Developers' Market Power: How do Developers Price New Housing in a Highly Oligopolistic City?

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Highlights

Advocates often invoke developer market power and profits in housing policy debate. Hong Kong, an extremely concentrated housing market with five developers supplying over 70% of new housing, is used as a case. We use a difference-in-difference model to analyze the price of first-hand units sold by developers relative to otherwise identical second-hand units. At odds with the market power argument, developers sold at a discount (not premium) of 5 percent; the discount by the top five developers was even larger. The discount is related to the need to resolve demand uncertainty and the competitive force from substitutes.

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Abstract

The profiteering developer is a common figure in debates over housing policy. Governments increasingly use developer profits to justify policies like inclusionary housing. Yet, we actually understand little about the competitiveness of housing development. One unresolved question is whether developers use market power to profit when selling new units, especially in highly concentrated markets. We use the case of Hong Kong, where the five largest developers build almost two-thirds of new housing units, to address this question. Using a difference-in-difference estimation strategy, we find that new condominiums sell at a discount, not a premium. We attribute this lack of market power to the resalable feature of durable goods – the discount is bigger when more re-sellers are located nearby – as well as the need to resolve demand uncertainty – the discount is bigger when developers have to sell more units. Our results suggest that the first-hand market, even in a highly concentrated market, is competitive. They add to a growing body of research on the role of new housing in affordability, and invite further study of competitiveness in different kinds of housing markets.

Keywords: Developers; monopoly; housing prices

1 Introduction

The profiteering developer is a common figure in housing policy debates. Animosity to developers and new development has spurred moratoria on all new construction (Manville and Osman, 2017) and governments use the perception of developer profit to justify policies such as impact fees, community benefits agreements, and inclusionary housing. A recent article in the *Shelterforce* community development magazine on how all cities should adopt inclusionary housing ordinances argues, "where housing development is profitable, the added cost of an inclusionary housing program … can be fairly easily borne." (Reyes, 2018). Yet, we actually understand little about the competitiveness of housing development in a systematic manner. In her seminal article, DiPasquale (1999) lamented the dearth of knowledge about housing supply and the development process. Many of the holes in our understanding persist today (Been et al., forthcoming).

The market structure of the property development industry is also one part of a popular explanation for high housing costs, and advocates often blame new luxury housing for high rents (Tenants Together, 2018). Casual observers might think that potentially corrupt and clearly oligopolistic developers build only for the very rich, and because of their market power, they are able to charge excessive and exorbitant prices for new housing. But is this true? Do developers price new housing units above their market value? We can answer this question, though it is only one component of developer profit and market structure.

We use Hong Kong as a case study to explore this question and provoke further research in US cities. Hong Kong is an ideal case for several reasons. First, it has one of the most expensive property markets in the world. In 2017, the average residential price reached a record high of US$1,700/ft^2 (Rating and Valuation Department, 2018), well out of reach of the vast majority of the city's population. Second, popular accounts in Hong Kong partly explain unaffordability with developers' market power:

> "Hong Kong's property market for new flats is rigged in favour of the property tycoons who can withhold their massive landbanks, delay development and slowly release completed flats into the market." (Guy, 2016)

Third, evidence presented in the media seems to support this argument. Property developers reportedly sold first-hand units at a 20-25% price premium over units sold in the resale market.[i] Fourth, the development industry is highly concentrated. A government report in the early 1990s found that seven developers supplied 70% of new units (Consumer Council 1996), and

the first-hand market became even more concentrated during 1995-2012. Fifth, property tycoons in Hong Kong always top the list of the richest individuals in the city[ii], making market power an apparently indisputable truth. Finally, data are ample and detailed in Hong Kong.

The market power explanation, however, suffers from two problems – one empirical and the other theoretical. Empirically, even if the 20-25% premium has been accurately estimated, it could be due to quality differences between first-hand and second-hand units. If a developer charges a higher price for higher quality housing, this is not market power. Theoretically, the market power of even a monopolistic developer would be limited because real estate is a durable good and thus resalable. New units are competing with re-sellers in the second-hand market, in some cases buyers who just bought new units in the same building. Coase (1972) conjectures that a monopolist of durable goods cannot charge a premium because they cannot credibly commit to restricting future supply.

We approach the 'overpricing' problem of first-hand units by first examining factors in addition to market power in a general setting of new housing development. A key issue is that developers do not know the market demand when pricing new units. They may resolve the demand uncertainty through inter-temporal pricing strategies (e.g. selling in phases), but these take time and incur holding costs. Alternately, they may simply set a lower price and transfer the pricing risk to risk-taking buyers. Thus, *a priori* we do not know if first-hand units will be more or less expensive on average. The prediction from demand uncertainty differs from the prediction from market power and offers another perspective to interpret patterns of over or underpricing.[iii]

The identification of a discount or premium on new units is an empirical challenge. A first-hand unit is normally higher quality than a second-hand one, so simple price comparison is biased. The hedonic approach has been used to assess market power in environmental amenities (Taylor and Smith, 2000) and farmland (Cotteleer et al., 2008), but the unobserved qualities of housing present a distinct challenge. We therefore employ a difference-in-differences (DID) approach that tracks the change in the first-hand and second-hand prices of the *same* unit while controlling for the corresponding price change in the second-hand market over the same time period, in this case from 1995 to 2012.[iv] This is somewhat like a repeat-sale approach except that we add an intercept to estimate the constant-quality price difference between first-hand and second-hand units.

Our DID results show that, in contrast to anecdotal evidence, new housing units actually sell at a discount with respect to otherwise identical resales. This first-hand discount, moreover, is larger for the developers who have the highest market share. These findings reject the idea of market power in favor of the importance of demand uncertainty.

