beyond the scope of this study. We thank some anonymous friends for this qualification.

³⁸ Following Leung and Tang (2012), we designate the periods of the Asian and global financial crises as December 1997 and September 2008, respectively.



Source: Census and Statistics Department, Hong Kong SAR Government.

Figure 10b Public Expenditure by Policy Area Group

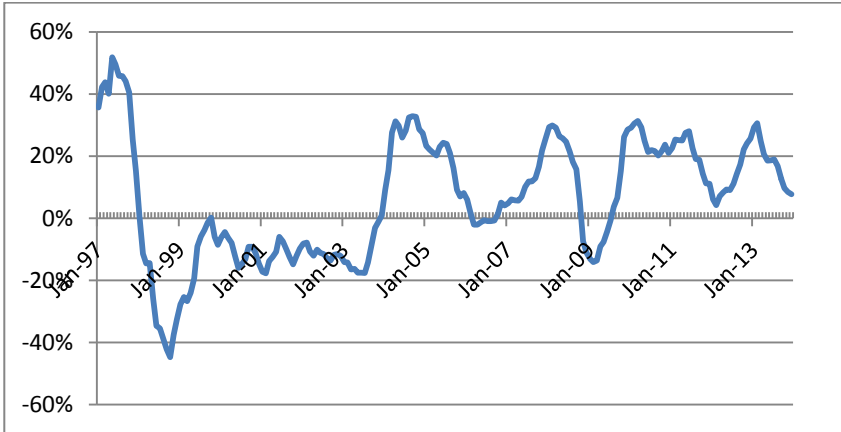


Source: Census and Statistics Department, Hong Kong SAR Government.

To shed further light on this issue, we attempt to study the relationship between the stock prices of developers and housing prices. As the real stock prices of the four major developers are positively correlated (Table 5), we use a principal component analysis to extract the “common factor” in the stock prices of different developers. Clearly, PC1 explains most of the variation (Table 6), and is positively and significantly related to stock prices (Table 7). The Granger causality results in Table 8 show that PC1 is Granger-caused by real housing prices. There is also a feedback effect such that PC1 Granger-causes real housing prices. As a robustness check, the analysis is repeated for the other six developers, and the same conclusion is reached. In summary, the

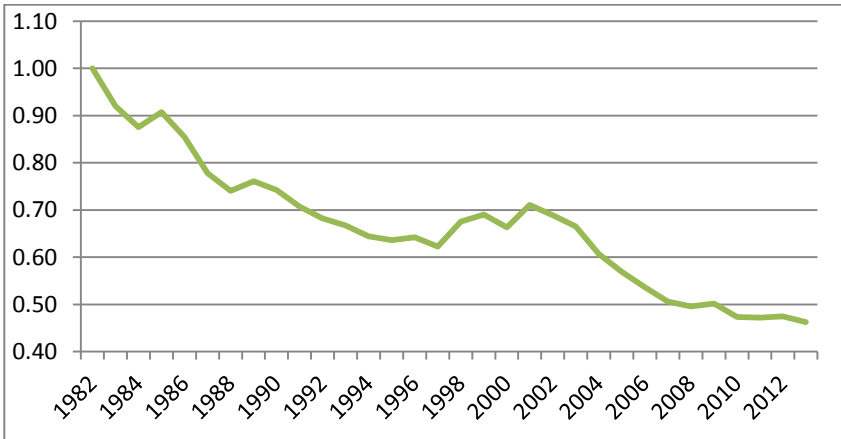
performances of the stocks of the major developers are closely tied to real housing prices. High house prices benefit stock prices. In light of this, it is unlikely that profit-maximizing developers would have much incentive to build affordable housing units.

Figure 11a Annual Growth Rate of Price-to-Cost Ratio



Sources: Civil Engineering and Development Department; Census and Statistics Department, Hong Kong SAR Government.

Figure 11b Ratio of Official Wage Index Relative to Per Capita GDP (Rebased as unity set in year of 1982)



Sources: Census and Statistics Department; Rating and Valuation Department, Hong Kong SAR Government.

