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Superstition, Conspicuous Spending, and the Housing Market: Evidence from Singapore

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Abstract

We study the effect of superstition and conspicuous spending motive on housing demand and price in Singapore. We find that buyers pay less for homes with unlucky addresses and more for homes with lucky addresses. There were fewer housing transactions on inauspicious days of the lunar calendar when people are advised to avoid making major economic decisions. This suggests that superstitious belief still affects economic activities. The demand for lucky addresses is also weaker on these inauspicious days, suggesting that superstitious belief indeed affects the demand for lucky addresses. Moreover, the price premium for lucky address is significantly higher for apartments of larger size or on top floors. Since these two housing features can signal wealth and are highly visible, the larger price premium suggests that conspicuous spending motive also plays a significant role in the Singapore housing market. We also find that informed buyers, even with less superstitious or conspicuous spending motive, might still pay price premiums for lucky addresses. In contrast, uninformed buyers are unlikely to pay a premium for these addresses.

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1 Introduction

For most people, buying a house is their single largest financial commitment. Like other investments, housing investments present many uncertainties – notably, the quality of the construction and maintenance, whether the home will fit the family's future needs, the development of the neighborhood, and the evolution of interest rates and housing prices. Research in psychology suggests that individuals rely on superstition as a way to cope with misfortune and uncertainty, and to rationalize a complex world (Vyse 1997; Ang et al. 2014; Zhang et al. 2014). Given the large stakes and many uncertainties, people may well rely on superstitious cues when buying a home.

Prior researches have shown that many Chinese have a strong preference for houses numbered "8" and dislike houses numbered "4" (Shum et al. 2014; Fortin et al. 2014). These authors generally attribute these preferences to superstitious belief. However, these preferences could also be expressions of conspicuous spending to signal future wealth or status, rather than or in addition to superstition. Where to live, how big a house is, and expensive interior decorations are all visible and even conspicuous. House numbers are visible as well. Although they have no intrinsic value, people might pay more for number "8" to show that they can afford it. Just as they pay more to live in a more expensive neighborhood or build a flashier mansion.

Existing literature has found evidence on individuals engaging in conspicuous spending to signal their future wealth or status (Feltovich et al. 2002; Charles et al. 2009; Heffetz 2011). For instance, living in a big house or having a house on the top floor of a building could be possible ways to signal wealth or status to potential business partners and spouses (Wei et al., 2012). Charles et al. (2009) and Heffetz (2011) emphasize the need to understand conspicuous spending in housing, yet qualify that such research is challenging due to confounding factors and measurement issues.

This paper investigates the effects of superstitious belief and conspicuous motive on housing demand in Singapore. Our unique empirical setting offer three advantages in studying the impact of superstition on asset prices and trading behavior. First, the Singapore's government imposes strict regulations on the numbering of high-rise buildings,

which requires the unit numbers to follow a fixed format; and prohibits the manipulations by developers by skipping unlucky numbers in a building. The unique rules allow us to eliminate possible endogeneity caused by the supply-side adjustments by developers, and clearly identify the demand-side preferences of Chinese buyers. Second, by using only data on brand-new apartments in high-rise buildings, where the floors are highly homogeneous, if not identical, we could analyze prices and buyer preferences by examining variations across locations and unobserved quality of interior upgrades and maintenance of the units. Third, Singapore is a multiracial country comprising Chinese majority and other non-Chinese minority races. Using the non-Chinese group as a clean control group, we identify the superstitious belief that is specific to only Chinese. The non-Chinese buyers are unlikely to have consumption motives, but are likely to have only investment motives when buying houses with lucky addresses.

Specifically, under the competing hypotheses of superstition and conspicuous spending, we develop predictions for the effects of various factors on buyer preference for lucky addresses. Next, we construct a novel dataset consisting of over 54,000 transactions of new apartments in Singapore's private housing market between 2000 and 2009, matched to the data on ethnicity, nationality, age, and information of firm registration. Then, we run empirical contests between alternative hypotheses of superstition and conspicuous spending.

Following the existing literature, we first document a considerable price discount of 1.3 percent for very unlucky addresses, and a price premium of 1.9 percent for very lucky addresses. The price differentials exist both across unit numbers and floors. Consistent with Fortin et al. (2014), we also find that the observed price differentials depend on the share of Chinese buyers in the locality. In particular, buyers can only enjoy price discounts for unlucky addresses in buildings where the share of Chinese buyers of unlucky addresses is at least 80 percent. The evidence suggests that buyers are sorted by their preferences for unlucky and lucky addresses, and the observed price differentials are determined by the preferences of the marginal buyers.

We then investigate the possible mechanisms: superstition and conspicuous spending.

To test the role of superstition in lucky address premium, we use home buyers behavior that is correlated with superstition but not correlated with conspicuous motives to measure whether individuals are superstitious. One indicator for buyers' superstitious belief is their economic activities during the "Ghost Month". According to the Chinese Astrology, the "Ghost Month" that falls on the seventh month of the lunar calendar is inauspicious. Individuals should avoid making important decisions during the month. Consistent with this belief, we indeed observe that there are fewer housing transactions and firm registrations during the Ghost Month (Agarwal et al. (2018)). Moreover, individuals who registered a firm in the Ghost Month are also more likely to buy an apartment in the Ghost Month, which suggests that the decline in both activities in the Ghost Month is likely to be driven by people's superstitious belief rather than pure chances. Hence, it is reasonable to assume individuals who bought an apartment or registered a firm in the Ghost Month are less superstitious. If superstitious belief is indeed responsible for the observed price differentials between apartments with lucky, unlucky, and neutral addresses, these less superstitious buyers should have weaker demand for lucky addresses. Our estimation results confirm this prediction, and support that superstition can help to explain the observed price differentials.

To test the role of conspicuous motive in lucky address premium, we use home characteristics that are correlated with conspicuous spending but uncorrelated with superstition. Specifically, apartments of larger size or on top floors can signal their owner's wealth. Hence, these two housing features could have conspicuous values. Moreover, we show that the demands for these two types of apartments are not correlated with the degree of superstition, as measured by the propensity of property purchase or firm registration during the Ghost Month. If the willingness to pay for lucky addresses and the dislike for unlucky addresses are partially driven by conspicuous consumption, these buyers are also willing to pay a premium for larger apartments or apartments on top floors. Our results are consistent with this prediction, and support that conspicuous consumption is also responsible for the observed price differentials.

Having documented the roles of superstition and conspicuous consumption, we further

analyze the behavior and interaction between different type of buyers. Presumably, some buyers are neither superstitious nor conspicuous. These buyers could be either informed – buyers who know about other people's preference for lucky addresses – or uninformed – buyers who do not know about the preferences of others. To the best of our knowledge, our paper is the first to show how these buyers are affected by other buyers' preferences in the housing market. We show that informed buyers, even though they themselves are neither superstition nor conspicuous, might still pay price premiums for lucky addresses. This is most likely because they might sell their apartments to superstitious or conspicuous buyers in the resale market. In contrast, uninformed buyers are unlikely to pay a premium. These results suggest an interesting redistribution effect due to the preference for lucky addresses: uninformed buyers might benefit more than informed buyers.

Our paper makes several contributions to the literature. First, we contribute to the literature on the roles of superstition and conspicuous spending in the housing market. Consistent with the results of Hirshleifer et al. (2012), Shum et al. (2014), and Fortin et al. (2014), we show that the preference for lucky numbers affects both the demand and the prices for housing unit with lucky addresses. Since the Singapore's government imposes strict regulations that disallow developers to manipulate the numbering of units, we are able to disentangle the demand-side preferences from the supply-sides adjustments, and thus eliminate possible endogeneity in the supply-side responses that could distort the results. While the preference for lucky numbers could be caused either by superstition or by conspicuous consumption; the existing literature invariably assumes that superstition is the key factor driving the price differentials across different address types. Our paper provides direct empirical evidence showing that both superstition and conspicuous spending matter in explaining buyers preference for lucky addresses. We further analyze how the heterogeneity in buyers' preferences affect the price differentials. Consistent with the hypothesis that it is the preferences of the marginal buyers that determine the magnitudes of the price differentials, we find that the shares of different types of buyers in the locality affects the observed price differentials. Our thought experiment conducted using Singapore's housing market data could be naturally extended to explaining consumer behaviors

in other markets.

Second, we contribute to board literature of behaviorial finance and show non-standard preference affects important financial decisions (DellaVigna 2009). Existing literature have studied the effect of non-standard preference in various markets, including weather effects on personal mood and stock returns (Hirshleifer and Shumway 2003), risk attitudes in capital markets (Kliger and Levy 2003), and household spending (Agarwal et al. 2012). Some researchers associate solar and lunar eclipses with lower trading volume and stock returns in U.S. and Asian equity markets, and they find larger volatility in stock prices during the eclipses (Lepori 2009). In China, newly listed firms with lucky listing codes are also found to have traded at premiums, but the premiums dissipate over three years (Hirshleifer et al. 2016). We study a particular preference: the preference for lucky number due to superstition or conspicuous spending. We show that home purchase decisions could be driven by superstitious belief or conspicuous motive of buyers, especially for Chinese buyers.

Moreover, by analyzing the behavior and interaction between different type of buyers, we show that while informed buyers pay price premiums regardless of whether they have superstitious or conspicuous preferences, uninformed buyers are unlikely to pay a premium. As a result, uninformed buyers could outperform informed buyers when they sell their apartments. These findings are related to the literature on heterogeneous investors in financial market (Delong et al. 1990; Hong and Stein 1999; Mendel and Shleifer 2012; Barberis et al. 2015).