Additionally, we find that developers are more sensitive to substitutes than resellers are, consistent with the argument that developers have a higher holding cost. This substitution effect stems not just from the units outside the new development but also from within, implying that a developer selling many units is indeed competing with itself. Developers' marketing strategies, apparently, do not completely offset the self-substitution effect.

We hope this study provokes further research in the United States and globally. Understanding how the relative concentration of the property development industry in a city as well as the importance of new housing in its housing market shapes the discount/premium on new units is important. Clearly, developers and new housing play a crucial role in urban growth, and improving the empirical evidence about their role in the housing market can improve urban policy.

One clear implication of this study for policymakers is that since liquid second-hand markets constrain developers' selling power, governments should promote them to the extent possible, for example by moving away from transaction taxes and towards property taxes. Additionally, if a liquid second-hand market is in place, any resources for anti-trust investigation in the real estate sector should target developers' factors of production (e.g. land purchase), not their selling practices. Our study does not investigate developers' potential market power as buyers of land or development permits, which may be a source of rents.

After reviewing the literature on market power and demand uncertainty and introducing the Hong Kong condominium market, we present our hypotheses based on the two theories. Then, we describe the methodology and data we use. Finally, we discuss the results and their implications for further research on this topic.

2 Literature on Market Concentration and Pricing

A highly concentrated market is conducive to anti-competitive behavior, such as collusion, to earn higher profits. The relationship between concentration and profitability of firms is long studied (Newmark 1990) but the empirical work on this is plagued with measurement problems. For example, a popular measure of profitability is the Lerner index (Lerner 1934), or the percentage difference between product price and marginal cost. Since marginal cost is not observable, however, scholars often use accounting cost, such as the rate of return on asset or equity. Accounting data, however, is a noisy measure of economic variables (Schmalensee 1989). At the firm level, it does not provide adequate information on cost at the product level. This is particularly problematic for conglomerates because the allocation of firm-level costs to different business lines is inevitably arbitrary.

The interpretation of the co-existence of high profitability and high market concentration is also unclear (Demsetz 1973). Is it a consequence of market power or production efficiency? A highly productive firm would expand its market share and make more profits, but this is a result of competitive efficiency not monopoly. Coase (1972) conjectures that market concentration cannot give rise to any market power for durable goods, because buyers rationally expect a durable-good monopolist is unable to limit future supply. Maskin and Tirole (1988) and Esteban and Shum (2008) have generalized this theory to a dynamic oligopoly setting, although empirical work is still scant.

To avoid the abovementioned measurement problems, a more recent approach is to measure market power at the product level, using product prices. Prices come directly from market transactions and are thus not subject to accounting manipulation. They are also less vulnerable to interpretation problems because the pure effect of production efficiency should drive prices down. Recent studies have therefore shifted their focus to analyze the relationship between prices and concentration, examining industries like housing (Cronin 1983), banking (Cyrnak and Hannan 1999), airline (Haskel et al. 2013), food retailing (MacDonald 2000), and natural gas (Morris 1988). Weiss (1989) found a positive relationship between prices and concentration in many industries.

Studies using prices must also contend with measurement challenge. Most products are not identical and thus sellers compete on dimensions beyond price itself (Newmark 2004). Thus, using prices may still be misleading if there are important uncontrolled or unobserved

differences in products. Higher prices could simply be a result of higher quality (Pautler 2001). To use the price measure, scholars must carefully consider and control for quality differences. The present study contributes to the empirical literature in this sense, by using a difference-in-differences approach that can effectively separate quality from prices for durable goods.

Market power is not the only force in play in pricing new products, however. Demand uncertainty is another important factor that could affect sellers' pricing decision. Starting with the assumption that sellers do not know the exact market demand, how do firms set the quantity and price of goods in advance?

Firms use two common inter-temporal pricing strategies to address demand uncertainty. One is to charge a high price initially and then lower the price in a sales period. Retailers selling seasonal goods or theatre tickets often take this approach (Nocke and Peitz 2007). The other is to set a low price initially to attract early buyers and then raise the price for those who buy late, a common strategy for airline tickets (Möller and Watanabe 2010). Developers use both strategies, although tend to favor the latter. Sirmans and colleagues (1997) show that developers reduce the price in the earlier phase to ensure that there will be sufficient demand and then increase the price sequentially as more demand information is obtained.

Whichever strategy developers employ, the demand uncertainty theory does not assert that sellers with a large market share should necessarily earn a price premium. Instead, both holding (inventory) cost and product characteristics matter.

On one hand, sellers with a large inventory generally want to sell quickly. Developers have a strong incentive to speed up sales in order to reduce holding costs (Ott et al. 2011). To do so, however, they have to lower the price in order to induce buyers to take the market risk (Lai et al. 2004). On the other hand, sellers with a large inventory can also sell in phases in order to gather information about market demand. Gradually selling units is a common strategy and may help them achieve higher overall revenues on a project (Wang and Zhou 2006).

The effectiveness of phased sales depends on the similarity of products to other substitutes on the market (Haurin 1988). Waiting may not benefit sellers if holding costs are high and close substitutes are available. This means, for durable goods, the substitutability between first and second-hand products should matter. We could not find any articles focused on this question as we do, thus a further contribution of this study is the innovative measure of product similarity inspired by Haurin's (1988) atypicality measure.