Table 4 Granger Causality between Land Sale Area (LSA) and Real

Housing Price (RHP) (F-statistics)
(Sampling period: 1980Q4 – 2013Q1)

	LSA does not Granger cause RHP	RHP does not Granger cause LSA
Lag = 1	0.319	3.079 *
Lag = 2	0.299	2.355 *
Lag = 3	0.290	1.686
Lag = 4	0.521	1.565
Lag = 8	0.463	1.180
Lag = 12	0.360	1.239

Note: The cyclical components are used. ***, ** and * denote 1%, 5% and 10% significance respectively.

Table 5 Correlations among Stock of Developers
(1983Q1 – 2013Q1)

Panel A: 4 Main Developers

	CH	HEN	NWD	SHK
CH	1			
HEN	0.761***	1		
NWD	0.622***	0.841***	1	
SHK	0.870***	0.916***	0.768***	1

Key: CKH = Cheung Kong (Holdings) Limited; HEN = Henderson Land Development Company Limited; SHK = Sun Hung Kai Properties Limited; NWD = New World Development

Panel B: Other 6 Developers

	HL	HOPE	HUT	HYS	SINO	WH
HL	1					
HOPE	0.533***	1				
HUT	0.434***	0.387***	1			
HYS	0.542***	0.624***	0.584***	1		
SINO	0.782***	0.632***	0.557***	0.625***	1	
WH	0.707***	0.629***	0.563***	0.845***	0.670***	1

Key: HL = Hang Lung Properties Limited; HOPE = Hopewell Holdings Limited; HUT = Hutchison Whampoa Property; HYS = Hysan Development Company Limited; SINO = Sino Land; WH = Wharf Holdings Limited

Note: The cyclical components are used. ***, ** and * denote 1%, 5% and 10% significance respectively.

Table 6 Explanatory Power of Principal Components**Panel A: 4 Main Developers**

	Proportion explained
PC1-A	84.90%
PC2-A	10.09%
PC3-A	3.63%
PC4-A	1.39%

Panel B: Other 6 Developers

	Proportion explained
PC1-B	67.71%
PC2-B	10.90%
PC3-B	9.25%
PC4-B	6.90%
PC5-B	3.43%
PC6-B	1.81%

Table 7 Principal Components**Panel A: 4 Main Developers**

	PC 1-A	PC 2-A	PC 3-A	PC 4-A
CH	0.479	-0.672	0.491	0.280
HEN	0.519	0.188	-0.587	0.592
NWD	0.475	0.689	0.538	-0.102
SHK	0.525	-0.197	-0.354	-0.749

Panel B: Other 6 Developers

	PC1-B	PC2-B	PC3-B	PC4-B	PC5-B	PC6-B
HL	0.405	-0.415	0.510	-0.236	0.415	0.420
HOPE	0.382	-0.336	-0.533	0.622	0.262	0.037
HUT	0.348	0.775	0.301	0.361	0.238	0.032
HYS	0.427	0.243	-0.427	-0.362	-0.398	0.536
SINO	0.431	-0.231	0.380	0.244	-0.691	-0.285
WH	0.448	0.050	-0.197	-0.487	0.260	-0.673

Our second conjecture is related to income inequality. Glaeser and Gyourko (2008, p. 16) argue that “combining income and housing costs in a single affordability metric is a bad idea because it confuses issues of income inequality with problems in the housing market”. According to their calculations, people who are earning minimum wage would not have much left after paying for rent and basic consumption. Thus, part of the “observed housing unaffordability” problem may be due to the fact that the income of certain groups in society cannot keep pace with the aggregate output trend.

This conjecture is consistent with the recent literature in macroeconomics. Among others, Krusell et al. (2000) argue that capital goods are complementary to skilled labor and as the relative price of capital goods (including computers) continues to drop, the “college premium” increases and the income gap between those who are college educated and those who are not widens. Duffy et al. (2004) confirm this hypothesis with panel data from more than 70 countries.³⁹

Table 8 Granger Causality between PC1 and Real Housing Price (F-statistics)

Panel A: 4 Main Developers

	PC1-A does not Granger cause real housing price	Real housing price does not Granger cause PC1-A
Lag = 1	25.96 ***	9.287 ***
Lag = 2	5.972 ***	5.864 ***
Lag = 3	3.639 **	5.527 ***
Lag = 4	2.718 **	4.174 ***
Lag = 8	4.748 ***	3.033 ***
Lag = 12	3.859 ***	1.782 *

Panel B: Other 6 Developers

	PC1-B does not Granger cause real housing price	Real housing price does not Granger cause PC1-B
Lag = 1	14.61 ***	5.172 **
Lag = 2	5.568 ***	3.416 **
Lag = 3	3.698 **	3.559 **
Lag = 4	2.667 **	2.851 **
Lag = 8	3.318 ***	2.392 **
Lag = 12	2.730 ***	1.534

Note: ***, ** and * denote 1%, 5% and 10% significance respectively.