2 Institutional Backgrounds

2.1 Chinese Numerology and Astrology

Chinese is a language with a common written script, but spoken differently in different regions. In some Chinese dialects, the number "8" is pronounced like the word "prosperity", while the number "4" is pronounced like the word "death". Consequently, "8" is considered to be lucky, and "4" to be unlucky. As Hirshleifer et al. (2016) observe, Chi-

nese numerological symbolism, which derives from Confucian and Taoist beliefs, deviates from the scientific notions of causality in two ways. The similarity in the pronunciation of a number to another word is believed to have a causal impact. Further, association with the number (and so, indirectly with the word) is believed to have an effect on the likelihood of experiencing favorable or unfavorable outcomes.

The effect of Chinese numerological superstition has been extensively studied. The government of Hong Kong sells new vehicle license numbers by public auction. In auctions between 1997 and 2009, the prices of vehicle license numbers including the lucky "8" were systematically higher, while prices of vehicle license numbers including the unlucky "4" were lower (Ng et al. 2010).

However, the premium for "8" could also be interpreted as conspicuous spending to signal wealth or status. The conspicuous spending interpretation is consistent with the premium for "8" falling after 2006, when the government introduced vanity license numbers, thereby providing car owners more avenues to signal their wealth and status.

Most research into Chinese numerological superstition has focused on real estate. Fortin et al. (2014) analyzed the sales of about 117,000 of single-family homes in the Greater Vancouver area between 2000 and 2005. In neighborhoods with relatively more Chinese residents and in repeated transactions, the transacted prices of houses with street address numbers ending in "4" were 2.2 percent lower and those ending in "8" were 2.5 percent higher than houses with other addresses. However, these findings might be confounded by unobservable differences between houses, or explained by conspicuous spending.[1]

Shum et al. (2014) studied a random sample of high-rise residential sales in Chengdu, a large city in the southwest of China, between 2004 and 2006. The prices of apartments on floors ending with a number "8" were 8.7 percent higher when sold as second-hand but not significantly higher when sold as new. Buyers who had more 8's in their mobile telephone numbers were more likely to buy apartments on the lucky 8th floor. However,

[1]Houses numbered "4" were older, while those numbered "8" were newer and had better features. The difference in age might be related to people buying houses numbered "4", rebuilding and then, petitioning to renumber. In neighborhoods with more Chinese, house numbers ending in "0", "5", and "8" were more frequent (Fortin et al. 2014: Figure 3).

more educated people were not less likely, and older people were not more likely to buy 8th floor homes. To the extent that age and education are correlated with superstition, these results are not consistent with superstition as the explanation behind the premium paid for number "8". Indeed, the estimates seem more consistent with conspicuous spending. A mobile number with more 8's is very conspicuous.

Hirshleifer et al. (2016) investigated the effect of superstition on equity markets in the context of initial public offerings in China between 1991 and 2005. On the Shanghai and Shenzhen stock exchanges, listed companies are identified by a numerical code, which is the equivalent of the U.S. ticker. For instance, the listing code of the Industrial and Commercial Bank of China is 601398.SS. Consistent with superstition, the proportion of issuers with lucky listing codes (that included at least one lucky digit and no unlucky digit) was abnormally high, and the proportion of issuers with unlucky listing codes was abnormally low. Moreover, newly listed shares with lucky listing codes initially traded at a premium relative to shares with unlucky listing codes, but the premium dissipated within three years.[2]

Besides numerological superstition, astrology also plays a significant role in the daily life of the Chinese. One well known example is that Chinese people attach real meaning to the zodiac calendar, which comprises a 12-year cycle, each named after an animal. The dragon year is considered to be particularly auspicious and is associated with surges of new births among Chinese people. In a study of the U.S. population, Johnson and Nye (2011) found that Asians born in dragon years are more educated than those born in other years, which suggests that Asian parents invest more in the education of dragon children. However, in a separate study using Singapore's data, Agarwal (2017) found the opposite results indicating that dragon babies face less favorable labor market and economic outcomes in terms of salaries, university admissions, savings and consumption, when they grow up.

In addition to the zodiac, another influential Chinese astrological belief is that people

[2]Different researchers defined the lucky numbers somewhat differently. Shum et al. (2014) defined both "6" and "8" as lucky, while Hirshleifer et al. (2016) considered "6", "8", and "9" to be lucky. Nevertheless, a common thread is that "8" is lucky and "4" is unlucky.

should avoid making important decisions, such as opening a business, buying or renovating a house, and having a wedding, during the *Ghost Month*, the seventh month of the lunar calendar year. This is because according to Chinese folk culture, the gates separating the hell realm and the living realm open on the fifteenth day of the seventh month. Ghosts and spirits of deceased ancestors come out from the lower realm to visit the living families, and in some cases, to seek revenge on those who have done wrongs against them in their past life. To pacify spirits wandering on the earth, a considerable number of Chinese in Singapore burn ritualistic offerings on road sides, such as food, joss sticks, candles, paper money, paper houses and clothes in the Ghost Month. As a result, the belief is still very salient in modern Singapore.

2.2 Singapore Housing Market

Singapore is an island nation with a total land area of about 716 square kilometers. As of June 2012, the population of the country was estimated at 5.31 million, which include 3.29 million citizens and 533,000 permanent residents. The resident population is ethnically diverse comprising 74 percent Chinese and 26 percent other races.[3] Singapore's ethnic diversity provides a natural setting to investigate the effect of superstition and conspicuous consumption in the housing market. Non-Chinese and individuals who purchased properties or registered firms during the Ghost Month provide a ready control group to test whether the preference for lucky numbers and dislike for unlucky number are due to superstition.

Singapore has among the world's highest home ownership rate of over 90 percent. The residential market comprises two segments. About 77 percent of the housing stocks are apartments or flats built by a government housing agency, the Housing and Development Board (HDB), mostly for direct sale to eligible citizens at subsidized prices. Public housing is primarily owner-occupied, with a small proportion of the flats set aside for rental by low income families. The government closely regulates the sale and resale of public housing.[4]

[3]These and the following statistics of Singapore's population and housing market are drawn from the Yearbook of Statistics 2013 and the Census of Population 2010, Department of Statistics, Singapore.

[4]A unique feature of Singapore's public housing is an explicit policy to ensure ethnic diversity (Wong 2013). The Housing and Development Board regulates the resale of apartments by building and area to

The remaining 23 percent of the housing stocks are in the private housing market. It is laissez-faire, except that foreigners are not allowed to buy low-rise buildings such as single-family homes. Thus, we focus on Singapore's private housing, where preferences for lucky and unlucky numbers are more likely to be fully revealed.

The Singapore government strictly regulates street addresses and the numbering of apartments. The Inland Revenue Authority of Singapore (IRAS), which is responsible for collecting taxes on real estate and real estate transactions, has stipulated a specific format for the numbering of all apartment buildings. The format comprises a block number and then a unit number arranged in a sequence of two digits or characters designating the floor, a hyphen, and two or three digits or characters designating the location on the floor. For instance, apartment number 05-08 is the 8th unit on the 5th floor.

The IRAS enforces compliance with the numbering plan. With regard to the numbering of floors, the IRAS states unequivocally, "'01' is normally assigned to the first level of a building where the main entrance is located, followed by '02' for the second level and so on. Omission of any numbers is not allowed" (IRAS 2013: Paragraph 3B(1)). The IRAS is equally firm with regard to the numbering of apartments on each floor: "Units are generally numbered sequentially in a clock-wise direction starting from "01". An apartment number will be provided for each distinct unit shown on the floor plan. Omission and reservation of any numbers are not allowed for a residential development" (IRAS 2013: Paragraph 3B(3)). In addition, the IRAS assigns a unique 6-digit postal code to every building.[5]

prevent the percentage of any particular race from exceeding specified quotas.

[5]By contrast, the authorities in other countries are more flexible. In the United States, many high-rise hotels lack a 13th floor (USA Today, 2007). The Hong Kong authorities are particularly accommodating of real estate developers in floor numbering. The sales brochure for the Arch, a development in West Kowloon, boldly advertised that "[t]here are no 14, 24, 34, 40-49, 53-54, 58, 60-61, 64 & 74F". In the absence of units with unlucky numbers, any research would be limited to investigating only the effects of lucky numbers.

3 Empirical Strategy

3.1 The Demand for Lucky Addresses

Previous research on the demand for residential housing among Chinese buyers identifies preferences over the house number (Fortin et al. 2014) as well as the floor number (Shum et al. 2014). To encompass both aspects, we define an ordinal variable for the lucky address number as follows:

4 = very lucky if the last digits of both floor and unit numbers are "8";

3 = lucky if the last digit of either floor or unit number is "8" and neither last digit is "4";

2 = neutral if not very lucky, lucky, unlucky, or very unlucky;

1 = unlucky if the last digit of either floor or unit number is "4" and neither last digit is "8";

0 = very unlucky if the last digits of both floor and unit numbers are "4".

The above ordinal classification represents Chinese dislike of the number "4" and preference for the number "8" in a fairly flexible way. It explicitly allows complementarity in lucky/unlucky addresses; for instance, the premium for very lucky addresses needs not be double the premium for lucky addresses. Moreover, by grouping addresses with only one lucky (unlucky) number regardless whether it is from unit number or floor, we implicitly restrict that buyers are indifferent between address like 02-08 or 08-02 after controlling for all other housing characteristics. This restriction helps us to separately identify the impact of floor and luckiness of an address on housing price. Without this constraint, the identification of the price premium of lucky floor depends on the assumed functional form of the relationship between housing price and floor. This is because lucky floors are on average four floors higher than unlucky floors.[6] The only ambiguity of our classification is

[6]Our sensitivity analyses indeed show that while the price differentials estimated using our preferred specification are not sensitive to whether floor is included as a linear or quadratic function, the coefficients on lucky and unlucky floors are sensitive to how floor is controlled for.

whether to classify mixed addresses like 04-08 and 08-04 in the same category as addresses with neither unlucky nor lucky numbers such as 03-07. In the main estimates, we classify mixed addresses as neutral, and exclude them in a robustness check.