3 Hong Kong's condominium market

The property market in Hong Kong differs in at least four important ways from cities in the United States. First, a majority of housing units are condominiums in medium to large buildings, typically between 20 and 40-storey tall. Such buildings are often developed into an estate that houses more than a thousand units. Second, the vast majority of new housing units sell as condominiums to individuals. Rarely do Hong Kong developers maintain ownership of multi-family housing and rent units out. Instead, the rental market is primarily comprised of individual property owners renting out their condominiums in multi-owner buildings. Third, all land is technically owned by the government and sold to developers as leasehold interest through annual land auctions and land use conversions. Finally, roughly half the city's population lives in publicly built housing (30% in public rental housing and 20% in subsidized ownership housing), which means its social-spatial structure is as different from US cities as its built environment (Monkkonen and Zhang, 2014).

In our analysis, we consider the first-hand and second-hand condominium markets separately. They do not operate in isolation from one another, however. Developers employ various strategies to sell their newly built units as they cannot ignore the potential substitutes offered by nearby resellers. The nature of durable goods dictates that in the long-run second-hand goods will dominate the supply. This is true for Hong Kong condominiums. Annual new supply (first-hand units) constitutes less than 2% of the total stock on average[v]. First-hand units were, on average, 18% of all transactions between 2002 and 2012.

One difference between markets is that property agents coordinate the sale and purchase of second-hand units on behalf of individuals. They match individual buyers with sellers and facilitate negotiation between them. Compared to the first-hand market, the second-hand market is more competitive simply because there are so many sellers with very few units. They therefore do not make use of sale strategies that are otherwise available to developers.

In this study, the focus is on the first-hand units built and sold by real estate developers. According to Consumer Council (1996), the first-hand market was highly concentrated with a small number of large developers. At that time, seven developers built and sold 70% of the new units. We produce an updated picture for 1995 to 2012 in Table 1, which shows how the first-hand market actually became more concentrated since that report. On average, three developers

built and sold 64% of new units and five developers supplied 77%.

[Insert *Table 1* here]

Not only is the market concentrated in Hong Kong, few new players have entered the condominium market until recently. The reason for this is not clear. Hong Kong is one of the freest economies in the world[vi], thus barriers to entry are low. Capital can easily move in and out, profits tax is low, and the government uses the common law system. The high cost to development, especially land acquisition, may be a barrier, but there is nothing to prevent developers from forming joint ventures in land bidding. Another possible barrier is a lack of local knowledge or contacts, but new firms can buy expertise from professionals and market analysts. Mainland Chinese developers' recent aggressive entry into Hong Kong's condominium market, with 40% of land market share in value terms in 2016,[vii] shows that the lack of local knowledge is not a sufficient barrier.

The limited research on market concentration for housing development in major US metropolitan areas suggests the industry is not concentrated. Comparable data can be challenging, in part because developers use different LLCs for different projects. Buzzelli (2001) suggests that new housing production deconcentrating from levels that were previously low compared to other industries. In part, this is because smaller buildings are much more prevalent. In the City of Los Angeles, for example, over half of the 681 new development projects permitted in 2016 were duplexes and only four had over 500 units (City of Los Angeles, 2017). This type of construction allows smaller and more developers to exist.

Using Los Angeles County as a comparison case, available data reports the largest five developers selling 43% of the roughly 3,000 new units sold in 2017 (Los Angeles Business Journal, 2018). Many of these homes were in single-family subdivisions, as developers of large multi-family residential projects often hold them as rental properties. Also in contrast to the Hong Kong case, the 3,000 new units were less than 1% of the County's housing stock, and less than 4% of housing transactions that year[viii].

4 The Relative Price of First and Second-Hand Housing Units

Abstracting from any strategic interactions in an oligopoly market, we first consider the

simplest case of a first-hand market with a monopolist seller who faces a downward sloping demand curve. Under certain cost conditions, monopoly theory predicts that the seller has market power. As a profit maximizer, they should restrict supply to set prices above the competitive level. If the second-hand market is more competitive, this theory's prediction is straightforward:

Hypothesis 1: Ceteris paribus, the price of first-hand units is higher than that of second-hand units, especially when the seller of first-hand units is a developer with high market share.

Instead of monopoly, another starting point is that all sellers are price searchers who face demand uncertainty. In the first-hand market, sellers release new products to the market, but they do not know how quickly they will sell at any given price. Resellers also do not know what price to set but they only have to sell one unit. Both first-hand sellers and resellers may use inter-temporal pricing strategies to discover demand, but the higher holding cost of first-hand sellers may prevent them from searching as much as resellers do.

One sales strategy for first-hand sellers is to set a lower price for some products and transfer the pricing risk to risk-taking buyers or speculators. In any case, since first-hand sellers tend to search less or lower their pricing risk, the implication from demand uncertainty is that:

Hypothesis 2: Ceteris paribus, the price of first-hand units is, on average, not higher than that of second-hand units. Moreover, the higher the holding cost of developers, the lower the price of first-hand units relative to that of second-hand units.

We can test the holding cost component of *Hypothesis 2* in a number of ways. First, developers with the highest market share build more units and should therefore sell at a lower price, as opposed to the higher price predicted by *Hypothesis 1*. Similarly, developments with more units should sell at a lower first-hand price. Holding cost also relates to market conditions. When the market has higher liquidity or prices are rising, holding costs are relatively lower and developers can sell at a higher price.

Regardless of market power or demand uncertainty, we expect first-hand prices to be lower when there are ample substitutes. Whether the effect is larger for first-hand sellers or resellers is an empirical question. On one hand, the effect could be the same for both if condominium units are sufficiently homogeneous and substitutability between first and second-hand units is high. On the other hand, the effect could be stronger for first-hand sellers due to their holding

of a large inventory. They have to lower the first-hand price more in order to sell all their products as quickly as resellers do. The degree of price adjustment depends on how close the substitutes are. This leads to our third hypothesis:

Hypothesis 3: Ceteris paribus, substitutes have a larger negative effect on the price of first-hand units than that of second-hand units, and this is more so when the substitutes are closer to the first-hand units.

