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Evolving institutions to tackle asymmetrical information problems in the housing market: A case study on 'shrinkage' of flat sizes in Hong Kong

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ABSTRACT

The phenomenon of floor area 'shrinkage' of newly completed units has long been a hot debate issue in Hong Kong's housing market. Prior to the enactment of the Residential Properties (First-hand Sales) Ordinance in April 2013, news reports had revealed that the actual useable areas of some presales housing units only accounted for 50% of the gross floor areas proclaimed in the sales brochures. Notwithstanding the alarming situation, 'shrinkage' of flat size is, in fact, a lawful act in Hong Kong. Akerlof (1970) suggests that under information asymmetry, lemons tend to crowd out non-lemons. This study attempts to investigate whether an adverse selection process is taking place in Hong Kong's housing market with reference to the shrinkage phenomenon. To measure area shrinkage, 13 private mass housing developments located on the Hong Kong Island were chosen, and a total number of 16,946 flats, were involved. This paper shows that the market is full of lemons due to the delay in responses of the law governing the sales of first-hand properties. We found that the carpet areas of the selected housing developments had fallen short of between 23% and 49% of the proclaimed gross floor area, as stated in the sales brochures. Analyzing a total number of 55,227 transactions between 1991 and 2013 of the subject premises, it shows that the turnover rates of units with the highest shrinkage ratios are about 45% more than those with the smallest shrinkage ratios. ANOVA tests have been carried out and illustrated that there are significant variations between each tenth percentile of the flats in accordance to the flat shrinkage ratios. This paper concludes with a discussion of the evolution of institutions in Hong Kong's housing market to tackle the lemon problems. Attention has been placed on the effects of mandatory, voluntary and third party information disclosure. The lessons learnt in Hong Kong will shed light on policies and legislations for the fast expanding housing markets in developing countries, especially those densely populated Asian cities undergoing rapid urbanization.

1. Introduction

Adverse selection problems have been elicited in Akerlof's (1970) seminal paper on information asymmetry. Based on the observations in the used-car market in the US, Akerlof contends that since it is difficult for buyers to discern the latent defects, irrespective of the quality, they tend to offer a lower price for a used-car for self-insurance. Sellers of high quality used-cars, usually with higher private valuations of their vehicles, are thus driven out of the market. Akerlof terms this adverse selection process as the "Lemon Principle", which could eventually lead to market collapse.

Empirical tests that show the Lemon Principle is at work in the markets that are not affluent. Most of the early studies of lemons (Arrow, 1963; Pauly, 1968; Rothschild & Stiglitz, 1976) were concerned with the insurance market; this is where the term "adverse selection" originated. More recent empirical tests that affirm presence of the Lemon Principle include Kaena and Stravrunova (2014) in the health insurance market; Cohen and Siegelman (2010) in the general insurance market; Gobbi and Lotti (2004) in the banking industry; and Lambert and Wilson (2003) in the wheat market. In the real estate market, Chau and Choy (2011), found that durable lemons are overpriced under different legal institutions governing sales information. Despite the aforementioned investigative studies, it can be stated that detailed empirical investigations of the adverse selection problem in real estate markets is far from adequate.

Hypothetically, the key reason that can be attributed to the insufficiency of empirical tests on the housing market is the high expenditures involved in conducting measurements. Hong Kong's housing market is an ideal test bed for the Lemon Principle due to its high transaction volume. Nevertheless, this is based on the premise that

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measurement costs researching the housing attributes be kept affordable. A carefully chosen element has been focused on, in order to carry out an empirical test of adverse selection, – unit size. In Hong Kong, before the ratification of the Residential Properties (First-hand Sales) Ordinance (SRPO thereafter), that came into effect on 29 April 2013, regulations governing the descriptions of unit size were ambiguous and inadequate. Maximizing usage of the regulation limitations, property developers lawfully built housing projects with a smaller useable floor area than was presented in sales brochures. However, for the buyers, the information provided by property developers proved to be a costly concern; the buyers could not precisely calculate the actual usable area their flats would have, prior to entering into a sales purchase agreement. By engaging a building professional to conduct assessments, and by utilizing established consistent procedures; this study aims to systematically measure the actual carpet area, as a proxy of actual useable area, of 16,946 selected housing units on the Hong Kong Island. This information has never been released into the public domain by any means, neither in the first-hand pre-sale market nor the second-hand market. This systematic process will enable us to expose the durable lemons in the Hong Kong housing market.