Unfortunately, official data to study income inequality is limited in Hong Kong.⁴⁰ Here we adopt the ratio between the official wage index and per capita GDP. The idea is that if wages can somehow keep pace with the aggregate GDP trend, that ratio would remain more or less constant. Formally, we can in fact prove the following proposition. (The proof can be found in Appendix 5.)

³⁹ Among others, see also Acemoglu (2002) and Hornstein et al. (2007) for related analyses.

⁴⁰ Among others, see Lui (2011) for a related analysis.

Proposition 1:⁴¹

If the aggregate production of an economy is characterized by an aggregate Cobb-Douglas function as in much of the macroeconomics literature, $Y = A(K)^\alpha (N)^{1-\alpha}$, where Y is the aggregate output, A is the productivity, K is the aggregate capital, N is the aggregate labor inputs, and the factor markets are perfectly competitive, then the ratio of the wage rate to per capita real GDP, $w/(Y/N)$, is a constant.

Note that this result holds whether the productivity is a constant or a random variable. With this theoretical benchmark, we plot the empirical counterpart of this ratio in Figure 11b.

According to the graph, the ratio drops from unity (baseline value set at 1982) to less than half. It seems reasonable to conclude that income inequality in Hong Kong is indeed widening.⁴² Some research questions remain open: (1) how does this affect the housing market? and (2) what should the corresponding optimal policy be? We are unable to address these questions here, and can only suggest that they be examined in future research.

4. Housing Price Volatility

The third issue that we consider is housing market volatility, which has recently received much attention.⁴³ For example, Leung and Teo (2011) note that differences in supply elasticities⁴⁴ can be used to explain for the differences in house price volatility. In particular, they find that supply elasticity is negatively and significantly related to housing volatility in major U.S. cities. The idea is very simple. If housing supply elasticity is low when prices are low, then most of the adjustments in housing markets would occur when the market are affected by shocks. Therefore, when we compare the volatility of housing prices across cities, we should consider the potential differences in supply elasticities.

Unfortunately, for most Asian economies, comparable time series of house prices are not publicly available. Perhaps more importantly, we need *a*

⁴¹ Since the Nobel-winning work of Kydland and Prescott (1982), the aggregate production function is typically assumed to be Cobb-Douglas for a variety of reasons. Among others, see Cooley (1995), Davis (2009), King and Rebelo (1999), and Ljungqvist and Sargent (2007) for more discussion.

⁴² Thus, our result is also consistent with the findings of Karabarbounis and Neiman (2013) with regard to major economies.

⁴³ For instance, see Leung et al. (2013) for the decomposition of volatility in the Hong Kong housing market and the references therein.

⁴⁴ See Glaeser et al. (2005), Green et al. (2005), Saiz (2010), and Davidoff (2013) for discussions of supply elasticities and housing price movements.

statistical relationship between supply elasticity and the volatility of the housing price among cities comparable to Hong Kong, so that we can determine whether the housing price volatility in Hong Kong is “too high” given its supply elasticity. Hence, a comparison of Hong Kong with another Asian city would not be suitable for our purposes. We thus use the relationship that has been identified in major U.S. cities.⁴⁵ Although Hong Kong is clearly not an American city, there are some similarities. For example, like many American cities, Hong Kong has high levels of maturity and transparency, and a large listed real estate market.⁴⁶ Interestingly, Hong Kong fits reasonably well in the statistical relationship identified by Leung and Teo (2011). We thus use the monthly real estate data from 1993 to 2011 and calculate the supply elasticity of the Hong Kong housing market as 0.76 and its house price volatility as 8.37%. Based on the estimation provided by Leung and Teo (2011), an American city with a supply elasticity of 0.76 would be associated with a volatility that is 7.90%, which is close to the actual house price volatility of Hong Kong.⁴⁷ Figure 12 shows that if Hong Kong was an American city, it would fit well in the regression line given in Leung and Teo. The result is even better if we remove Atlanta from the regression.⁴⁸ Thus, the housing market of Hong Kong is not suffering from excessive volatility, despite the comments in the media.⁴⁹