We can divide the substitutes into three types: 1) similar second-hand units, 2) similar first-hand units from other developments, and 3) similar first-hand units from within the same development. To a developer, Type 2 substitutes are closer than Type 1 because both their products and Type 2 are first-hand, and because sale strategies are available to both them and Type 2 sellers. Type 3 is a bit tricky. This is the closest substitute in terms of quality because the same developer produces it and shares observed and unobserved features. However, Type 3 is under full control of its developer, who could phase the sale of their units in order to keep any 'self-competition' to a minimum. Our empirical result will tell how close Type 3 substitutes are, as compared to Type 1 and 2.

5 Method and data

5.1 First-hand price premium

Implicit in our hypotheses is a comparison of first and second-hand prices. To test them, we must minimize, if not eliminate, any quality difference between first and second-hand units. A hedonic pricing model can control for observable quality differences, but unobservable differences, like developers' reputation, could still bias our estimate. We therefore develop a new method based on the difference-in-differences approach.

Among many transactions of individual units, we confine our sample to repeat sales. In this case, these are units sold in the first-hand market by developers and then in the second-hand market. Abundant repeat sales are available, so sample size is not a concern. Since the unit is virtually the same across the two sales, the difference of the two sale prices removes both observable and unobservable quality differences. Here we define the first-hand price premium of unit i (FP_i) as:

$$FP_i = ln\left(P_{i,t1}/P_{i,t2}\right) \quad (1)$$

where $P_{i,t1}$ is the price at which the developer sells unit *i* to the first-hand buyer at time t_1 (first-hand sale) and $P_{i,t2}$ is the price at which the first-hand buyer resells the same unit to a second-hand buyer at time t_2 (second-hand sale). It is the dependent variable of our study.

5.2 Control

Quality differences are taken out in Eq(1), but we introduce time differences. Thus, we must also control for any change in market conditions. We do this using a real estate price index. We construct a set of repeat-sale price indices, with a method similar to Chau et al. (2005), for each of 40 districts in Hong Kong. The district-level index captures location-specific shocks better than a market-wide index. We construct the repeat-sale indices using second-hand sales only. As such, the corresponding time control for unit *i* in Eq(1) is the change in second-hand market prices in the same district (SP_i):

$$SP_i = ln(RSI_{t1}/RSI_{t2}) \quad (2)$$

where RSI_{t1} is the district price index at t_1, and RSI_{t2} is the district price index at t_2. By comparing FP_i with SP_i, we are able to single out any price premium enjoyed by developers relative to resellers from quality differences or changing market conditions. Since SP_i is an aggregate measure of market changes, it is exogenous to price changes of individual units FP_i.

Another change from t_1 to t_2 is depreciation. We address this issue in two ways. One is to allow FP_i to change with the age difference ($DAGE_i$) between unit *i*'s first and second sale, i.e. assuming no change in market conditions, the first-hand premium of unit *i* would appear to be larger when its second-hand sale occurs later (the building gets older). The second is to restrict our repeat-sales sample to units sold within five years after completion. Condominiums within five years are still relatively young and it is unlikely that changing ownership will induce significant renovation during this time.

Finally, we control if the first-hand sale takes place before or after building completion. It is quite common for developers in Hong Kong to sell their units before completion (presales). Chau et al. (2003) shows that the loss in rental income for presales induces a price discount. To allow for this, we use a dummy variable *PRE*, which has a value of 1 if the first-hand sale is a presale and 0 otherwise.[ix]

5.3 Empirical model for hypothesis testing

Using the first-hand price premium and other control variables described above, our empirical model is:

$$FP = a_0 + a_1 SP + a_2 SP^2 + a_3 DAGE + a_4 DAGE^2 + a_5 PRE + a_6 BIG5 + \boldsymbol{DU} + \boldsymbol{SIM} + \varepsilon \quad (3)$$

where a_0-a_6 are coefficients to be estimated; *BIG5* is a dummy variable which equals 1 if the unit is sold by the five developers with the highest market share (see *Table 1* before) and 0 otherwise; ***DU*** is a vector of variables capturing the implications of demand uncertainty; ***SIM*** is a vector of variables measuring similarity in different ways; ε is an error term. We suppress the subscript *i* to simplify presentation. We add square terms of *SP* and *DAGE* to allow for non-linearity. Table 2 presents the definition of each variable.

[Insert *Table 2* here]

We demean all right-hand-side continuous variables so that we can interpret the intercept, a_0. a_0 is the key parameter to critically test Hypothesis 1 (market power) against Hypothesis 2 (demand uncertainty). The former predicts that a_0 is positive and the latter predicts that it is negative.

Another parameter that can differentiate the two hypotheses is a_6, the coefficient of *BIG5*. If market power exists, it is most likely associated with developers with high market share. Hypothesis 1 predicts that a_6 is positive. In contrast, if demand uncertainty prevails, developers with high market share are likely to suffer most due to their high holding cost; they typically have many projects in the pipeline and have the pressure to sell their units out timely. If Hypothesis 2 is true, a_6 should be negative.

DU captures other holding-cost implications of the demand uncertainty theory:

$$\boldsymbol{DU} = b_1 DEVS + b_2 MKTS + b_3 VOL \quad (4)$$

where *DEVS* is development scale, measured by the total number of units that a developer has to sell with unit *i*; *MKTS* is market sentiment, measured by the past 12-month change in market price in log scale before the first-hand sale takes place; *VOL* is the trading volume in the second-hand market at the time the first-hand sale takes place; b_1-b_3 are their coefficients.