Once the durable lemons have been identified, we can then study whether Akerlof's (1970) adverse selection problem is persistent in the Hong Kong housing market. This study will trace the 55,227 transactions of the subject premises carried out between 1991 and 2013, and then verify whether or not the turnover rates of the lemons are statistically higher than that of the non-lemons. How institutions evolve to manage the adverse selection problem will be the key issue of focus for discourse, subsequent to the empirical testing. The findings and the experiences of institutional changes in Hong Kong will shed light on the rapidly expanding housing markets in developing countries. It is especially useful in the context of densely populated Asian cities. The structure of the paper is as follows. First, an introduction highlights the study. Then it will give a brief but focused literature review. The subsequent section outlines the methodologies and data sources. The empirical findings will then be discussed with reference to the laws governing sales of properties. Finally, the evolving institutions to tackle lemons in the housing market will conclude the whole paper.

2. Literature review

Information can be exploited to reduce uncertainties in making decisions. Following Coase (1937), subsequent studies such as Williamson (1973, 1985 and 1993) suggest that transaction costs exist in acquiring information, negotiating, monitoring, signing and enforcing contracts. Uneven distribution of information in the marketplace is the key reason for the existence of asymmetries (Philips, 1988). Information asymmetry may occur under different circumstances. For instance, in some economies, producers and manufacturers are reluctant to reveal completely transparent information to consumers, despite such information being available and in their possession. The vendor motivation behind this is for greater financial gain and profitability; the less information available to the consumers, the greater the leverage the sellers have to realize higher sales pricing. Due to the lack of complete information, the consumers stand to make imprecise judgments of the real value of products. Ultimately, the number of transactions within a market will eventually diminish due to a lack of confidence by consumers to purchase goods and services.

Asymmetric information leads to problems such as moral hazard and adverse selection. Williamson (1985) suggested that information impactedness is another complication that is the result of information asymmetry. Information impactedness arises in complex contracting situations, in which the buyer and the seller possess private knowledge and information, respectively. Opportunism is a possible outcome which leads to contract hazards, of which the transaction costs could be prohibitively high to overcome and hence lead to market failure.

Empirical studies of the Lemon Principle are considered less available than those dealing only with the theoretical work. It is largely due to the high measurement costs pertaining to the qualities of the subjects. In the insurance industry where the idea of adverse selection is originated, some empirical evidences contrary to Akerlof (1976) have been produced. In the French automobile insurance market, Chiappori and Salanié (2000), found neither adverse selection nor moral hazard problems in the industry. In a US study, the National Medical Expenditure survey (Cardon & Handel, 2001) showed no empirical evidence that less healthy people had subscribed to higher coverage of medical insurance products, and thus rejected the notion that adverse selection took place in the market. Nevertheless, also in the US Medigap insurance market, Keane and Stavrunova (2016) concluded that there was adverse selection, but that the effect was negligible.

Contrastingly, several studies have come to conclusions based on empirical evidence affirming the Lemon Principle, for example, Engers, Hartmann, and Stern (2009) in the automobile market; Mocan (2007) in the child-care market; Downing, Jaffee, and Wallance (2009) in the mortgage-backed securities market; and Lambert and Wilson (2003) in the wheat market. In a recent paper by Bajari, Dalton, Hong, and Khwaja (2014) which deployed a semi-parametric analysis on insurance claim data of a large-scale self-insured employer, they found statistical evidence of both moral hazard (overconsumption of healthcare services) and adverse selection (higher premium plans attract more employees with latent health problems). Cohen and Siegelman (2010) also conducted comprehensive empirical studies and reviews of adverse selection and moral hazard in other insurance markets.

In the field of real estate, empirical studies on information asymmetry are also scanty. In an earlier study, Chau, Yiu, and Wong (2002) found no empirical evidence of adverse selection in Hong Kong's housing market between 1995 and 2000. They argued that the most influential piece of information affecting property prices is the cost of land, which is rather symmetrical information in nature.