We estimate an ordered logit model of the buyer's choice by address to investigate the effect of superstition and conspicuous spending on housing demand. Specifically, we assume that the latent utility received by buyer i from an apartment with a type j address in quarter q of year t can be expressed as,

$$y^*_{itq} = \alpha_0 + S_i\alpha_1 + X_i\gamma + \mu_t + v_q + \eta_{itq}. \tag{1}$$

where S_i denotes buyer $i's$ demographic, economic, and other characteristics; X_i denotes legal and physical attributes of an apartment including legal tenure, location, size, and floor level; μ_t denotes transaction year effects to control for changes over time in the macroeconomy that affect all residential real estate transactions in the same way; v_q denotes transaction quarter effects to control for potential seasonality; and η_{itq} is a random variable with a logistic distribution; α and γ are the estimated coefficients. The probability that buyer i will buy an apartment with a type j address is defined as

$$P(y_{itq} = j) = P(\kappa_{j-1} \leq y^*_{itq} \leq \kappa_j) = F(y^*_{itq} - \kappa_j) - F(y^*_{itq} - \kappa_{j-1}), \tag{2}$$

where κ is the cut-off value; $j \in (0, 1, 2, 3, 4)$ indicates the luckiness of an address; and F is the logistic cumulative function defined as

$$F(z) = \frac{e^z}{1 - e^z}. \tag{3}$$

While we are interested in how personal characteristics, such as superstitious belief, affect the demand for lucky addresses, it is still important to control for housing attributes, X_i. This is because an individual's decision to buy an apartment with a particular address could be correlated with legal and physical attributes of the apartment. If buyers with different characteristics differ in their preference for these legal and physical attributes, then in the absence of proper control for these attributes, the estimated effects of the

characteristics might be biased. For instance, if the Chinese have a stronger preference for high floor apartments than non-Chinese, then Chinese buyers will be more likely to purchase apartments on the 8th floor than on the 4th floor, even if they are neither superstitious nor spending conspicuously.

Our identification assumption is that in the absence of superstitious belief and conspicuous motive, buyer's characteristics do not affect the demand for lucky addresses after controlling for legal and physical attributes. To justify this assumption, we note that the design of Singapore apartments is fairly uniform, with very homogeneous layout on each floor. A "04" unit is the same on every floor of the building, and similarly, the "08" unit is the same on every floor. Furthermore, the government's strict regulation and the clockwise numbering rule prevent real estate developers from selectively numbering more desirable apartments (for instance, closer to or further from the elevator); and disallow home-owners from renumbering their apartments. Initially, uniform interior design is provided by the developers for all apartments in the same building. While home buyers may change the interior designs after they buy the apartments, our analyses focus on new sale by the developers so that the price differentials across different types of addresses are not confounded by the subsequent modifications made by individual buyers. Thus, the controls for physical attributes would effectively eliminate most heterogeneity among apartments in the same building.

After controlling for legal and physical attributes, the estimate of α_1 reveals whether a buyer's preference is correlated with her characteristics. For instance, if S is an indicator variable for non-superstitious buyers, then a negative and significant $\hat{\alpha}_1$ suggests that superstitious belief indeed affects the demand for lucky addresses. One way to measure the degree of a buyer's superstitious belief is by looking at the day of the transaction. As we discussed in Section 2.1, buyers who bought an apartment during the Ghost Month are unlikely to be superstitious.

3.2 The Price of Lucky Addresses

We run the following regression to estimate the impact of the luckiness of an addresses on housing price:

$$p_{ijtq} = \beta_0 + \pi_j + X_j\beta_1 + \mu_t + v_q + \epsilon_{ijtq}, \tag{4}$$

where p is the logarithm of real price in 2014 Singapore dollars per m^2 paid by buyer i for a type j address in quarter q of year t; π_j, where $j \in (0, 1, 3, 4)$, captures the price differential between type j and the neutral addresses ($j = 2$); μ_t is transaction year effects used to control for changes over time in the macroeconomy such as changes in the interest rates that affect all residential real estate transactions in the same way; v_q is transaction quarter effects to control for potential seasonality; ϵ_{ijtq} is a random variable.

A test for $\pi_j = 0, \forall j$ is equivalent to testing whether superstitious belief or conspicuous motive can affect housing prices. Since a lucky address can only be used to show off its buyer's status if people are aware that it is lucky, the existence of superstitious belief in an economy is necessary for the conspicuous motive to manifest itself through the willingness to pay for lucky addresses. However, it does not mean that all buyers who spend conspicuously on lucky addresses are superstitious. As long as there exist enough superstitious buyers, buyers trying to spend conspicuously will have an incentive to pay price premiums for such apartments. In a housing market that is dominated by superstitious or conspicuous buyers, non-superstitious or non-conspicuous buyers might still need to pay price premiums for lucky addresses and can enjoy discounts for unlucky addresses. This is because location plays a dominate role in people's housing choice. On the one hand, non-superstitious or non-conspicuous buyers might have to compete with superstitious or conspicuous buyers for apartments with lucky addresses. On the other hand, non-superstitious or non-conspicuous owners of apartments with unlucky addresses might have to sell to superstitious or conspicuous buyers if there are not enough demand from non-superstitious or non-conspicuous buyers. Therefore forward looking non-superstitious or non-conspicuous buyers may also demand discounts for unlucky addresses.

Besides living in an apartment with very lucky address, living in a large apartment or on a top floor also signals the buyer's status. Hence, these two features could also be used to measure the conspicuous aspects of housing consumption. However, since size and floor have intrinsic functional values that are appreciated by all buyers, their impacts on housing prices cannot be used directly to test the existence of conspicuous motive. Under the assumption that superstitious belief is uncorrelated with the preference for large or top floor apartments, if there is no conspicuous motive, the price differentials should not depend on the size and floor of an apartment. If there is conspicuous motive, the price premiums for lucky addresses should be bigger for apartments of larger size or on top floors. If superstitious buyers do not have a stronger preference for these types of apartments than the other buyers, finding an incremental price premium for larger or top-floor apartments with lucky addresses would support the conspicuous motive. Therefore, we further run the following regression:

$$p_{ijatq} = \beta_0 + \pi_j + X_j\beta_1 + \phi_a + \sum_j \phi_{aj} A_a \times (S_j = j) + \mu_t + v_q + \epsilon_{ijatq}, \tag{5}$$

where ϕ_a captures the impact of attribute A_a (such as large size or top floor) on housing price, and ϕ_{aj} captures an incremental price premium (discount) for an apartment with a type j address and attribute A_a. When larger size is used as the attribute, we set A_a to 1 if an apartment is larger than 90% of our sample apartments.

4 The Data

Our study combines four different sources of data. The first is a dataset of legal filings for private housing transactions with the Registry of Land Titles between January 1995 and December 2012. The records contain information on address, name of the building, floor and unit number, attributes of the apartment, and details of the transaction. The apartment attributes are legal tenure (freehold or leasehold), type of development (apartment, condominium, or landed), and size in square meters. The transaction details are date, names and national registration numbers of buyers and sellers, type of sale (new sale,

subsale, or resale – as explained below), price, and whether the purchase was financed by a mortgage loan.

A "new sale" refers to a sale of an apartment by the real estate developer, which may occur either before or after the government issues the "temporary occupation permit", which certifies that an apartment is safe for inhabitation. A "subsale" refers to a sale of an apartment that occurs before the government issues the temporary occupation permit, by a party who is not a developer. A "resale" refers to a sale of an apartment after the issuance of the temporary occupation permit, by a party who is not a developer.

The second source of data is a system that we build to classify any person by name into one of four ethnicities: Chinese, Malay, Indian, and others. The classification is based on the value of a linear combination of the characteristics of the data. We used a proprietary dataset of personal information to train the ethnic classifier system. When validated against a data set of 1,327 persons with confirmed ethnicity, the system achieved accuracy of over 99 percent in recognizing Chinese names and 82.7 percent in recognizing non-Chinese names (over 99 percent of persons classified as Chinese were actually Chinese, and 82.7 percent of those classified as non-Chinese were actually not Chinese). We used the classification system to identify the ethnicity (Chinese or non-Chinese) of buyers named in the residential property transactions.

The third source of data is a simple classifier that we build to infer a Singaporean's year of birth from their national registration number. The government issued national registration numbers in sequence by year of birth to people born in the year 1955 and after. Consequently, the classifier only works for these people. For people born earlier, the national registration number was not issued in sequence. So it is impossible to infer their age from the national registration number. For these cases, we assume that they were born in 1954.

The fourth source of data is a dataset of the firm registration records between 2008 and 2016. For each firm registration, the record includes registration date, names and national registration numbers of the parties. We link the firm registration records to residential property transactions through the buyer's national registration number.

Our data offer several advantages when testing the impact of superstition on the asset pricing and the trading behavior. First, unlike other papers use sale data that do not contain buyers attributes, we are able to match our property sale data to the personal details of buyers. Second, in our unique housing market setting, we directly measure the superstitious beliefs and preferences using the Chinese buyers identities and their house buying and business registration activities during the Ghost months in our identification strategies. Third, we collect the housing transaction data over a long period of 18 years, and calculate the holding period returns for the buyers. Through the long time-series data, we are able to investigate the consumption and investment motives of the buyers of houses with lucky addresses.

Note that many residential property purchases involve more than one buyers, such as husband and wife buying jointly. In classifying buyers by race, we construct indicator variables that equal 1, if at least one buyer belongs to a selected race category; and 0 otherwise. For instance, an apartment is identified to be bought by Chinese, if at least one buyer is Chinese.