However, when housing prices increase and there is the possibility of a speculative bubble, the Hong Kong government does attempt to take some precautionary measures to cool down the market.⁵⁰ Due to the pegged exchange rate system, the recent nominal interest rate in Hong Kong has been low. At the same time, the Hong Kong economy has been stimulated by the appreciation of the renminbi, which has resulted in a high inflation rate. Overall, such a low real interest environment encourages home purchases, by locals and residents of foreign countries. The government has responded by

⁴⁵ Clearly, there are other studies that compare Hong Kong with U.S. cities. See, for instance, Chang et al. (2013) for an analysis on how shocks in the U.S. affect the GDP and asset markets in Hong Kong.

⁴⁶ Among others, see Newell et al. (2007) for details.

⁴⁷ Please refer to Appendix 6 for computations.

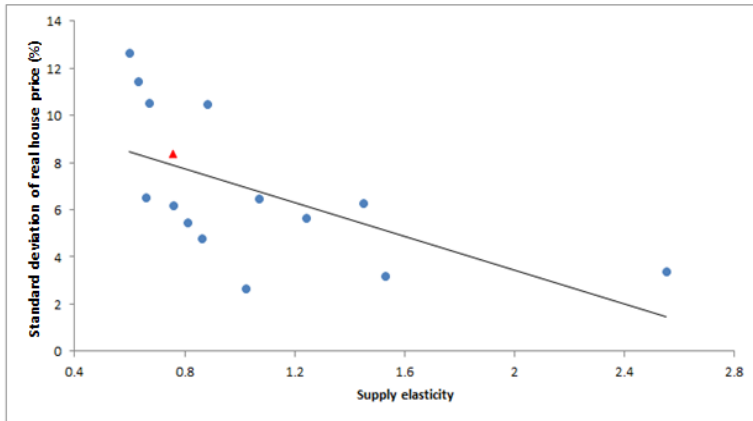
⁴⁸ Details provided by request.

⁴⁹ Historically, the Hong Kong government has attempted to stabilize housing prices. In 2002, housing was in a trough. The government launched nine measures aimed to provide public rental houses to those in need, thus reducing direct participation in the private housing market, and improving transparency in the market. Together with the Individual Travel Scheme in 2003, the housing market started to recover. For details, please refer to the document (Chinese only): www.legco.gov.hk/yr03-04/chinese/sec/library/0304fs01c.pdf. In fact, similar stabilizing measures have also been implemented in the U.K. According to Stephens (2012a and 2012b), the U.K. government has also attempted to identify the root causes of volatility, create a sustainable housing market, and protect homeowners from high volatility.

⁵⁰ See Yiu et al. (2013) for the identification of bubbles in the Hong Kong property market.

imposing different versions of a transaction tax, including the Buyer Stamp Duty (15%), Special Stamp Duty,⁵¹ and Double Stamp Duty, thus enforcing a “Hong Kong land for Hong Kong people” policy and restricting the mortgage ratio to 60% or below. Banks are not allowed to approve a mortgage contract if the monthly payment to income ratio exceeds 50%. With these measures, Secretary for Development Paul Chan Mo-po said that the housing market has stabilized and only 2% of home purchases are by non-locals (The Standard, 2014a).

Figure 12 Scatter Plot of Housing Volatility and Supply Elasticity



5. Conclusions

This paper has examined three aspects of the Hong Kong housing market: availability, affordability, and volatility. The examining of availability is relatively straightforward. Section 2 presents evidence which suggests that there is a “housing shortage” in both the public and private housing markets. The number of outstanding applications for public rental houses has reached 229,000 cases, whereas the expected number of new completed units remains 20,000 a year. The waiting time is clearly much longer than the official targeted number of units. The number of new private units available has recently been said to be less than 20,000 units annually, which suggests that there may be “excess demand”.

As land ownership in Hong Kong is public, it is tempting to conclude that if the government increases the land supply, the housing supply issue (i.e., availability) will be solved. Unfortunately, our econometric findings suggest

⁵¹ The rates of the Special Stamp Duty are available at: <http://www.ird.gov.hk/eng/faq/ssd.htm>. For a formal analysis of how the stamp duty affects the housing market, see Leung et al. (forthcoming), among others.

that even if the government increases land sales, the new housing supply may not be increased, because building more housing units and making them more affordable may not be consistent with the profit-maximizing objective of the real estate developers.