Referencing an empirical test on Hong Kong's housing market, Chau and Choy (2011) investigated problems from information disclosure perspectives. Results suggested that even if transacting parties are forced to disclose adverse information, this does not necessarily increase efficiency; but it may render desirable effects if the total social costs can be saved by such disclosure. For specific information that is very costly to research and obtain, a compulsory disclosure requirement might suffice. As an example, presentation of flat size by property developers; current regulations require property developers to disclose the unit size in a specific format during pre-sale. Prior to April 2013 there was no standard definition or prescribed format to convey the information on the size of the flat to the buyer. This can and has resulted in considerable variance in the flat size buyers perceived during the pre-sale stage, and what they realized upon completion and seeing the actual flat. Several factors may give rise to the variance in flat sizes; the thickness of the load bearing walls inside the flats, the provisions of bay windows, curtain walls, room divisions, external hallways, and public areas. Construction projects carried out by different developers exemplify significant variances in terms of floor area efficiency. To reliably calculate the real shrinkage of usable area requires a consistent measurement method of floor areas. This paper attempts to track the adverse selection process in the housing market by the review of empirical test results used to measure the shrinkage ratios and turnover rates of 16,946 premises over a study period between 1991 and 2013.

3. Methodology

This study posits that those durable lemons in Hong Kong's housing market can be identified by measuring the shrinkage rates of the housing units. Understanding some key terminologies of area measurement in Hong Kong is useful to understand the methodology.

The two major types of area interpretation customarily adopted in Hong Kong, namely Gross Floor Area (GFA) and Saleable Area (SA), could have confused the general public. GFA is the most commonly

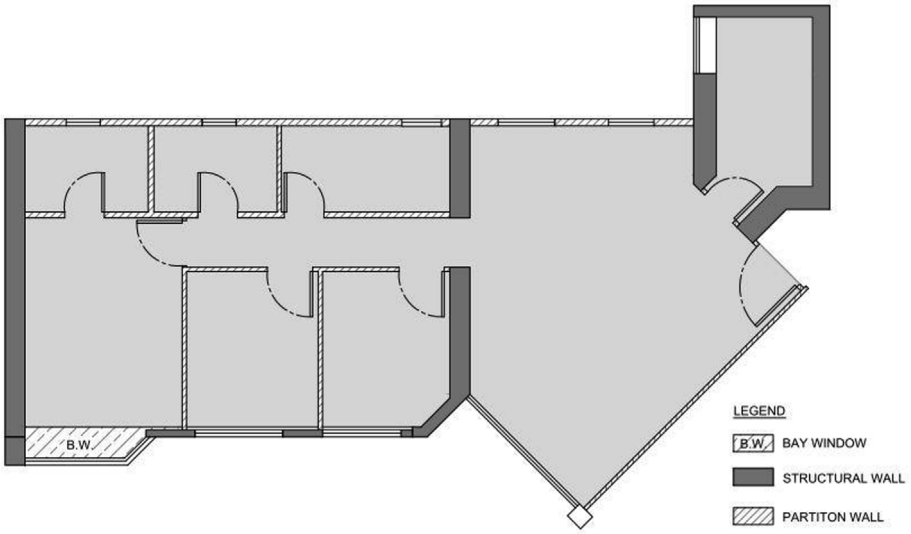

Fig. 1. Floor Plan of Unit A (comparatively low shrinkage ratio).
*Source: Buildings Department and the authors