Like Shum et al. (2014), we focus on high-rise residential projects. The floor plans for high-rise buildings are quite homogeneous, if not identical. Possible differences from a common floor plan include first floor apartments that might include a terrace, and top floor apartments that might include a terrace or staked-up floors (double storey units). By contrast, single-family homes are heterogeneous, and may differ in unobservable ways that correlate with the house numbers (Fortin et. al. 2014).

Unlike previous studies, we consider only the primary market, i.e., new sales. Apart from a few transactions with missing details, the data on new sales are quite complete. Importantly, all new apartments in a building are sold by the same seller (i.e., the developers), and so within-development estimates would not be confounded by unobserved differences. In addition, the quality of new apartments is uniform within a building. By contrast, studies of the secondary market are subject to possible selection bias and differences among sellers. Moreover, resale apartments might also differ in ways that we cannot observe, such as renovation and maintenance, which might be correlated with unit or floor

number.

A government agency, the Urban Redevelopment Authority, publishes limited data on all private housing transactions in the online database called REALIS. However, REALIS does not publish the personal information of buyers and sellers. Figure A.1 compares the numbers of new sales of private housing in the REALIS database and our proprietary dataset from the legal filings. Evidently, the legal filing dataset we obtain provides a good coverage from 2000 onward and up to 2009. Between 2000 and 2009, transactions volumes from both datasets show a cyclical pattern, peaking in 2002 and then falling sharply in 2003, which is the year of the SARS (Severe Acute Respiratory Syndrome) crisis. Transactions recovered gradually to a new peak in 2007, before falling sharply again in 2008 on the advent of the global financial crisis. Accordingly, we focus our study on transactions that occurred during 2000-2009. After excluding transactions with incomplete or obviously wrong information, and those with corporate buyers, we end up with 54,236 new sale transactions for our main analysis. As a robust check, we also consider transactions in the secondary market, i.e., subsales and resales in some regressions.

[Insert Table 1 here]

Table 1 presents the summary statistics. The average real price is S$8,424 per square meter (2014 = 100) or about US$462 per square foot (converted at the average exchange rate of one Singapore dollar to 59 U.S. cents in 2014). The size of the average apartment is 118.7 square meters or 1277.7 square feet, and the average price of an apartment is US$590,183. With regard to nationality and ethnicity, 78.1 percent of the buyers are Singaporeans (citizens or permanent residents), and about 93 percent of those Singaporean buyers are Chinese. The ethnic classifier system is accurate in classifying the ethnicity of Singaporeans, but less accurate for foreigners. Among the foreign buyers, there are Indonesian Chinese with Malay-like names, which the ethnic classifier might wrongly classify as non-Chinese.

Table 2 compares the distribution of luckiness of addresses between apartments bought by Chinese and non-Chinese buyers in the primary market, as well as between apartments in the primary and the secondary markets. While the Kolmogorov-Smirnov test cannot

reject the null hypothesis that the distributions of lucky addresses bought by Chinese buyers and non-Chinese buyers are the same, the mean test indeed shows that Chinese are more likely to buy apartments with lucky addresses. The Kolmogorov-Smirnov test strongly rejects the null hypothesis that the distribution of lucky addresses in the primary market is the same as that in the secondary market. The proportion of unlucky and very unlucky addresses tend to the higher and those of lucky and very lucky addresses tend to be lower in the secondary than in the primary market. This suggests that at the given market price differentials, owners of apartments with lucky addresses are less likely to sell their units while owners of apartments with unlucky addresses are more likely to sell. The differences between the primary and the secondary markets are due to the fact that while both the buyer's and seller's preference toward lucky addresses affect the secondary market, it is mostly the buyer's preference that affects the primary market as the sellers are all corporations whose primary goal is to maximize their profits. This provides further supporting evidence for us to focus on the primary market.

For a first look at the data, Figure 1 plots the estimated coefficients on the last digit of the unit number in a regression of the logarithm of price per square meter on indicators of the last digit of a unit number in the primary market. Figure 2 plots the estimated coefficients on floor levels. In addition to floor and the last digit of unit number, we also control for apartment size, and building fixed effects. Clearly, prices are the lowest for units with numbers ending in "4" and the highest for units with numbers ending in "8".

[Insert Figure 1 here]

The dotted and solid lines of Figure 2 indicate floors with the last digits ending in "4" and "8", respectively. Unlikely in Figure 1, the price differentials between units located on floor ending with "4", "8", and other numbers are much harder to discern. This is likely due to the strong, and almost linear relationship between the price and floor at least up to the 47th floor.[7]

[Insert Figure 2 here]

[7]It appears that the relationship between floor and price is weaker in buildings with 45 or more floors. This is largely because there are only nine such transactions in our dataset.

5 Estimation Results

5.1 Lucky Addresses and Housing Prices

To quantify the impacts of lucky addresses on housing prices, Table 3 presents the ordinary least squares (OLS) regressions of the housing price (specified as the logarithm of price per square meter). The luckiness of an address is defined based on the combination of the last digits of unit number and floor number. They are included as a series of dummy variables with the neutral address as the reference group. By doing so, we assume that the price premium for an apartment whose unit number ends with "8" will be the same as an apartment whose floor number ends with "8". This assumption helps us to disentangle the impact of the luckiness of a floor number on housing price from the impact of buyer's preference for apartments located on higher floors. Columns (1)-(4) of Table 3, report the estimates that control for size, floor, legal tenure (freehold) and development type (condominium), progressively including finer controls for location: starting with no control for location, followed by 2-digit postal district fixed effects, 4-digit postal district fixed effects, and building fixed effects (6-digit), respectively. Our data comprise transactions in 64 out of a total of 80 2-digit postal districts in Singapore. These 2-digit postal districts are further divided into 721 4-digit postal districts. Each 4-digit district consists of between 1 and 37 apartment buildings, with an average of less than 6 buildings. Each building has a distinct 6-digit postal code. Hence, the 4-digit district fixed effects control more stringently for differences between neighborhoods than the 2-digit fixed effects.

[Insert Table 3 here]

Regardless of the postal district controls, apartments with very unlucky addresses ($j = 0$) are always the cheapest, and those with very lucky addresses ($j = 4$) are the most expensive. Controlling for the 2-digit postal districts reduces the estimated discount for very unlucky addresses by 2.6 percentage points from 3.9% to 1.3%, and the premium for very lucky addresses by 0.8 percentage points from 3.7% to 2.9%. The results suggest significant variations in the composition of apartments with lucky addresses across districts.

In Singapore, the maximum height of each building varies across districts, as stipulated by the government's Master Plan.[8] Buildings with fewer than eight floors do not have any very lucky addresses. Hence, the supply of very lucky numbers would be relatively lower in districts with fewer high-rise buildings. If the average housing price varies across the districts, failing to control for geographic location could bias the estimated impact of the luckiness of an address on housing price. Except for the premium for very lucky addresses, the estimated relationships between the luckiness of an address and price hardly change when we control for the 4-digit compared to the 2-digit postal districts. The results suggest that the 4-digit postal district fixed effects effectively control for most of the bias caused by cross-district variations in the composition of apartments with lucky addresses. Indeed, the coefficients on lucky addresses hardly change, even when we impose a more stringent control with the 6-digit postal codes, which is unique to each apartment building. After controlling for the building fixed effects, the estimated discount for very unlucky addresses is 1.3%, and the premium for very lucky addresses is 1.9%.

To check whether the results are stable over time and robust to the sample selection, column (5) reports the estimates using an extended sample period from 1995 to 2013. The estimates in column (5) are almost identical to those in column (4), suggesting that our price differentials across different types of addresses are stable over time, at least since 1995. Column (6) extends the sample to include transactions in the secondary market. While including transactions from the secondary market increases the price discounts for unlucky addresses and decreases the price premiums for lucky addresses slightly, the differences are not statistically significant.

When we define the luckiness of an address, we do not differentiate buyers' preference for lucky floors from that for lucky unit numbers. For instance, we assume that an apartment located on the 8th floor with a unit number 07 will be ranked equally as an apartment located on the 7th floor with a unit number 08. In other words, we assume that people value the luckiness of a floor number and the luckiness of a unit number

[8]The Master Plan is a statutory land use plan that guides the physical developments of Singapore in the medium term; and the land use plan defines the permitted land use type and density for every land parcel in Singapore. The plan is reviewed every 5 years.

equally. To check whether our results are sensitive to how we rank an address's luckiness, we relax this assumption by including indicators for lucky and unlucky unit numbers and for lucky and unlucky floor numbers separately and re-run all regressions. An apartment is considered as having a lucky unit number if it ends with 8 (referred as U8 unit) and as having an unlucky unit number if it ends with 4 (referred as U4 unit). An apartment is considered as having a lucky floor number if it ends with 8 (referred as F8 unit) and as having an unlucky floor number if it ends with 4 (referred as F4 unit). We also include the interaction between U4 and F4, and between U8 and F8, to capture the potential non-additive relationship between lucky (unlucky) unit number and lucky (unlucky) floor number.

Table 4 reports the estimation results. In general, the results are consistent with Table 3. There are price discounts for unlucky addresses and price premiums for luck addresses. While the coefficients on U4 and U8 are relatively stable across specifications, the coefficients on F4 and F8 are less stable. This is due to the fact that building height varies considerably across postal districts and the coefficients on F4 and F8 are sensitive to the estimated relationship between floor and housing price. Nevertheless, the coefficient on U4 is similar to that on F4 and the coefficient on U8 is similar to that on F8 in columns (2) and (3), which supports our assumption that buyers value the luckiness of a floor number and that of a unit number equally. Controlling for building fixed effects decreases the estimated discount for F4 while having little effect on other estimates. Even with the change in the coefficient on F4, the joint effect of the luckiness of a floor and that of a unit is still very close to what we found in Table 3. For instance, according to the estimates reported in column (4), the implied discount for very unlucky units is 1.3% and the premium for very lucky units is 1.9%. The negative sign on the interaction between U4 and F4 and the positive sign on U8 and F8 suggests that the impact of the luckiness of a floor number and the luckiness of a unit number is likely to be complimentary. This suggests that our conclusions are not sensitive to how we specify the luckiness of an address.