Hypothesis 2 predicts a lower first-hand premium when holding cost is high. A large development with more units to sell is an indication of high holding cost, whereas a positive market sentiment (a growing price trend) and high liquidity (more transactions) tend to reduce the cost to wait. As a result, we expect b_1 to be negative, and b_2 and b_3 to be positive.

5.4 Similarity

We discuss measurement of ***SIM*** separately in this sub-section. Haurin (1988) introduced the idea of measuring product uniqueness in the real estate market. He defines a property as 'atypical' if its attributes are different from the average attributes in the market. For a property with *K* attributes, the measure of atypicality (*ATP*) is the weighted sum of the absolute difference between its attributes and the market average:

$$ATP = \sum_{k=1}^{K} w_k |q_k - \overline{q_k}| \qquad (5)$$

where q_k is the quantity of attribute *k* of the subject property; $\overline{q_k}$ is average quantity of attribute *k* in the market; and w_k is the weight of attribute *k*, which is based on the implicit price of that attribute from a hedonic pricing model.

Inspired by Haurin's atypicality measure, we develop a similarity measure that replicates what some buyers would consider in choosing property. The first criterion is location. We posit that a buyer targets a location, implicitly comparing a particular first-hand unit *i* to second-hand units nearby. We define a catchment zone, within which we count the total supply of units (*S*). Since Hong Kong is a compact city, we set 1.5km (about 15-minute walk) as the radius of the catchment zone. We also try a smaller area of 1km radius as robustness check. This is our first, crudest similarity measure.

Within the catchment zone, buyers consider other units with similar characteristics as substitutes. We consider the three most important characteristics to be building age, unit size, and floor level. The first similarity criterion is therefore that a unit has to be within five years old.[x] The second similarity criterion is that a unit's size has to be within ±100 square feet of the first-hand unit. For high-rise condominiums, the vertical location of a unit affects the view and environmental quality of the unit (Wong et al. 2011) thus the third criterion is that a unit be within ±10 stories of the first-hand unit. We add up the number of units that jointly satisfy the above three criteria (*S3*).

We further divide *S3* further into market segments. The buyer who has targeted a first-hand

unit may consider other first-hand units as closer substitutes than second-hand units. Other first-hand units may be from other developments or within the same development, and these will have different degrees of substitutability. We thus separate the three components of *S3*: 1) the number of second-hand units ($S3_s$), 2) the number of first-hand units from other developments ($S3_f$), and 3) the number of first-hand units from within the same development ($S3_w$). They form our third similarity measure.

Now we can define the ***SIM*** variable in Eq(3) in three ways:

$$\boldsymbol{SIM} = c_1 S \qquad (6a)$$

$$\boldsymbol{SIM} = c_1 S + c_2(S3/S) \qquad (6b)$$

$$\boldsymbol{SIM} = c_1 S + c_3(S3_s/S) + c_4(S3_f/S) + c_5(S3_w/S) \qquad (6c)$$

where c_1-c_5 are coefficients to be estimated. In Eq(6b) and (6c), *S3*, $S3_s$, $S3_f$, and $S3_w$ are entered as a ratio to *S* because they are a subset of *S*. Hypothesis 3 predicts that all the *c's* are negative. In particular, a first-hand unit should face a stronger substitution effect from other first-hand units than second-hand units, so c_4 should be more negative than c_3. Whether c_4 should be more negative than c_5 is an empirical question. First-hand units from the same development should be a closer substitute than those in other buildings (i.e. $c_4 > c_5$), but a developer could use sale strategies to reduce the effect of self-competition (i.e. $c_4 < c_5$).

5.5 Data

We use a database of all condominium sales in Hong Kong finished between 1995 and 2012 from the Economic Property Research Centre (EPRC). Data include price, sale date, building age, floor level, and unit size. We cleaned or removed transactions that are duplicate, incomplete, or erroneous.[xi] We classify the first transaction of a unit as a first-hand sale and the rest as second-hand sales. We cut off units sold after 2012 to allow sufficient time for repeat sales to occur. This results in 88,983 pairs of repeat sales involving a developer in the first sale and a reseller in the second sale within five years of completion to minimize effects of depreciation.

Table 3 summarizes the characteristics of units in our sample statistics. As shown in Panel A, the first-hand price is lower than the second-hand price of the same unit by 6% (*FP*), simply because market prices have been rising (average *SP* being negative). The *BIG5* variable

requires data on the market share of developers. We manually compile this using raw data from the Rating and Valuation Department, the Lands Department, the Building Department and developers' annual reports. We find that 75% repeat sales pairs in the sample come from the five largest developers.

We collect the total number of units in each development (*DEVS*) from the monthly reports of the Building Department. The average development has 2,302 units, suggesting high holding costs. This partly explains why presales have been a dominant sale strategy in Hong Kong (67% of the repeat sales involve presales). Developers try to sell before completion in order to reduce inventory costs on one hand and to reduce exposure to market risk on the other.

To calculate the similarity measures, we created a residential stock database for all Hong Kong using data from EPRC and Centaline, one of the largest real estate agencies in the city. We collected the coordinates, building age, floor level, and size of each unit in the district, no matter if it was sold or not.

[Insert *Table 3* here]

Panel B in Table 3 presents the summary statistics of our similarity measures. We vary the radius of the catchment zone from 1.5 km to 1 km for robustness check. On average, there are 28,800 units within 1.5 km of a subject first-hand unit; within them, 1,764 meet the three criteria based on building age, unit size, and floor level. More than half the potential substitutes come from the second-hand market, another 23% from the first-hand development itself, and the rest from other first-hand developments. $S3_w$ remains the same regardless of the change of the catchment zone area because it captures only the units within the subject development.