used area information stated in the sales brochures for decades, which comprises the floor area of a unit, and a share of all 'common areas', such as corridors, lift lobbies and clubhouses within the entire housing development. So virtually the total GFA of all units embraces every single inch of buildable area within a housing development. Nevertheless, since there is no legitimate and consistent definition of GFA in the regulations governing sales of first-hand premises, the information displayed on the sales brochures is, by and large, self-regulated. Akerlof (1970) suggests that reputation is a self-evolving institution to tackle with the lemon problems. The influence of reputation is evidenced by the housing market in Hong Kong, where some reputable developers tend to produce units with higher efficiency ratios than the others. These developers tend to command a higher premium. Among many different ways, lowering the GFA figures in sales brochures can attain higher efficiency ratios. After the enactment of the SRPO in 2013, nevertheless, GFA can no longer be displayed in the sales brochures. This was a measure deemed to prevent the possible misleading information being shown in developer's sales brochures. By contrast, SA is always better defined than GFA. The definition is a result of a joint effort between the government, professional bodies and the Consumer Council. It attempts to exclude the common areas of the residential development to be shared by each unit from the GFA. SA has long been construed as the exclusive useable floor area of a unit, until new building methods and layouts deployed in recent decades rendered some units significantly smaller than others, albeit of their identical SA. The "vanishing" areas include the exterior and internal walls, and also the extensive uses of utility platforms for air-conditioners, electrical and other utility installations. Although SRPO has refined the definition of SA by splitting up various components including balcony and utility platform to be displayed in the sales brochures, in reality, the actual useable floor areas have not been truly reflected by SA.

Information asymmetry may arise in Hong Kong's first-hand property market, because most of the products sold are uncompleted units. So, it is not possible for prospective buyers to inspect the housing units, and hence they need to rely on the information provided by the sellers. The sellers possess more information advantages than the buyers do. While the housing developers have been providing GFA/SA information for legal compliance, the actual useable floor areas are never made known to the buyers in the first hand market before the units are handed over. Thus, this study measures the 'carpet area' of each unit to reflect the actual usable floor area of the subject premises. For the purpose of this study, carpet area refers to the net effective covered area within the unit, exclusively enjoyed by the occupier, excluding balconies, utilities platforms, bay windows, air conditioning platforms and other similar features. It is measured from the internal face of the unit, excluding the columns, load-bearing walls, and internal partitions. This is the net effective usable space that occupier can actually enjoy.

There is no public information explicitly revealing the actual useable floor areas in Hong Kong, neither from statutory bodies nor developers. For this study, a building professional was thus hired to measure the carpet area of the targeted developments under the authors' supervision.

Before 2013, as both GFA and SA figures were displayed in the sales brochures, generally, the public would refer to the efficiency of the floor area as the 'sales efficiency', so that

Sales Efficiency = (Saleable Area / GFA)*100%

The sales efficiency typically ranged from 70% to 80% for a mass housing development in Hong Kong.

In this study, efficiency is redefined as Net Carpet Efficiency:

Net Carpet Efficiency = (Carpet Area/Saleable Area)*100%

While the GFA Flat Shrinkage ratio is interpreted as:

GFA Shrinkage Ratio = [(GFA – Carpet Area) /GFA]*100%

The Saleable Flat Shrinkage ratio is interpreted as:

Saleable Area Shrinkage Ratio = [(Saleable Area – Carpet Area) / Saleable Area]*100%

Figs. 1 and 2 shows an example of the vanished area for a comparatively low shrinkage flat and a high one with similar GFA.

The GFA of the unit in Figure, Unit A, 1 is 1060 s.f., and the saleable area is 878 s.f. It comprises: i) the exclusive usable floor area (i.e. carpet area in light grey colour) of 760 s.f.; ii) the structural walls and internal partition walls of 106 s.f. (dark grey, and hatched, respectively); iii) the bay windows of 12 s.f. Items ii) and iii) take up an area of 118 s.f. in total. By adding the 'common area' allocated to the unit of 182 s.f., the total 'vanished' area is approximately 300 s.f.

The GFA shrinkage ratio of Unit A is about 28%, while the Saleable Area shrinkage ratio is about 13%.

To compare, the GFA of the unit in Fig. 2, Unit B, is 1030 s.f. and the saleable area is 750 s.f. It comprises: i) the exclusive usable floor area (i.e. carpet area in grey colour) of 530 s.f.; ii) the structural walls and internal partition walls of 130 s.f.; iii) the bay windows of 45 s.f.; iv)