Having established the relationship between housing price and the luckiness of ad-

dresses, we investigate whether this relationship is driven by superstitious belief or conspicuous consumption or both in the next two subsections.

5.2 Numerological Preferences

Because an apartment with lucky addresses only has a conspicuous spending value if people believe that it is lucky or share the superstitious belief, the differences between Chinese and non-Chinese cannot be used to differentiate these two sources. In this subsection, we propose to use people's economic activities during the Ghost Month. Presumably, people who did purchase a house or register a firm during the Ghost Month are likely to be less-superstitious if some people avoid making major economic decisions during the Ghost Month. To test this hypothesis, we first examine whether people are less likely to buy an apartment or register a firm during the Ghost Month. From our transaction data and the firm registration data, we calculate the number of apartments sold and the number of firms registered each day. Then we regress these two series on a Ghost Month indicator. We also control for year fixed-effects, month fixed-effects, and day-of-week fixed effects.

Table 5 reports the results. Column (1) shows that daily firm registration volume declines by 11.4, which is about 7 percent of the sample mean. Column (2) shows that daily new sales volume declines by 4, which is about 22 percent of the sample mean. The empirical evidence indicates that a considerable number of people in Singapore still avoid engaging in major economic activities during the Ghost Month. Hence, those who did purchase a flat or register a firm during the Ghost Month are likely to be less-superstitious.

To further check whether less superstitious individuals in one market also tend to be less superstitious in another market, we estimate the relationship between these two activities among Singaporeans who bought at least one apartment between 2000 and 2009 and registered at least one firm between 2008 and 2016. Column (3) shows that the proportion of people who bought an apartment in the Ghost Month is 0.8 percentage points higher among those who registered a firm in the Ghost Month than those who registered a firm in other months. Since only 11 percent of our sample bought an apartment in the Ghost Month, the 0.8 percentage-point difference between these two groups is economically

meaningful. We add personal characteristics as additional controls and report the results in column (4). The estimated relationship between these two activities hardly changes, suggesting that the acts of avoiding economic activities during the Ghost Month are not purely by chance, but by conscious actions of buyers.

As for personal characteristics, the estimate shows that younger buyers are more likely to purchase a flat in Ghost Month, i.e. they are less superstitious than older cohorts. While statistically insignificant, the negative coefficient on non-Chinese might seem strange. This is because we have already included an indicator for those who registered a firm during the Ghost Month. If we do not control for that, the coefficient on non-Chinese would have been positive, although still not significant. Nevertheless, the coefficient on "buyer with an English name" will become statistically significant, suggesting that the more westernized individuals are less affected by the traditional Chinese superstitious belief.

[Insert Table 5 here]

Having established the relationship between people's economic activities in the Ghost Month and superstitious belief, we further analyze how superstitious belief affects the demand for luck addresses. Table 6 reports the ordered logit regressions with the categorical choices ordered from the very unlucky unit (last digits of floor and unit numbers are both "4") to the very lucky unit (last digits of floor and unit numbers are both "8") as the dependent variable. Column (1) shows the results using all new sales with controls for legal tenure, physical attributes, year and month of purchase fixed effects, and the 4-digit postal district fixed effects. The coefficient on "Bought in Ghost Month" dummy is estimated at -0.091 (s.e. 0.053), which implies that the demand for lucky addresses is significantly lower in the Ghost Month than in other months. Assuming that people who purchase apartments during the Ghost Month are less superstitious, our results suggest that superstitious belief indeed affects the demand for lucky addresses.

The coefficient on non-Chinese is negative and statistically significant at -0.144 (s.e. 0.029), suggesting that Chinese buyers have a stronger incentive to buy luck addresses than non-Chinese. Column (2) further controls for whether the buyer also registered a firm during the Ghost Month and restricts the sample to include only individuals who

registered a firm and bought an apartment. The restriction shrinks our sample by about 50%. The coefficient on "Registered a firm in the Ghost Month" dummy is negative but not statistically significant. Nevertheless, adding the new control has little impact on the coefficient on "Bought in Ghost Month". Column (3) further includes the interaction between "Bought in Ghost Month" and "Registered a firm in the Ghost Month". The coefficient on the interaction term is -0.356 (s.e. 0.197). It suggests that individuals who bought an apartment as well as registered a firm during the Ghost Month has a much weaker demand for lucky addresses. This evidence supports the hypothesis that superstitious belief is responsible for the demand for lucky addresses. Column (4) examines whether the demand for luck addresses differs between investors, defined as those who bought multiple properties during the sample period, and non-investors. The coefficient on investor is positive and statistically significant at the 1% level.[9] This result suggests that investors are sophisticated buyers and they take future buyers' preference for lucky addresses into considerations when they invest in properties. It implies that given a large proportion of superstitious and conspicuous buyers in the market, even non-superstitious, non-conspicuous buyers might contribute to the price premiums due to their sophistication.

[Insert Table 6 here]

It should be noted that the demand for lucky addresses does not necessarily imply that apartments with lucky addresses will command a price premium. For instance, if apartments with lucky addresses account for 10% of the total market, while only 5% of the buyers are willing to pay a price premium for these apartments, these buyers will not need to pay a premium for these lucky addresses in a competitive market. Nevertheless, these 5% buyers will buy apartments with lucky addresses. This implies that buyers are sorted according to their willingness to pay for the lucky addresses, and the price premiums are determined by the marginal buyers' willingness to pay. The logic is similar to the economic effects of discrimination in Becker (1957) where wage gap is determined by marginal employer's preference. Given that ethnic Chinese makeup 74% of Singapore's

[9] We have tried several alternative ways to define investor, such as holding multiple properties or bought more than 2 properties during our sample period. The estimate is not sensitive to how we define this variable.

population according to the 2010 population census and 87% of the buyers in our sample, the marginal buyers for apartments with lucky addresses are more likely to be Chinese than non-Chinese. Nevertheless, non-Chinese could still be the marginal buyers in some buildings.

To test whether marginal buyers drive the price premium, we study the heterogeneous effect on price across building with different proportion of Chinese buyers. We first check whether there are enough variations in the proportion of Chinese buyers across buildings by lucky and unlucky addresses. Figure 3(a) plots the cumulative density function of the share of Chinese buyers in a building's lucky addresses, and Figure 3(b) plots the cumulative density function of the share of Chinese buyers in a building's unlucky addresses. In these plots, an address is considered as lucky if its address type $j > 2$, and unlucky if its address type $j < 2$. Figures 3(a) shows that the share of Chinese buyers of lucky address is lower than 50% in 7.6% of the buildings and lower than 80% in 26% of the buildings. Figure 3(b) shows that the share of Chinese buyers of lucky address is lower than 50% in 7.4% of the buildings and lower than 80% in 29% of the buildings. The slightly smaller share of Chinese buyers of unlucky addresses than lucky addresses further confirms that Chinese buyers prefer apartments with lucky addresses.

[Insert Figure 3 here]

Columns (1) and (2) of Table 7 report the results using apartments sorted into the two groups by the share of Chinese buyers of lucky addresses in a building. About 16% of our new sale transactions (26% of the buildings) are from buildings where the share of Chinese buyers of lucky addresses is lower than 80%. Interestingly, even among these buildings, lucky addresses are still sold at a 0.7% price premium although the coefficient on very lucky addresses becomes insignificant. The latter is likely to be driven by the fact that there are only 62 out of 9,543 transactions that have a very lucky address. This suggests that even in buildings where the share of non-Chinese buyers of lucky addresses exceeds 20%, those non-Chinese buyers still need to pay a price premium for these units. This is because there are always some Chinese buyers who are willing to buy those lucky units at the market price premium. It is also interesting to note that buyers for apartments

with unlucky addresses cannot enjoy any significant amount of discount. This is because the presence of a considerable number of non-Chinese buyers makes them the marginal buyers. For buildings where the share of Chinese buyers of lucky addresses is at least 80%, buyers of lucky units need to pay about a 0.5% price premium and buyers of very lucky units need to pay a 2.2% price premium. Moreover, buyers of unlucky units can enjoy a 0.5% price discount and buyers of very unlucky units can enjoy a 1.4% price discount. All price differentials are statistically significant at the 5% level. Similar conclusions can be drawn from columns (3) and (4) of Table 7 if we group building based on the share of Chinese buyers of unlucky addresses.

There are two types of buyers in the market: those with a preference for luck addresses, and those without. The former clearly know some buyers prefer lucky addresses, hence they are informed. The latter could be either informed, or uninformed, i.e., they do not know that some buyers prefer lucky addresses. To check whether the price premiums and discounts vary across different types of buyers, we include interactions between a series of buyer characteristics with the luckiness of an address in the price regression and report the results in columns (1) - (3) in Table 8.