6 Results

Table 4 presents the results of our empirical models. In the baseline model (column 1), both change in second-hand prices (*SP*) and its square show significantly positive signs. One percentage change in *SP* leads to approximately 0.8% change in first-hand prices (*FP*). Undoubtedly, market changes within the district are the main contributor to such a relationship. We also obtain a significantly positive *DAGE* while its square term is negative. A larger age difference in the repeat sales pair leads to a larger price decline because of depreciation, and

the depreciation rate is higher for newer properties. As expected, *PRE* has a negative sign. The presale discount results from the rental income forgone before completion.

[Insert *Table 4* here]

After controlling for market change, quality depreciation, and presale, the constant term is consistently negative. This is evidence of a first-hand discount. Developers sell a statistically identical property for 4.5% less on average than second-hand owners. The finding of a discount is consistent with the demand uncertainty theory (*Hypothesis 2*) rather than the market power argument (*Hypothesis 1*).

Moreover, the top five developers who occupy most of the market share sell at an added 1% discount compared to other, smaller developers. This finding again rejects market power (*Hypothesis 1*) in favor of the demand uncertainty argument (*Hypothesis 2*) that sellers holding hundreds of or even thousands of units should sell at a lower price to hedge against the pricing risk and limit holding costs. Any sale delay in one project could have brought huge adverse impact to the big developers who have many other units to sell in the pipeline.

In column 2, we include another three variables to further test the demand uncertainty argument through variations in holding cost. Suggested by the negative sign of *DEVS*, a larger development scale is associated with a lower first-hand price relative to second-hand price. The high holding cost caused by multiple units within a development drives the developer to lower the sale price under demand uncertainty. Both market sentiment (*MKTS*) and trading volume (*VOL*) exert strong positive impact on first-hand price relative to second-hand price. With the signal of rapid historical price increase and high liquidity in the second-hand market, developers' holding cost is lowered and do not have to cut their prices that much.

The other columns report the results of including our similarity measures, which support *Hypothesis 3*. *S* (number of units in the catchment zone) has a significant negative coefficient, meaning that the substitution effect is stronger for first-hand units than second-hand units (column 3). The degree of similarity also matters, as *S3/S*, which measures the portion of close substitutes, exerts a significant negative impact on the first-hand price relative to second-hand price (column 4).

We further compare the negative effect from different types of substitutes in column 5. *S3s* represents Type 1 substitutes from the second-hand market and has a negative coefficient. $S3_f$

and $S3_w$ measure Type 2 and 3 substitutes from the first-hand market, respectively. Both have a more negative coefficient than Type 1 substitutes, meaning that first-hand substitutes have a stronger impact on the first-hand price than second-hand substitutes.

Quality-wise, Type 3 should be the closest substitutes since they are produced by the same developer at the same time and should exert the strongest negative impact on the first-hand price. However, $S3_w$ has a smaller negative coefficient than $S3_f$. This suggests a developer may be able to use some sale strategies, such as phased sales, to reduce the impact of self-competition. Nevertheless, they do not eliminate the discount.

Appendix Table 1 presents the results of robustness checks using a different distance criterion to construct our similarity measures. The results do not differ substantially from the previous.

7 Conclusion

Housing policies that place burdens for community benefits or affordable housing on developers are increasingly common in the United States. Animus towards developers and development and the perception of ill-gotten gains likely animates the popularity of this approach (Monkkonen and Manville, 2018). The relative dearth of research on the real estate development industry, especially in regards to market concentration and market power, limits the debate over this type of policies and other efforts to improve efficiency in housing production and reduce corruption at the local level.

This paper tackles one aspect of market power in housing production. We address the question of how developers price new housing, and whether their market power allows them to set prices above that of a competitive market. In comparing the first and second-hand condominium markets in Hong Kong, we examine two inter-related issues systematically. First, since market concentration and high prices characterize the first hand housing market, it seems that first-hand sellers have market power. This, however, ignores quality differences between the two markets, as well as the theoretical proposition that market power over durable goods is difficult to attain.

Second, the market power explanation ignores the informational constraints faced by sellers. However concentrated a market, first-hand sellers do not know the highest price they can obtain

for their goods. This demand uncertainty affects first-hand sellers most because they have a larger quantity of goods to sell. Developers must charge less to maintain the same sale speed and lower their market risk.

Abundant data from the condominium market in Hong Kong enables us to examine these issues using a difference-in-differences approach. We track the first and second-hand prices of the same condominium unit over time and compare them with corresponding sales in the second-hand market. We therefore control for unobservable qualities of units such as developers' reputation. We find that the first-hand market is highly concentrated, but that first-hand unit prices are lower than second-hand prices after controlling for quality differences.

Importantly, we also find that the first-hand discount is bigger for larger developments and smaller when market liquidity is high. These findings collectively reject the argument of market power in favor of demand uncertainty. Moreover, we find that developers are more sensitive to substitutes than resellers. We define substitutes as the number of units with similar attributes within a catchment zone. In particular, we showed that a developer is competing with their own product once they have sold some of their units. Developers cannot fully offset this self-competition effect by the use of sale strategies such as phased sales.

From a policy perspective, our findings show how the second-hand market can serve as a self-regulating instrument to constrain developers' market power. Whenever a developer overprices their first-hand units, buyers would have a choice to turn to the second-hand market. The presence of such a 'threat' automatically forces developers to set a more competitive price, without the need of government intervention. This implies that governments should promote transparency (e.g. by making sales data more available) and liquidity (e.g. by shifting away from transaction taxes towards property taxes) in the second-hand market to maintain a competitive check on the price of new units.