How then, can the Hong Kong government increase the availability of housing units? Several strategies have been proposed. Wong (1998, 2013) suggests that current practices, such as the lack of means testing, could create a mismatch between public housing units and tenants. Therefore, Wong suggests the privatizing of public housing units to improve their market efficiency and even the wealth of the residents.⁵² Alternatively, to modify the “hold and wait” behavior of developers, some commentators suggest that a maximum period of time should be specified in land sale documents during which private developers must build a specific number of units.⁵³ The government may also need to provide incentives to increase the supply of labor in the construction sector, so that the official target of completing 470,000 housing units in ten years can be met.

Clearly, the lack of housing tends to drive up house prices, and if income distribution is uneven, unaffordability can become an issue. We argue that the HLLP is not the crucial factor that makes private housing unaffordable. There are other agents in the housing market. For instance, as suggested by Ortalo-Magné and Prat (2014), among others, homeowners may have incentives to keep housing units unaffordable to outsiders. Our study provides evidence that the unaffordability of housing units may come from the strategies of the developers. The objective of developers is to maximize shareholder profit, and hence the developers may lack incentives to sell housing units at “affordable prices”. The fact that average wages cannot keep pace with the aggregate GDP may also suggest the widening of income inequality, which causes housing units to be unaffordable to a growing proportion of the population. Although the government might develop policies that encourage developers to provide private units at affordable prices, it is much harder for the government of a small open economy to resist the global trend of increasing income inequality.

Finally, if the limited housing supply is persistent, it can magnify the volatility issue. Hong Kong has a small open economy and hence is subject to different kinds of international shocks. For instance, a sudden and significant inflow of capital can drive up the housing demand and as housing is non-tradable, house prices can only increase to clear the market. If the housing supply elasticity is low, the extent to which house prices need to increase is even higher. In fact, the Hong Kong housing market has experienced peaks and troughs in the past two decades. To minimize the swings in the housing market, the government

⁵² Based on Ortalo-Magne and Rady (2006), Ho and Wong (2006) discuss the potentially negative side of the privatization of public housing in Hong Kong.

⁵³ It is well known that developers may wait to develop when facing stochastic prices. Among others, see Wang and Zhou (2006) for a formal analysis.

has implemented countercyclical measures to stabilize the market. Given the supply elasticity of the Hong Kong housing market, we find that the actual housing price volatility in Hong Kong is comparable to that in American cities. In that sense, the Hong Kong housing market is functioning well. Thus, if the Hong Kong government intends to lower housing price volatility, attention should be shifted to policy measures that can increase the elasticity of the supply of housing. Whether this is worth pursuing, and if so, how it can be achieved, is a question for future research.

Obviously, several issues are left unexplored in this study. For instance, given that small and medium size enterprises constitute a large number of firms in Hong Kong, and many of these entrepreneurs use their personal homes as collateral,⁵⁴ how might the macroeconomy be distorted? What is the optimal housing and land use policy? Furthermore, will the housing policy need to be adjusted if the global trend of increasing income inequality persists? We believe that future research could provide more guidance on these issues.⁵⁵

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⁵⁴ Among others, see Jin and Zeng (2007) and Chen and Leung (2008) for more analysis.

⁵⁵ Among others, see Leung (2004) for a non-technical discussion of the early macro-housing literature.

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Appendix

The appendix consists of several parts.

- Appendix 1 provides a detailed description of Letter A/B in land exchange.
- Appendix 2 provides the major listed developers in Hong Kong. Their stock codes and market capitalization (as of 6 June 2013) are also shown.
- Appendix 3 expands the formula of the model from Malpezzi (1999).
- Appendix 4 shows the time plot of revenue from different land disposal types.
- Appendix 5 provides the proof of Proposition 1.
- Appendix 6 shows the calculation method of the supply elasticity.