We use the following three characteristics to approximate buyers' type, non-Chinese, Chinese who bought houses or registered firms in the Ghost month, and Chinese investors. Non-Chinese are likely to be uninformed while less superstitious Chinese are likely to be informed. Column (1) shows the interaction between non-Chinese and the luckiness of an address. For Chinese buyers, the price discount for unlucky addresses and price premium for lucky addresses are similar to the results in Table 3. The coefficient of the interaction between non-Chinese and the very lucky address indicator is negative and significant at the 1% level. The sum of the coefficient on this interaction term and the coefficient on "Very lucky" indicator is slightly negative and insignificant. It suggests that non-Chinese buyers do not pay a price premium for very lucky addresses. In column (2) and (3), we focus on Chinese buyers since the majority of Chinese buyers are likely to be aware of the numerological preference even if they do not believe it themselves. Column (2) shows the interaction between those who bought houses or registered firms in the Ghost Month and

the luckiness of an address. Column (3) shows the interaction between investors and the luckiness of an address. The coefficients on those interaction terms tend to be small and statistically insignificant. These results show that less-superstitious buyers pay a similar price premium for lucky addresses as other buyers.

Why do non-Chinese not pay price premiums for very lucky addresses but less superstitious Chinese buyers still do? One possible explanation is that non-Chinese do not know about the preference for lucky addresses. They do not consider the price premium they might receive when they sell the house and so their willingness to pay for lucky addresses is similar to neutral addresses. In contrast, Chinese buyers are likely to be aware of the numerological preference even they do not believe it themselves. Some of them might be willing to pay for lucky addresses since they can sell the house at a price premium in the future.

5.3 Conspicuous Consumption

To examine the role of conspicuous consumption in the housing market, we need some observed housing features that are related to conspicuous consumption but not to superstition. As discussed in subsection 3.2, the size and floor of an apartment are two potential candidates. Columns (5) and (6) of Table 6 show that the coefficients on the indicator "Bought in Ghost Month" is insignificant both statistically and economically, which suggests that demands for these two features do not depend on buyers' superstitious belief. Hence, in the absence of conspicuous spending motive, the price premium for units with lucky addresses should neither depend on their size, nor on whether they are located on the top floor. If the price premiums for these units are higher than the other units, then the evidence suggests that there exists conspicuous spending motive in the housing market.

If the demand for lucky addresses is partially driven by conspicuous motive, then buyers who bought lucky addresses for the purpose of conspicuous spending might also have a stronger motivation to buy a larger or top-floor unit. If they are also the marginal buyers, they will drive up the price premiums for larger or top-floor units with lucky addresses.

Moreover, given the limited supply of larger or top-floor units with very lucky addresses, these buyers are very likely to be the marginal buyers.

Column (4) of Table 8 reports the regression results with an interactive term between a series of indicators for the luckiness of an address and a large unit dummy. The coefficient on the interaction terms between large apartments and very lucky address is 0.078 (s.e. 0.026), suggesting that buyers need to pay an additional 8% for large apartments with very lucky addresses on top of the 1.7% premium for regular size apartments with very lucky addresses. The coefficient on the interaction between large apartments and lucky address is slightly positive while the coefficient on the interaction between large apartments and unlucky address is slightly negative. Neither of them is statistically significant, suggesting no further premium for large apartments with lucky addresses and no further discount for large apartments with unlucky addresses. Column (5) of Table 8 reports the regression results with an interaction term between a series of indicators for the luckiness of an address and a top-floor unit dummy. Consistent with column (4), we find that buyers need to pay an additional 7.1% for top-floor apartments with very lucky addresses on top of the 1.7% premium for non-top-floor apartments with very lucky addresses.

Overall, the results in columns (4) and (5) of Table 8 suggest that the conspicuous spending motive is also responsible for the price premium for apartments with lucky addresses.

5.4 Consequences and Implications

We have shown that both superstition and conspicuous spending contribute to the price premium of lucky addresses. We now investigate the consequences of the preference for lucky addresses on different types of home buyers.

Table 6 shows that not only superstitious buyers or conspicuous buyers have a higher demand for lucky addresses, property investors, who are less superstitious and have weaker conspicuous motive since they do not live in these apartments, also have a higher demand for lucky addresses. This is likely because investors are informed buyers and they consider future buyers' preference for lucky addresses when they buy properties. It implies that

given a large proportion of superstitious and conspicuous buyers in the market, even non-superstitious, non-conspicuous buyers might contribute to the price premiums due to their expectations of other buyers' preferences.

The redistribution effect among different types of home buyers is one possible outcome of the preference for lucky addresses. Investors are likely to be aware of and attentive to the superstitious beliefs of Chinese buyers. Non-Chinese, who are aware of the superstitious beliefs of Chinese buyers, however, may not be attentive to the extent of the premiums (discounts) for lucky (unlucky) units. Non-Chinese buyers are more likely to sell their apartments to Chinese buyers, who constitute the largest proportion of buyers in the secondary market. As a result, the existence of premiums (discounts) for lucky (unlucky) addresses might create redistributive effects among different types of buyers. We investigate the distributive effects in the paper by analyzing the returns in the resale market.

To check whether the economic returns from housing investment depend on the luckiness of its address, we first regress the annualized returns on a series of indicator variables of the luckiness of an address, size, floor, time of initial purchase, time of resale, and building fixed-effects. Column (1) of Table 9 reports the estimation results. Except for the coefficient on "Unlucky" address, all the other coefficients are negative but not statistically significant even at the 10% level. The evidence suggests that the economic returns from buying either an apartment with lucky or unlucky, particularly lucky addresses are at best the same as that of buying an apartment with a neutral address.

Column (2) adds the interaction terms between the non-Chinese indicator and the indicator variables of the luckiness of an address. Interestingly, the coefficient on the interaction between non-Chinese and "very lucky" is positive and significant while the coefficient on the interaction between non-Chinese and unlucky is negative and insignificant. Why do non-Chinese enjoy a higher return from buying apartments with very lucky addresses, even though they may be naive and may not know about other people's preference for lucky addresses? Figure 3 and Table 8 show that non-Chinese buyers could be the marginal buyers in some buildings even though most buyers are Chinese. When

non-Chinese are the marginal buyers, they do not pay a price premium. When they sell their apartments, however, it is likely that they will be able to sell to Chinese buyers who are willing to pay a price premium for these "very lucky" apartments.

Columns (3) and (4) focus on Chinese buyers since most of them should be aware of the Chinese numerological preference even though they may or may not believe it themselves. Column (3) includes an indicator variable that equals one if the buyer bought an apartment or registered a firm in the Ghost Month, as well as its interactions with the four indicators of luckiness of address. The results show that those who bought lucky addresses have slightly lower return than those who bought neutral addresses. Nevertheless, none of the coefficients on the interaction terms are statistically significant even at the 10% level. Under the assumption that individuals who bought an apartment in the Ghost Month are less superstitious, the similarity in the returns between these two types of buyers suggests that they behave similarly in the housing market. Therefore, superstitious belief is not the only driver for the price differentials across different address types. Column (4) includes an indicator of whether a buyer is an investor and its interactions with the four indicators of luckiness. Similarly, none of the coefficients on the interaction terms are statistically significant even at the 10% level. The similarity in the returns between investors and other buyers suggests that these two types of buyers behave similarly in the housing market.

Overall, the results in Table 9 suggest that the preference for lucky addresses does have consequences in the housing market in addition to the price differentials across different address types. The uninformed buyers benefit more than the informed buyers. This is most likely because the uninformed buyers receive a price premium when they sell their apartments with lucky addresses to Chinese buyers even though they did not pay a price premium when they bought their apartments in the primary market. In contrast, informed investors do not earn higher returns due to the following reason. In the market segments where the marginal buyers are superstitious or spending conspicuously, the equilibrium price already reflects the preference. Investors who buy lucky addresses and hope to sell them at a premium have to pay a price premium in the first place as the preferences for lucky addresses have already been priced in. Hence, this strategy cannot

yield any additional returns. The differences in the returns to informed and uninformed buyers imply a potentially profitable trading strategy in the housing market where agents have heterogeneous preferences. Investors should look for the market segments where the marginal buyers are neither superstitious nor spending conspicuously. In these market segments, since the preferences for lucky addresses have not been priced in, investors can buy properties with lucky addresses without having to pay a premium, and later sell them when the marginal buyers are superstitious or spending conspicuously.

5.5 Supply Side Response

Based on the same reasoning as the economic effects of discrimination argued by Becker (1957), if developers respond to the premiums (discounts) for lucky (unlucky) addresses by providing more lucky units and less unlucky units in the housing markets, we may expect the supply-side responses to reduce the premiums (discounts) for the lucky (unlucky) units. In this sub-section, we conduct several robustness tests on the supply-side responses. First, we examine the distributions of the physical housing units with lucky addresses and unlucky addresses. Table 1 shows that there are more unlucky units than lucky units. We find that unlucky unit accounts for 20% of the total addresses; whereas the lucky unit account for only 14% of the total addresses. Similarly, units ending with number 4 accounts for 11%; whereas units ending with number 8 accounts for 8%. Second, we test if there are more lucky addresses in the Chinese concentrated neighborhoods. We regress the percentage of lucky units per building on the fraction of Chinese in the building, and find that the coefficient is 0.0063 and is not statistically significant (p=0.83). We also regress the percentage of very lucky units per building on the fraction of Chinese in the building; and again find that the coefficient is 0.0016 and it is not statistically significant (p=0.62). Hence, there is no evidence of the supply-side response in the Chinese concentrated neighborhoods. Moreover, given the strict planning regulations in Singapore that disallow manipulations in the numbering of units in high-rise buildings by developers, our empirical results show no evidence of supply-side adjustments in response to the preference for lucky addresses.

6 Concluding Remarks

Using a large and rich micro-level dataset merged from various sources including housing transactions and company registrations, we find that both superstition and conspicuous spending affect the purchase of high-rise private apartments in Singapore. To the best of our knowledge, this is the first paper that directly tests the roles of both superstition and conspicuous consumption in the housing market. We identify buyers as less superstitious if they purchased an apartment or registered a firm during the Ghost Month, the seventh month in the lunar calendar. The rationale is that superstitious individuals would have avoided making major decisions during this month if they believe in the Chinese astrology. By showing that less superstitious buyers have a weaker demand for apartments with lucky addresses, the evidence suggests that superstition is at least partly responsible for the observed price differentials across addresses of different degrees of luckiness.