Although we do not find evidence of market power when developers sell their units in the product market, they might still have market power in other stages of the development process. In the market for land, major infrastructure services, or permits required to build large buildings, there might be a quasi-monopsony. This is an important question for future anti-trust research in Hong Kong and abroad. Additionally, this paper suggests an important path for further research on how market conditions – especially the concentration of housing development and the relative importance of new housing in the overall market – shape the impact of market

power and demand uncertainty on the pricing of new housing.

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Table 1■ Market share of major developers in the first-hand condominium supply, 1995-2012

						Percent of new housing sold by	
Year	**The 5 developers with the highest market share**					**Top 3**	**Top 5**
1995	A	C	B	E	F	47	52
1996	C	A	B	F	H	51	61
1997	B	A	D	E	C	49	68
1998	A	D	E	B	F	51	62
1999	C	B	A	H	D	73	74
2000	B	C	E	A	J	46	62
2001	B	E	H	A	J	68	80
2002	B	C	D	A	I	55	77
2003	B	G	A	C	F	61	80
2004	B	A	E	D	J	67	71
2005	B	C	A	I	D	66	75
2006	B	A	C	D	E	62	76
2007	A	E	B	C	G	81	87
2008	A	E	C	B	G	59	75
2009	E	B	A	C	G	61	72
2010	A	B	J	E	G	80	89
2011	A	B	D	E	C	78	81
2012	E	A	B	D	J	67	88
Average	**B**	**A**	**C**	**E**	**D**	**56**	**70**

Notes: The alphabets A to J denote the identity of 10 major developers in Hong Kong. “Top 3” (“Top 5”) is the total market share of the three (five) largest developers. The figures were compiled by the authors from raw data supplied by Rating and Valuation Department, Lands Department, Building Department, and developers’ annual reports.

Table 2■ Variables description

Variables	Description
FP	Log of the ratio of first-hand price at t_1 to second-hand price at t_2 for the same unit
SP	Log of the ratio of the district price index at t_1 to the district price index at t_2
SP^2	Square of *SP* (to capture any non-linear effect)
DAGE	Building age at t_1 minus building age at t_2 for the same unit
$DAGE^2$	Square of *DAGE* (to capture any non-linear effect)
PRE	A dummy variable that equals 1 if a unit is sold by the developer before building completion (i.e. a presale) and 0 otherwise
BIG5	A dummy variable that equals 1 if a unit is developed by the five developers with the highest market share and 0 otherwise
Variables related to demand uncertainty (DU)	
DEVS	Development scale, in total number of units within a development
MKTS	Market sentiment, measured by the past 12-month change in market price in log scale before the first-hand sale takes place
VOL	Trading volume in the second-hand market at the time the first-hand sale takes place
Variables related to similarity (SIM)	
S	Number of units within a catchment zone (radius=1.5km or 1km)
S3	Number of units within the catchment zone that meet these three criteria: 1) building age is within 5 years, 2) unit size is within ±100 square feet, and 3) floor level is within ±10 storeys
$S3_s$	Number of second-hand units in *S3*
$S3_f$	Number of first-hand units in *S3* from other developments
$S3_w$	Number of first-hand units in *S3* from within the same development

Table 3■ Summary statistics for dependent and independent variables (before demeaning)

Panel A:					
	Mean	Min	Max	Std.Dev.	Obs.
FP	-0.060	-1.118	1.160	0.307	88,050
SP	-0.105	-1.150	1.224	0.317	88,050
DAGE	2.136	0.003	4.997	1.415	88,050
PRE	0.668	0	1	0.471	88,050
BIG5	0.753	0	1	0.431	88,050
DEVS	2,302	3	9,813	2001	88,050
MKTS	0.125	-0.610	1.823	0.389	88,050
VOL	7,049	5,808	20,604	4036	88,050

Panel B:								
	Radius=1.5 km				**Radius=1.0 km**			
	Mean	Min	Max	S.D.	Mean	Min	Max	S.D.
S	28,800	79	102,722	16,206	17,814	61	81,059	11,570
S3	1,764	1	11,024	1,858	1,374	1	11,024	1,565
$S3_s$	996	0	8,558	1,304	724	0	8,558	1,091
$S3_f$	368	0	5,201	658	251	0	4,571	487
$S3_w$	399	1	2,952	405	399	1	2,952	405

Notes: The definition of the variables can be found in Table 2. *S3* is a subset of *S*. The sum of $S3_s$, $S3_f$, and $S3_w$ is *S3*. Radius means the radius of the catchment zone.

Table 4■ Regression results (Radius for *S* =1.5 km)