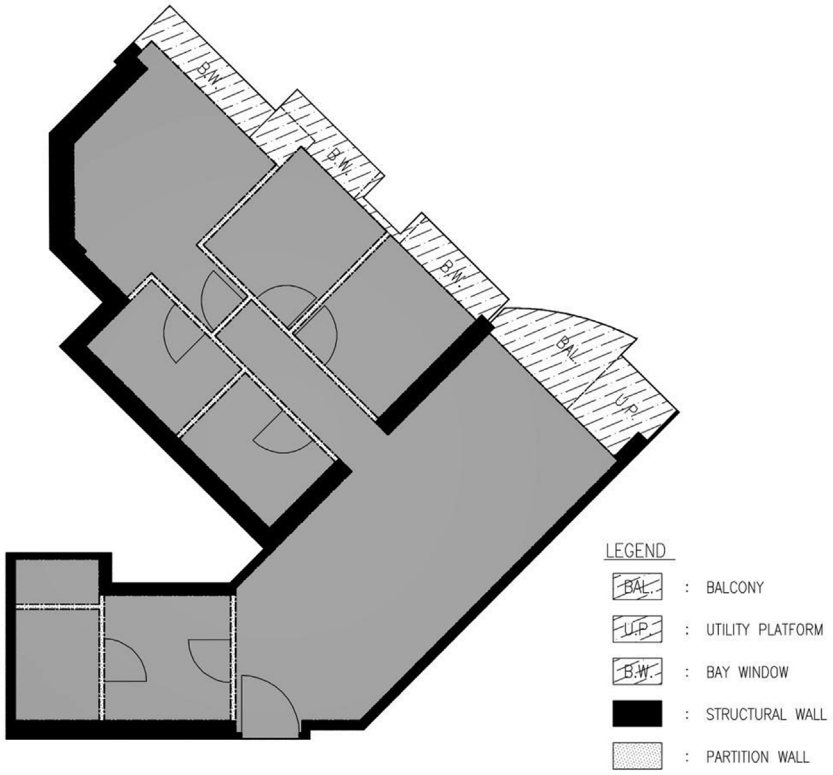

Fig. 2. Floor Plan of Unit B (comparatively high shrinkage ratio).
*Source: Buildings Department and the authors

balcony of 25 s.f.; and v) the utility platform of 20 s.f. Items ii) to v) take up an area of 220 s.f. in total. By adding the 'common area' allocated to the unit of 280 s.f., the total vanished area is approximately 500 s.f.

The GFA shrinkage ratio of Unit B is about 49%, while the Saleable Area shrinkage ratio is about 29%.

In short, the difference of the vanished areas of these two flats with similar GFA, i.e. 300 s.f. for Unit A and 500 s.f. for Unit B, is around 200 s.f. It represents a variation of 21% (i.e. 49%–28%) of GFA shrinkage. The current market price of this kind of premise is about HK$16,000 p.s.f. gross (US$ 2051 p.s.f.). Hypothetically, it accounted for a loss of approximate HK$3.2 million (about US$410,000) for a first-hand buyer who chose to purchase Unit B, as oppose to purchase Unit A, due to the lack of area shrinkage information.

By understanding and using these definitions, we can now reconstruct the actual efficiency ratios and hence identify the durable lemons in the market. To test the hypothesis that adverse selection exists in the market, we calculated the turnover rates of the subject housing units between 1991 and 2013 by splitting them into tenth percentiles, i.e. 10th, 20th, 30^{th} ….100^{th}, in terms of the shrinkage ratios. The null hypothesis is that there is no significant difference between the turnover rates of each tenth percentile of the properties.

4. Data sources

The main focus for this study is to examine whether adverse selection exists in the market.

A total of 13 mass housing developments[1] located on the Hong Kong Island were selected for this study. The selection criteria of the housing estates are as follows. First, we only selected those housing estates that fell onto the Rating and Valuation Department's Private Domestic Price Indices for Popular Developments. It was because the transaction prices can be easily deflated for further statistical analyses. Second, only those housing estates with their first assignment of deed titles completed after 1991 were selected. It was because housing transaction records were digitized only after 1991. This will enable future studies to compare the overpricing premium in the first and second hand markets. Third, because of budget constraints, we only studied the properties on the Hong Kong Island, which is one of the three key geographic segments of the property market in Hong Kong.