We use two highly visible housing features to measure an apartment's value for conspicuous spending: size and location on the top floor. We show that superstitious beliefs are uncorrelated with the demand for these two features. Consequently, if people are willing to pay higher price premiums for lucky apartments of larger size or on the top floor than lucky apartments of smaller size or below the top floor, then these additional price premiums must be attributable to the conspicuous motive. We find that buyers are willing to pay an additional 8% premium for lucky apartments of larger size and 7% for lucky apartments located on the top floor.

Since housing investment is the single largest financial commitment for most people, it is important to understand the consequences of paying considerable price premiums for lucky addresses and enjoying considerable discounts for unlucky addresses. A natural question is whether the price differentials across different address types in the primary market lead to differences in investment returns when people sell their apartments. On average, we do not find any systematic relationship between the luckiness of an address and its annualized rate of return. Nevertheless, we do find that the return is higher for non-Chinese buyers who bought apartments with very lucky addresses. Since non-Chinese buyers do not adhere to the Chinese numerological preferences and they also might not

know about the Chinese willingness to pay for lucky addresses, they are unlikely to pay a price premium for these apartments if they do not face competition from superstitious or conspicuous buyers at the time of purchase. Nevertheless, on the resale markets, they have a high chance of selling their lucky apartments to Chinese buyers as they are the majority. As a result, these uninformed buyers in the primary market could potentially enjoy a higher rate of return. In contrast, for Chinese buyers, since they know that some people are willing to pay a price premium for lucky apartments, they are also willing to pay a premium for these apartments even if they themselves are neither superstitious nor spending conspicuously. Their willingness to pay a price premium for lucky addresses, due not to their own superstitious belief, but to their belief about other people' superstitious belief, would help sustain the price differentials in equilibrium.

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Table 1: Sample descriptive statistics

VARIABLES	Mean	SD	Min	Max
Number of transactions	54,233			
Apartment size	118.65	44.94	5	768
S$ per square meter	8424.36	4400.61	2573	54896
Very unlucky unit	0.01	0.11	0	1
Unlucky unit	0.19	0.39	0	1
Lucky unit	0.13	0.34	0	1
Very lucky unit	0.01	0.08	0	1
Unit number ending with 4	0.11	0.31	0	1
Unit number ending with 8	0.08	0.27	0	1
Floor number ending with 4	0.12	0.33	0	1
Floor number ending with 8	0.08	0.27	0	1
99-year leasehold	0.49	0.50	0	1
999-year leasehold	0.04	0.20	0	1
Condominium	0.73	0.44	0	1
Floor number	9.59	8.12	1	68
Ground floor	0.06	0.23	0	1
Top floor	0.08	0.27	0	1
At least 1 Singaporean buyers	0.78	0.41	0	1
At least 1 Chinese buyers	0.93	0.26	0	1
At least 1 buyer w. English name	0.31	0.46	0	1
Registered a firm	0.49	0.50	0	1
Registered a firm in Ghost Month	0.02	0.15	0	1
Bought an apartment in the Ghost Month	0.10	0.30	0	1

Notes: The sample comprises new sales of apartments between the years 2000-09. Transaction prices are denominated in Singapore dollars per square meter (at the average exchange rate of one Singapore dollar to 59 U.S. cents in 2014, a price of S$1000 per square meter is equivalent to US$462 per square foot). Very lucky = last digit of both floor and apartment numbers is "8"; lucky = last digit of either floor or apartment number is "8" and neither last digit is "4"; unlucky = last digit of either floor or apartment number is "4" and neither last digit is "8"; very unlucky = last digit of both floor and apartment numbers is "4"; neutral = all other addresses.

Table 2: Lucky addresses: Type of sale and buyer ethnicity

	New sales			Subsales & resales
	All buyers	Chinese	Non-Chinese	All buyers
Very unlucky unit	0.01	0.01	0.01	0.02
	(0.11)	(0.11)	(0.11)	(0.13)
Unlucky unit	0.19	0.19	0.19	0.21
	(0.39)	(0.39)	(0.40)	(0.41)
Neutral unit	0.67	0.67	0.67	0.66
	(0.47)	(0.47)	(0.47)	(0.47)
Lucky unit	0.13	0.13	0.12	0.11
	(0.34)	(0.34)	(0.33)	(0.32)
Very lucky unit	0.01	0.01	0.01	0.01
	(0.08)	(0.08)	(0.07)	(0.07)
Unit # ending w. 4	0.11	0.11	0.11	0.12
	(0.31)	(0.31)	(0.31)	(0.33)
Unit # ending w. 8	0.08	0.08	0.08	0.07
	(0.27)	(0.27)	(0.27)	(0.25)
Floor # ending w. 4	0.12	0.12	0.12	0.14
	(0.33)	(0.33)	(0.33)	(0.34)
Floor # ending w. 8	0.08	0.08	0.07	0.08
	(0.27)	(0.28)	(0.25)	(0.26)
Number of observations	54233	47126	7107	54225
Kolmogorov-Smirnov test of the equality of distributions between				
	Chinese and non-Chinese		primary and secondary market	
	P value=0.63		P value=0.00	
Test of the equality of the share of apartments with lucky address between				
	Chinese and non-Chinese		primary and secondary market	
	P value=0.03		P value=0.00	
Test of the equality of the share of apartments with unlucky address				
	Chinese and non-Chinese		primary and secondary market	
	P value=0.14		P value=0.00	

Notes: The samples comprise apartments sold between 2000and 2009. Standard deviations are in parentheses. A apartment is considered as bought by Chinese buyers as long as one of the buyers is a Chinese.

Table 3: Lucky address: Prices

VARIABLES	New sales					Subsales
	2000-2009				All years	& resales
	(1)	(2)	(3)	(4)	(5)	(6)
Very unlucky unit	-0.039***	-0.013**	-0.014***	-0.013***	-0.013***	-0.018***
	(0.010)	(0.006)	(0.004)	(0.003)	(0.003)	(0.005)
Unlucky unit	-0.018***	-0.008***	-0.007***	-0.004***	-0.004***	-0.007***
	(0.004)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Lucky unit	0.013**	0.008**	0.006**	0.006***	0.006***	0.004*
	(0.006)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)
Very lucky unit	0.037**	0.029***	0.021***	0.019***	0.018***	0.017**
	(0.016)	(0.009)	(0.008)	(0.007)	(0.006)	(0.008)
Chinese buyer	Yes	Yes	Yes	Yes	Yes	Yes
Unit characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Lease tenure	Yes	Yes	Yes	-	-	-
Condominium	Yes	Yes	Yes	-	-	-
Building fixed effects	No	No	No	Yes	Yes	Yes
Postal district f.e.	No	2-digit	4-digit	-	-	-
Building age	-	-	-	-	-	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	54,233	54,233	54,233	54,233	69,069	50,597
R-squared	0.555	0.843	0.928	0.969	0.973	0.926
Mean of log of real price	8.94	8.94	8.94	8.94	9.01	8.85

Notes: Dependent variable is the logarithm of real price in Singapore dollars per m^2; Unit characteristics include a linear trend in floor number, indicators for first and top floors, logarithm of size; Estimates are robust to controlling for floor number with a quadratic or cubic trend; Robust standard errors clustered at building level (* p<0.1; ** p<0.05; *** p<0.01). Columns (1)-(4): New sales to all buyers between 2000 and 2009; Column (5): New sales, including earlier transactions back to 1995 and forward to 2012; Column (6): Secondary market (subsales and resales).

Table 4: Lucky address: Prices (robust)

VARIABLES	New sales					Subsales
	2000-2009				All years	& resales
	(1)	(2)	(3)	(4)	(5)	(6)
Unit # ending w. 4	-0.011	-0.008*	-0.007**	-0.010***	-0.010***	-0.003
	(0.008)	(0.005)	(0.003)	(0.003)	(0.002)	(0.002)
Floor # ending w. 4	-0.024***	-0.008***	-0.006***	-0.000	0.000	-0.008***
	(0.004)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Unit # ending w. 8	0.009	0.011*	0.007	0.009**	0.009***	0.007**
	(0.011)	(0.007)	(0.004)	(0.004)	(0.003)	(0.003)
Floor # ending w. 8	0.017***	0.006**	0.005**	0.003*	0.003**	0.004
	(0.005)	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)
Both unit and floor	-0.004	0.003	0.001	-0.003	-0.003	-0.006
# ending w. 4	(0.009)	(0.005)	(0.004)	(0.003)	(0.003)	(0.005)
Both unit and floor	0.011	0.011	0.010*	0.007	0.006	0.007
# ending w. 8	(0.012)	(0.007)	(0.005)	(0.004)	(0.004)	(0.009)
Unit characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Lease tenure	Yes	Yes	Yes	-	-	-
Condominium	Yes	Yes	Yes	-	-	-
Building fixed effects	No	No	No	Yes	Yes	Yes
Postal district fixed effects	No	2-digit	4-digit	-	-	-
Building age	-	-	-	-	-	-
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	54,233	54,233	54,233	54,233	69,069	50,597
R-squared	0.553	0.843	0.924	0.969	0.973	0.925
Mean of y variable	8.94	8.94	8.94	8.94	9.01	8.85