Appendix 1 Description of Letter A/B

Letter A/B actually refers to a kind of land exchange. The letters A and B were first issued by the government as an alternative to cash compensation when private land was to be resumed in the New Town Development Areas of the New Territories. The aim was to speed up acquisition of private land for public purposes by avoiding lengthy arguments over the level of compensation and cash payments and large outflow of cash. However, the system did not solve the ultimate problems because of the shortage of land in Hong Kong. Therefore, this system was terminated (Letter A/B is no longer available) on 8 March 1983. This system was first used to form part of the Tsuen Wan New Town.

In the old days, with the increase in population and expansion of urban areas, much of the land was urgently required for public purposes such as for road widening, community buildings or public housing schemes. However, a considerable amount of land selected for new town development was privately owned. A novel system of land exchange evolved which then enabled local inhabitants and landowners to retain an interest in the development of the new towns.

'Letter A' was issued by the government when private land was urgently required needed for public purposes and the land owners voluntarily surrendered the land with vacant possession without going through the statutory resumption.

Letter B was offered to the land owners who were already affected by a Gazette Notice of resumption under Cap. 124 and given a choice of either cash payment or an entitlement to a future grant of land.

Both Letters A and B could be exchanged for building land, residential or industrial, at any time when suitable land became available by payment of a

premium based on the difference in value of the agricultural land surrendered and the building land selected. Two sq. feet of building land could be exchanged for every 5 sq. feet of agricultural land that was surrendered. For building land, the ratio was one to one.

The bidder who submitted, in aggregate terms, the oldest Letter A/B calculated backwards from the date of closing the tender to the operative date of the Letter A/B surrendered would be awarded with the tender site.

In mid-1947, there was an outstanding land entitlement of between 420,000 and 470,000 sq. meters of building land in the form of Letter B. Due to the significant amount of land area accumulated from Letter A/B, the government had to take action to speed up the clearance of the commitments for Letter A/B. In 1984, it was announced that a number of New Territories related land transactions, e.g. the payment of modification premia, building covenant extensions, and short-term-tenancy rent, could be paid by surrendering Letter A/B in lieu of cash.

Later, in June 1997, the government enacted the New Territories Land Exchange Entitlements (Resumption) Ordinance to provide for the payment of redemption money in respect of land exchange entitlements to Letter A/B owners, and for the extinguishment of their rights against the government under such documents to a future land exchange. Nowadays, Letter A/B no longer exists.

Source: Li (2000).

Appendix 2 Listed Property Developers

Property Developer	Stock Code	Market Capitalization ⁵⁶ (HKD)
Sun Hung Kai Properties Limited *	0016	367,629,050,221
Hutchison Whampoa Property ^	0013	347,251,550,031
Cheung Kong (Holdings) Limited *	0001	245,050,186,960
Wharf Holdings Limited ^	0004	212,686,858,355
China Overseas Land and Investment Ltd.	0688	186,744,279,530
Henderson Land Development Company Limited *	0012	127,503,688,224
Hang Lung Properties Limited ^	0101	122,925,410,885
Swire Pacific A	0019	84,988,542,225
New World Development *	0017	75,612,975,128
Sino Land ^	0083	68,518,936,800
China Resources	0291	61,265,206,560
Kerry Properties Limited	0683	44,348,403,422
Hysan Development Company Limited ^	0014	35,790,915,397
Chinese Estates Holdings Limited	0127	25,562,095,659
New World China Land Limited	0917	24,950,598,742
Hopewell Holdings Limited ^	0054	23,366,038,311
Shun Tak Holdings Limited	0242	12,407,086,177
K. Wah International	0173	10,344,401,121
Emperor International	0163	8,690,256,575
Lai Sun Development	0488	4,694,717,029
Tai Cheung Holdings Limited	0088	3,865,745,721
SEA Holdings	0251	3,171,706,547
Y. T. Realty	0075	1,958,915,667
Chuang's Consortium International Ltd.	0367	1,781,383,563
Asia Standard International	0129	1,781,068,108
Tai Sang Land Development	0089	1,035,610,834

Note: The developers marked with * and ^ are referred to as the “top 4 developers” and the “other 6 developers” respectively.

⁵⁶ The values are obtained from Hong Kong Exchanges and Clearing Limited, as of 6 June 2013.