While the analytical framework of this study can be replicated to the other two geographical segments in Hong Kong, there is no compelling reason to believe that these sub-markets are fundamentally different from the one on the Hong Kong Island. As of April 2017 (Land Registry, 2017), about 25% of residential transactions in Hong Kong took place on the Hong Kong Island, which amounted to about one-third of the total transaction value of the whole market. Thus, the empirical results of the premises on the Hong Kong Island should be a representative one. To compute various efficiency ratios, GFA and SA figures were obtained from the Economic Property Research Center (EPRC) property database. The carpet areas were measured by a trained person under professional supervision. There are in total 16,946 flats with carpet areas measured in this study.

The transacted records were also obtained from the EPRC property database, which processed the original data from the Land Registry. To enhance the accuracy of the analysis, only transaction records of the formal *Agreement for Sales and Purchase* were being used. The period between 1991 and 2013 was chosen because the database covers transaction data starting from 1991, and the SRPO was enacted in 2013. After eliminating the outliners, the total number of transactions collected for these flats over this period was 55,227.

[1] The 13 mass housing developments include The Orchards, Grand Promenade, The Leighton Hill, Robinson Place, Illumination Terrace, Island Place, Island Resort, The Belcher's, Dynasty Court, The Redhill Peninsula, South Horizons, Les Saisons and Bel-Air on the Peak.

Table 1
Various forms of floor area efficiency ratios.

	Sales Efficiency[a]	Carpet Efficiency	Net Carpet Efficiency	Flat Shrinkage %
	SA/GFA	Carpet/GFA	Carpet/SA	GFA- Carpet/ GFA
Median (%)	79%	67%	85%	33%
Range (%)	72%–84%	51%–77%	69%–98%	23%–49%

[a] Before April 2013, Sales Efficiency was the only floor area ratio presented in developer sales brochures.

5. The empirical tests and findings

Table 1 illustrates the variance for different kinds of efficiency ratios and also the flat shrinkage ratios among the 16,946 numbers of flats in the selected developments.

Before the enactment of the SRPO, the sales efficiency ratio, as measured by SA/GFA, had dominated the public perceptions about the usability of floor areas within a unit. The ratios ranged from 72% to 84%, whereas the median was 79%. Then, we computed the carpet efficiency ratio by using the carpet areas we had measured. Data in Table 1 show that the actual usability of the units was substantially lower than perceived, evidenced by the reduction of the median ratio to 67%, and a range skewed towards to the low side from 51% to 77%.

In Table 1, the column Net Carpet Efficiency attempts to show how much actual usable floor area is entailed in the SA. The figures range from 69% to 98%. In other words, the actual usable floor area "vanishes" for, inter alia, the thickness of walls, utility platforms and other usages, ranging from 2% to 31% (i.e. 1–Net Carpet Efficiency).

The last column in Table 1 shows the Flat Shrinkage Ratios, the figures ranging from 23% to 49%. This paper posits that the higher the shrinkage ratio, the more likely a flat is a lemon.

After finding the lemons, we then proceeded to the adverse selection test. We have divided all the 16,946 units into ten 10th percentiles in accordance to their flat shrinkage ratios. We hypothesize that if the adverse selection process takes place in the market, the turnover rate for the units with smaller flat shrinkage (i.e. larger carpet area with respect to GFA), is expected to be smaller, and vice versa. Hence the null hypothesis is that there exists no statistical significant difference in term of turnover rates between each group. For the purpose of this study, turnover rate is defined as the total number of transactions for sale within the study period, i.e. 1991 to 2013, divided by the total number of flats in the corresponding 10th percentile.

Table 2 shows the turnover rates of units fall between the 10th and 50th percentiles. These are the flats with relatively smaller flat shrinkage. The average turnover rate shows that, on average, each flat changed hands for 2.85 times between 1991 and 2013.

The comparison in Table 3 shows the average turnover rates of units with a relatively higher flat shrinkage, which are more likely to be the durable lemons in the market. The average turnover rate suggests that, on average, each flat was resold 3.67 times from 1991 to 2013, which is higher than the figures in Table 2.

The median shrinkage ratio is 33% for all ten 10th percentiles, which could serve as an implicit benchmark differentiating lemons and non-lemons in Hong Kong's housing market.