	1	**2**	**3**	**4**	**5**
Variable	Coefficient (t-Stat.)				
Constant	-0.045*** (-32.59)	-.048*** (-34.09)	-.048*** (-34.43)	-.051*** (-36.27)	-0.051*** (-36.14)
SP	.777*** (404.12)	.761*** (393.41)	.763*** (392.57)	.769*** (396.64)	.771*** (395.41)
SP²	.144*** (33.28)	.054*** (11.81)	.053*** (11.61)	.044*** (9.49)	.043*** (9.46)
DAGE	.038*** (22.83)	.043*** (26.08)	.043*** (26.04)	.044*** (26.49)	.044*** (26.70)
DAGE²	-.004*** (-11.90)	-.004*** (-11.71)	-.004*** (-11.61)	-.004*** (-11.70)	-.004*** (-11.84)
PRE	-.006*** (-4.77)	-.005*** (-4.09)	-.005*** (-3.55)	-.008*** (-6.33)	-.008*** (-6.35)
BIG5	-.012*** (-8.49)	-.009*** (-6.29)	-.009*** (-6.20)	-.003* (-1.85)	-.003** (-1.99)
DEVS	/	-5.7E-06*** (-18.09)	-6.0E-06*** (-18.89)	-3.1E-06*** (-9.47)	-3.2E-06*** (-9.84)
MKTS	/	.043*** (24.60)	.041*** (23.24)	.055*** (30.79)	.051*** (27.96)
VOL	/	6.0E-06*** (35.26)	6.0E-06*** (35.24)	5.3E-06*** (31.48)	5.3E-06*** (31.42)
S	/	/	-2.4E-07*** (-6.30)	-5.2E-07*** (-13.44)	-5.4E-07*** (-13.17)
S3/S	/	/	/	-.288*** (-34.37)	/
$S3_s$/S	/	/	/	/	-.219*** (-17.37)
$S3_f$/S	/	/	/	/	-.524*** (-19.11)
$S3_w$/S	/	/	/	/	-.318*** (-16.36)
Obs.	88050	88050	88050	88050	88050
Adjusted R^2	.661	.672	.677	.677	.677

The dependent variable is *FP*, the log price change of the property sold by the developer in the first-hand market and resold by the first-hand buyer in the second-hand market within five years after building completion. All continuous variables are demeaned, so that the constant term can tell if the first-hand premium is positive (Hypothesis 1) or negative (Hypothesis 2). *BIG5*, *DEVS*, *MKTS*, and *VOL* are variables related to the two hypotheses too. *S*, *S3*, $S3_s$, $S3_f$, and $S3_w$ are our similarity measures for testing Hypothesis 3.
***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively; t-statistics are in parentheses.

Appendix Table 1■ Robustness test (Radius for *S* =1.0 km)

	1	2	3	4	5
Variable	Coefficient (t-Stat.)				
Constant	-0.045*** (-32.59)	-.048*** (-34.09)	-.060*** (-38.49)	-.065*** (-41.63)	-0.063*** (-40.43)
SP	.777*** (404.12)	.761*** (393.41)	.764*** (394.34)	.769*** (396.45)	.770*** (396.15)
SP²	.144*** (33.28)	.054*** (11.81)	.053*** (11.52)	.046*** (10.09)	.044*** (9.53)
DAGE	.038*** (22.83)	.043*** (26.08)	.043*** (26.10)	.043*** (26.25)	.044*** (26.87)
DAGE²	-.004*** (-11.90)	-.004*** (-11.71)	-.004*** (-11.65)	-.004*** (-11.59)	-.004*** (-11.97)
PRE	-.006*** (-4.77)	-.005*** (-4.09)	-.004*** (-3.83)	-.006*** (-4.95)	-.005*** (-4.10)
BIG5	-.012*** (-8.49)	-.009*** (-6.29)	-.008*** (-5.77)	-.004*** (-2.77)	-.005*** (-3.38)
DEVS	/	-5.7E-06*** (-18.09)	-6.2E-06*** (-19.69)	-3.5E-06*** (-10.68)	-4.1E-06*** (-12.24)
MKTS	/	.043*** (24.60)	.040*** (23.08)	.049*** (27.65)	.045*** (25.17)
VOL	/	6.0E-06*** (35.26)	6.0E-06*** (35.42)	5.6E-06*** (33.10)	5.7E-06*** (33.63)
S	/	/	-9.2E-07*** (-17.82)	-1.3E-06*** (-23.76)	-1.1E-06*** (-20.02)
S3/S	/	/	/	-.176*** (-26.21)	/
$S3_s$/S	/	/	/	/	-.168*** (-16.40)
$S3_f$/S	/	/	/	/	-.464*** (-21.77)
$S3_w$/S	/	/	/	/	-.093*** (-8.25)
Obs.	88050	88050	88050	88050	88050
Adjusted R^2	.661	.672	.674	.676	.677

Robustness test of the results in Table 4 by imposing an additional distance criterion on both *S* and *S3*: the distance of a unit has to be within 1km (instead of 1.5km) of the subject first-hand unit in order to be counted in *S*, *S3* and the *S3* components.

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively; t-statistics are in parentheses.

[i] Ming Pao, November 10, 2012.
[ii] See, for example, https://www.forbes.com/hong-kong-billionaires/list/ (last accessed 7/6/2018).
[iii] Coulson et al. (forthcoming) finds that, based on a hedonic study of Las Vegas, new homes can be sold at a premium or discount. This means overpricing should not be taken for granted.
[iv] The Hong Kong government implemented a series of new tax and mortgage-related measures in 2013 targeting first-hand markets. To avoid any bias from these measures, we did not consider transactions after 2012.
[v] Raw data from Rating and Valuation Department of Hong Kong.
[vi] See, for example, http://www.heritage.org/index/country/hongkong (last accessed 7/6/2018).
[vii] "On the receiving end: mainland Chinese money pours into Hong Kong real estate", *South China Morning Post*, April 28, 2017.
[viii] Data from Census Quick Facts www.census.gov/quickfacts/fact/table/losangelescountycalifornia/PST045217 (last accessed 7/9/2018) and Zillow https://www.zillow.com/research/data/2016 (last accessed 7/9/2018).
[ix] We also follow Chau et al.'s (2003) cost-of-carry model to adjust for the discount of presales. The results after the adjustment are similar to the results based on a PRE dummy and are not reported here.
[x] As of 2012, about 50% of the condominium units in Hong Kong were younger than 25 years old (Rating and Valuation Department).
[xi] The raw data could contain transactions recorded 1) twice, 2) with incomplete address, or 3) with too low a price (including zeros). We removed these before our analysis.