Appendix 3 Malpezzi (1999) Model

The model asserts that

$$\begin{aligned} dP_t = & \beta_0 + \beta_1 \left(\frac{P_{t-1}}{Y_{t-1}} - k \right) + \dots \\ & + \beta_n \left(\frac{P_{t-n}}{Y_{t-n}} - k \right) + \gamma_1 \left(\frac{P_{t-1}}{Y_{t-1}} - k \right)^3 + \dots + \gamma_n \left(\frac{P_{t-n}}{Y_{t-n}} - k \right)^3 \\ & + X\alpha + \varepsilon_t \end{aligned}$$

where P_t = real housing price at time t , Y_t is the real income at time t , k is the long-run house price-to-income ratio, X is a vector of control variables, and ε_t is the error term.

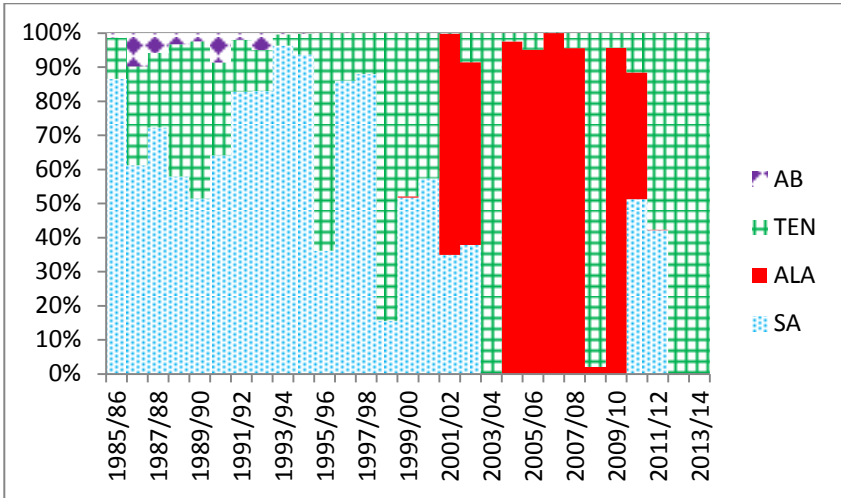
In our paper, it is considered that $n = 2$ and the model can be simplified as:

$$\begin{aligned} dP_t = & \beta_0 + \beta_1 \left(\frac{P_{t-1}}{Y_{t-1}} - k \right) \\ & + \beta_2 \left(\frac{P_{t-2}}{Y_{t-2}} - k \right) + \gamma_1 \left(\frac{P_{t-1}}{Y_{t-1}} - k \right)^3 + \gamma_2 \left(\frac{P_{t-2}}{Y_{t-2}} - k \right)^3 + \varepsilon_t \\ P_t - P_{t-1} = & \beta_0 + \beta_1 \frac{P_{t-1}}{Y_{t-1}} - \beta_1 k + \beta_2 \frac{P_{t-2}}{Y_{t-2}} \\ & - \beta_2 k + \gamma_1 \left[\left(\frac{P_{t-1}}{Y_{t-1}} \right)^3 - 3k \left(\frac{P_{t-1}}{Y_{t-1}} \right)^2 + 3k^2 \left(\frac{P_{t-1}}{Y_{t-1}} \right) - k^3 \right] \\ & + \gamma_2 \left[\left(\frac{P_{t-2}}{Y_{t-2}} \right)^3 - 3k \left(\frac{P_{t-2}}{Y_{t-2}} \right)^2 + 3k^2 \left(\frac{P_{t-2}}{Y_{t-2}} \right) - k^3 \right] + \varepsilon_t \\ P_t - P_{t-1} = & [\beta_0 - k(\beta_1 + \beta_2) - k^3(\gamma_1 + \gamma_2)] \\ & + \left[(\beta_1 + 3k^2\gamma_1) \frac{P_{t-1}}{Y_{t-1}} + (\beta_2 + 3k^2\gamma_2) \frac{P_{t-2}}{Y_{t-2}} \right] \\ & - 3k \left[\gamma_1 \left(\frac{P_{t-1}}{Y_{t-1}} \right)^2 + \gamma_2 \left(\frac{P_{t-2}}{Y_{t-2}} \right)^2 \right] \\ & + \left[\gamma_1 \left(\frac{P_{t-1}}{Y_{t-1}} \right)^3 + \gamma_2 \left(\frac{P_{t-2}}{Y_{t-2}} \right)^3 \right] + \varepsilon_t \end{aligned}$$