In order to show that the average turnover rates are statistically different between groups, an ANOVA Test was carried out. The null hypothesis carries the following form:

$$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 = \mu_7 = \mu_8 = \mu_9 = \mu_{10}$$

where μ_1 is the mean of the 10th percentile, μ_2 is the mean of the 20th percentile, and so forth.

Table 4 indicates that there is a significant variation between these groups. This study provides new evidence showing that an adverse selection process is taking place in the housing market in Hong Kong. The results appear to show a progressive increase of the turnover rate in accordance to the increase in flat size shrinkage. Taking a closer look at the 10th and 100th percentiles respectively, the empirical results suggest lemons tend to be resold more often than non-lemons. A flat of about 49% shrinkage rate (lemons) was resold 45% more often than a flat of less than 28% shrinkage rate (non-lemons) within the study period.

6. The evolving institutions to tackle lemons in the housing market

The "Flat Shrinkage" phenomenon has long been a hotly-debated issue in Hong Kong, especially under the skyrocketing property prices. The empirical results have unveiled why new institutions were called for, so as to tackle the problem. The newly-enacted SRPO in 2013 is an attempt to ease the lemon problem, which imposes more stringent requirements for area descriptions in the sales brochure. In a nutshell, the SRPO removes the measure of GFA entirely, and so SA is the only legitimate floor area description in the sales brochures. The definition of SA has been refined and made clearer. Now, in particular, a number of items such as balcony, utility platform and verandah, etc., must be listed in addition to the SA. By so doing, the first-hand buyers can better gauge the actual useable floor areas, and so can the subsequent buyers. A new authority has been set up to scrutinize the descriptions of floor areas and other important sales information. The new law addresses the information asymmetry problem by a mandatory information disclosure method (Chau & Choy, 2011). It is aimed to provide a fair and transparent platform for the buyers to obtain more accurate and realistic sales information before making buying decisions.

The SPRO establishes an institution that highlights mandatory information disclosure. Apart from standardizing measures of floor areas information, it also makes legal requirements on the dissemination of price lists, show flats and sales arrangements, together with advertisements and TV commercials. Detailed dimensions, the fittings, finishes and appliances, etc., within a unit are also required to be disclosed. It is now even mandatory to use certain font sizes of text characters and letters used in information leaflets (sales brochures). Grossman (1981) argues that the duty of disclosure may lead to an overinvestment in producer insurance and general prices may increase as a consequence if the sellers don't know what specific pieces of information to disclose. This new institution that requires the sales brochures to cover a wide array, if not excessive, amount of information will increase the information costs to both the sellers and buyers. In order to produce a

Table 2
Turnover rates of flats from 10th to 50th percentile.

Percentile	Flat Shrinkage % for the Percentile	Ranges for the Flat Shrinkage Ratio	No. of flats involved	No. of Transactions	Turnover Rate
10th	27.82%	< 27.82%	1751	5003	2.86
20th	29.03%	≥27.82% and < 29.03%	1647	5315	3.23
30th	30.48%	≥29.03% and < 30.48%	1727	4178	2.42
40th	31.43%	≥30.48% and < 31.43%	1684	4993	2.96
50th	32.75%	≥31.43% and < 32.75%	1667	4708	2.82

*Flat Shrinkage Ratio refers to [(GFA-Carpet Area)/GFA]x100%.

Table 3
Turnover rates of flats from 60th to 100th percentile.

Percentile	Flat Shrinkage %[a] for the Percentile	Ranges for the Flat Shrinkage Ratio	No. of flats involved	No. of Transactions	Turnover Rate
60th	34.60%	≥32.75% and < 34.60%	1678	5273	3.14
70th	36.51%	≥34.60% and < 36.51%	1683	6190	3.68
80th	38.05%	≥36.51% and < 38.05%	1719	6204	3.61
90th	40.30%	≥38.05% and < 40.30%	1653	6172	3.73
100th	48.64%	≥40.30% and < 48.64%	1737	7191	4.14

[a] Flat Shrinkage Ratio refers to [(GFA-Carpet Area)/GFA]x100%.

Table 4
Result of ANOVA test.

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
10 Percentile	5003	134450	26.87387	0.47718
20 Percentile	5315	150658.8	28.34596	0.149812
30 Percentile	4178	124219	29.73168	0.189977
40 Percentile	4993	154161	30.87542	0.072251
50 Percentile	4708	151207	32.11703	0.148268
60 Percentile	5273	177800.5	33.71904	0.356896
70 Percentile	6190	220080.1	35.55414	0.340692
80 Percentile	6204	232068.7	37.40631	0.235719
90 Percentile	6172	242455.3	39.2831	0.533035
100 Percentile	7191	298258.7	41.47667	1.976409

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	122071	9	136230.1	268774.8	0	1.880055
Within Groups	27987.07	55217	0.506856			
Total	1254058	55226				

comprehensive sales brochure, substantial extra resources are allocated by the housing developers to gather the required information. Usually an independent checker is engaged to double check the validity of the information. It is common to see tonnes of paper are being wasted to print these sales brochures, that are not read thoroughly by the prospective buyers.

In addition, meaningless mandatory disclaimer statements are also required to be displayed in the advertisements, during radio broadcasts as well as on TV commercials. On the other hand, although the search cost as well as the reliability of the information may appear to be reduced, as compared to the voluntary information disclosure, buyers, in fact, also need to spend extra time to process the overly-provided property information. With the additional information costs incurred to both parties, the net benefit of the SPRO may be less significant than originally anticipated.

In order to counter this bulking-up of sales information, an informal practice has been developed by the sales agents to tackle the increasing information cost arising from the SPRO. For each housing development for sales, the estate agents design a simplified leaflet of their own in which only the salient features of the premises are displayed. Nevertheless, since each of the sales agency companies distribute their own leaflets for each housing development, as an unintended consequence, a prospective buyer may receive multiple copies of property-related information from the sales agency offices, which are largely duplicated and unnecessary.

Brand names and guarantees were two counteracting institutions illustrated by Akerlof (1970) to deal with the lemons before the enactment of SPRO in 2013. For example, Chau, Ng, and Hung (2001) found that reputable housing developers had already been commanding a higher premium in Hong Kong. Some housing developers also devised buy-back guarantees within a certain period after the sales of first-hand properties. Usually properties with guarantee arrangement are with exquisite quality products and after-sales services. It is, in fact, a signalling arrangement (Spence, 1973), which attempts to differentiate high quality properties from the lemons. In practice, nonetheless, exercising the buy-back option is never heard of.

Another method to tackle the lemons was through voluntary information disclosure. Housing developers could opt to follow the sales guidelines issued by the Real Estate Developers Association of Hong Kong (REDA), a voluntary self-regulated association of housing developers, to serve as a signal that they are not lemons. These guidelines originally mainly attempted to enhance market transparency by providing additional information required by the laws, such as information on the separate floor areas occupied by ancillary facilities. However, these guidelines have been superseded by the SPRO since its enactment in 2013.

The emergence of third party information providers is another evolving institution to deal with the lemon problem. Social media are popular tools to convey sales information, reviews and analysis of the properties to the prospective buyers. This relatively new mean of information dissemination is complementary to prevailing third party information providers, such as newspapers, radio and TV programmes, which are all considered very effective, especially to the younger group of prospective buyers.

To sum up, this paper has unveiled that the adverse selection process was prevalent in Hong Kong's housing market before the enactment of the SPRO in 2013. A unit with a shrinkage ratio of the top tenth percentile (shrinkage rate of 49%) tends to change hands 45% more often than a unit of the bottom tenth percentile (shrinkage rate of 28%) between 1991 and 2013. The paper has also documented the formal and informal rules and the emergence of counter-institutions to deal with the lemon problems. Hong Kong's experiences suggest that once the durable lemons are produced, they keep on flipping in the market. So responsive formal and informal institutions to facilitate information

disclosure are essential for the sustainable development of the housing market. It is especially important for many cities in the developing world under rapid urbanization. Policies and laws governing information disclosure can be designed in such a way that consumer interests can be protected on the one hand, and overinvestment of information will not be resulted on the other hand. Further studies will be required to investigate the overpricing premium (Chau & Choy, 2011) commanded by the housing developers arising from the asymmetrical information. The empirical results of this study have paved the way for subsequent and related studies.

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