Hence, we have

$$\begin{aligned} \hat{P}_t = & P_{t-1} + \hat{\alpha}_0 + \hat{\alpha}_{11} \frac{P_{t-1}}{Y_{t-1}} + \hat{\alpha}_{12} \frac{P_{t-2}}{Y_{t-2}} + \hat{\alpha}_{21} \left(\frac{P_{t-1}}{Y_{t-1}} \right)^2 + \hat{\alpha}_{22} \left(\frac{P_{t-2}}{Y_{t-2}} \right)^2 \\ & + \hat{\alpha}_{31} \left(\frac{P_{t-1}}{Y_{t-1}} \right)^3 + \hat{\alpha}_{32} \left(\frac{P_{t-2}}{Y_{t-2}} \right)^3 \end{aligned}$$

Appendix 4 Revenue from Land Disposal Type



Key: SA – Scheduled Auction; ALA – Application List Auction; TEN – Tender; AB – Letter A/B

Source: Lands Department, Hong Kong SAR Government

Appendix 5 Proof of Proposition 1

Proposition 1: *If the aggregate production of an economy is characterized by a Cobb-Douglas function, $Y = A(K)^\alpha (N)^{1-\alpha}$, where Y is the aggregate output, A is the productivity, K is the aggregate capital, N is the aggregate labor inputs, and the factor markets are perfectly competitive, then the ratio of the wage rate to per capita real GDP $w / (Y / N)$ is a constant.*

Proof:

$$\begin{aligned} \text{Wage (w)} &= \text{Marginal Product of Labor} = \frac{\partial Y}{\partial L} \\ &= (1-\alpha)AK^\alpha N^{-\alpha} \\ &= (1-\alpha)\frac{Y}{N} \end{aligned}$$

$$\text{Rearranging gives } \frac{w}{\left(\frac{Y}{N}\right)} = 1 - \alpha = \text{constant}$$

Remark:

In microeconomics, we assume that the economy always achieves full employment. Hence “GDP per worker” and “GDP per capita” are identical. In reality, the two are not identical. The labor market participation rate changes over time. To correct for that, we need to define N to be the aggregate labor force and N^p as the total population. Hence $w / (Y / N)$ is a constant, but

$\frac{w}{\left(\frac{Y}{N^p}\right)} = \frac{w}{\left(\frac{Y}{N}\right)\left(\frac{N}{N^p}\right)}$ may not be a constant, since the labor market

participation rate $\left(\frac{N}{N^p}\right)$ may change over time. Empirically, the labor market participation rate does not change much and displays no clear trend. Thus, our result is essentially unchanged even after the correction.

Appendix 6 Calculation of Supply Elasticity

To calculate supply elasticity, we first obtain the housing data from the CEIC, which cover the period from January 1993 to December 2011. While the monthly series of housing price, consumer price and materials cost indexes are available, the data of private housing stock are only updated once a year. Hence, we use interpolation to turn this yearly series into a monthly series. Also, since the data for the relevant instruments proposed by Saiz (2010) are not available, we can only assume the error term is uncorrelated with housing price and housing stock in our analysis.⁵⁷ The estimation result is as follows (with the t-statistics inside the parentheses):

$$\begin{aligned} &\text{Log(Housing Price)} \\ &= -16.38 + 0.63 * \text{Log(materials cost)} + 1.32 * \text{Log(housing stock)} \\ &\quad (-1.86) \quad (3.44) \qquad \qquad \qquad (2.25) \end{aligned}$$

The estimates suggest a relatively inelastic housing supply on average, with a value of 0.76 (=1/1.32). In the previous literature, it is shown that areas with lower supply elasticities tend to have high volatility of real house prices. To calculate the volatility of Hong Kong housing prices, the cyclical component of the log of real housing price is used. It is found that the standard deviation of real housing price is 8.37% over the sampling period.

Leung and Teo (2011) estimate the relationship between supply elasticity and house price volatility. They found that

$$\begin{aligned} \text{Standard deviation (in \%)} &= 10.63 - 3.60 * \text{Supply Elasticity} \\ &\quad (6.34) \quad (-3.10) \end{aligned}$$

If we treat Hong Kong as one of the American cities, then by using the above equation, we would find that the standard deviation is about 7.90%.

⁵⁷ Same assumption has been made in Saks (2008).