Notes: Dependent variable is the logarithm of price in Singapore dollars per m^2; Unit characteristics include a linear trend in floor number, indicators for first and top floors, logarithm of size; Estimates are robust to controlling for floor number with a quadratic trend; Robust standard errors clustered at building level (* p<0.1; ** p<0.05; *** p<0.01). Column (1): New sales to all buyers with controls; Column (2): New sales to all buyers with controls and 2-digit postal district fixed effects; Column (3): New sales to all buyers with controls and 4-digit postal district fixed effects; Column (4): New sales to all buyers with controls and building fixed effects; Column (5): New sales, including earlier transactions back to 1995 and forward to 2012; Column (6): Secondary market (subsales and resales)

Table 5: The impact of superstitious beliefs on economic activities

VARIABLES	Daily volume		Purchased a flat in the Ghost Month	
	Registration	Housing		
	(1)	(2)	(3)	(4)
Ghost Month	-11.026**	-4.204***		
	(5.495)	(1.555)		
Registered a firm in the Ghost Month			0.008**	0.008**
			(0.004)	(0.004)
Non-Chinese buyer				-0.008
				(0.005)
Birth year				0.000**
				(0.000)
Buyer with an English name				0.002
				(0.003)
Male				0.010***
				(0.003)
Year fixed-effect	Yes	Yes	-	-
Month fixed-effect	Yes	Yes	-	-
Day-of-week fixed effect	Yes	Yes	-	-
Observations	3,057	3,041	49,290	46,395
Mean of y variable	157	18	.111	.111

Notes: The dependent variable in columns (1) is the daily firm registration volume between 2008 to 2016; in columns (2) is the daily new sale volume between 2000 to 2009; in column (3) and (4) is a indicator variable that equals 1 if a buyer purchased her apartment during the Ghost Month. The buyers in columns (3) and (4) consists of Singaporeans who bought at least one apartment in 2000-2009 and registered at least one firm in 2008-2016. Huber-White robust standard errors are reported in parenthesis. (* p<0.1; ** p<0.05; *** p<0.01)

Table 6: Lucky address: Buyer's choice

	Demand for lucky address				Demand for large units	Demand for top floor
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Bought in Ghost Month	-0.091*	-0.126*	-0.110	-0.090*	0.009	0.008
	(0.053)	(0.070)	(0.071)	(0.053)	(0.006)	(0.006)
Reg. a firm in Ghost Month		-0.018	0.017			
		(0.063)	(0.066)			
Bought a flat & registered			-0.356*			
a firm in Ghost Month			(0.197)			
Non-Chinese buyer	-0.144***	-0.124***	-0.125***	-0.133***	0.001	-0.001
	(0.029)	(0.036)	(0.036)	(0.030)	(0.003)	(0.004)
Investor				0.075***		
				(0.023)		
Year fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes
month fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes
Unit characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Postal district fixed-effect	4-digit	4-digit	4-digit	4-digit	4-digit	4-digit
Observations	54,233	26,522	26,522	54,233	54,233	54,233
Mean of y variable	1.93	1.94	1.94	1.93	0.08	0.08

Notes: Columns (1) - (4) report results from ordered logit models of demand for very lucky, lucky, neutral, unlucky, and very unlucky addresses, estimated by maximum likelihood; Ordered logit cut-points not reported; Columns (5) and (6) report results from a linear probability model of demand for large units (top 10 in terms of size) and top-floor units, respectively; Unit characteristics include a linear trend in floor number, indicators for first and top floors, logarithm of size, lease tenure, and an condominium indicator; Robust standard errors clustered at building level. Investors are defined as buyers who purchased multiple properties during the sample period. (* p<0.1; ** p<0.05; *** p<0.01). The sample in columns (1), (4), (5), and (6) consists of all new sale transactions between 2000 and 2009. The sample in columns (2) and (3) consist of individuals who bought a new apartment and registered a firm.

Table 7: Sub-sample analyses

	Share of Chinese buyer			
	of lucky address		of unlucky address	
	<80%	≥80%	<80%	≥80%
VARIABLES	(1)	(2)	(3)	(4)
Very unlucky	-0.004	-0.014***	-0.006	-0.015***
	(0.007)	(0.004)	(0.009)	(0.003)
Unlucky	-0.002	-0.005**	-0.001	-0.006***
	(0.003)	(0.002)	(0.003)	(0.002)
Lucky	0.007**	0.005**	0.009*	0.005***
	(0.003)	(0.002)	(0.005)	(0.002)
Very Lucky	0.002	0.022***	0.021	0.017***
	(0.012)	(0.008)	(0.016)	(0.007)
Constant	9.713***	9.635***	9.550***	9.682***
	(0.087)	(0.074)	(0.127)	(0.063)
Unit characteristics	Yes	Yes	Yes	Yes
Building fixed-effects	Yes	Yes	Yes	Yes
Year fixed-effect	Yes	Yes	Yes	Yes
Month fixed-effect	Yes	Yes	Yes	Yes
Observations	9,543	44,690	13,331	40,902
R-squared	0.975	0.965	0.972	0.966
Mean of log price	9.16	8.89	9.11	8.88

Notes: Dependent variable is the logarithm of price in Singapore dollars per m^2; Unit characteristics include a linear trend in floor number, indicators for first and top floors, logarithm of size; Robust standard errors clustered at building level (* p<0.1; ** p<0.05; *** p<0.01). Column (1): New sales in buildings where the share of Chinese buyers of lucky units is lower than 80%; Column (2): New sales in buildings where the share of Chinese buyers of lucky units is at least 80%; Column (3): New sales in buildings where the share of Chinese buyers of unlucky units is lower than 80%; Column (4): New sales in buildings where the share of Chinese buyers of unlucky units is at least 80%.

Table 8: Lucky address: Prices (heterogeneity)

	Z=				
VARIABLES	Non-Chinese buyers (1)	Less Superstitious buyers (2)	Investor (3)	Larger units (4)	Top floors (5)
Very unlucky × Z	-0.009	-0.012	-0.006	-0.061*	0.001
	(0.009)	(0.009)	(0.007)	(0.031)	(0.024)
Unlucky × Z	0.002	-0.003	-0.002	-0.012	-0.003
	(0.003)	(0.003)	(0.002)	(0.010)	(0.008)
Lucky × Z	-0.002	0.001	0.002	0.003	-0.004
	(0.004)	(0.004)	(0.003)	(0.009)	(0.007)
Very Lucky × Z	-0.037**	0.030	-0.003	0.078***	0.071**
	(0.017)	(0.025)	(0.016)	(0.026)	(0.033)
Very unlucky	-0.012***	-0.010***	-0.011***	-0.009**	-0.012***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
Unlucky	-0.005***	-0.005***	-0.005***	-0.004***	-0.005***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Lucky	0.006***	0.006***	0.005***	0.006***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Very Lucky	0.022***	0.018***	0.023***	0.017***	0.017***
	(0.007)	(0.005)	(0.007)	(0.006)	(0.006)
Unit characteristics	Yes	Yes	Yes	Yes	Yes
Building fixed-effect	Yes	Yes	Yes	Yes	Yes
Year fixed-effect	Yes	Yes	Yes	Yes	Yes
Month fixed-effect	Yes	Yes	Yes	Yes	Yes
Observations	54,233	47,126	47,126	47,126	47,126
R-squared	0.969	0.968	0.968	0.969	0.968
Mean of y variable	8.94	8.92	8.92	8.92	8.92

Notes: The dependent variable is the logarithm of price in Singapore dollar per m^2. ; Unit characteristics include a linear trend in floor number, indicators for first and top floors, logarithm of size; Estimates are robust to controlling for floor number with a quadratic or cubic trend; Robust standard errors clustered at building level (* p<0.1; ** p<0.05; *** p<0.01). Lucky addresses are interacted with Non-Chinese buyer, less superstitious buyers defined as those who bought an apartment or registered a firm in the Ghost Month, Investor, large apartment, and top floor in columns (1), (2), (3), (4), (5) respectively. In columns (1) the sample consists of all new sales between 2000 and 2009. In columns (2) to (5), the sample is restrict to Chinese buyers.

Table 9: Changes in price of resold units

VARIABLES	(1)	Non-Chinese (2)	Less superstitious buyers (3)	Investor (4)
Very unlucky × Z		-0.008	-0.114	-0.010
		(0.024)	(0.084)	(0.028)
Unlucky × Z		0.055	-0.004	-0.010
		(0.050)	(0.013)	(0.008)
Lucky × Z		0.005	-0.013	-0.006
		(0.014)	(0.013)	(0.008)
Very Lucky × Z		0.055**	0.067	0.041
		(0.025)	(0.042)	(0.036)
Very unlucky	-0.010	-0.018	-0.007	-0.017**
	(0.021)	(0.012)	(0.007)	(0.007)
Unlucky	0.011	-0.000	0.001	0.004
	(0.011)	(0.005)	(0.005)	(0.007)
Lucky	-0.001	-0.009**	-0.006	-0.005
	(0.007)	(0.004)	(0.005)	(0.006)
Very Lucky	0.010	-0.015	-0.023	-0.034
	(0.014)	(0.014)	(0.014)	(0.025)
Unit characteristics	Yes	Yes	Yes	Yes
Building fixed-effect	Yes	Yes	Yes	Yes
Purchasing year fixed-effect	Yes	Yes	Yes	Yes
Purchasing month fixed-effect	Yes	Yes	Yes	Yes
Resale year fixed-effect	Yes	Yes	Yes	Yes
Resale month fixed-effect	Yes	Yes	Yes	Yes
Observations	12,845	12,845	11,196	11,196
R-squared	0.321	0.306	0.376	0.376
Mean of y variable	.09	.09	.08	.08

Notes: The depend variable is the annualized returns. In columns (1) and (2), the sample consists of all new sale units (2000 and 2009) that are resold between 200 and 2009. In columns (3) and (4), we exclude new sale units initially bought by non-Chinese. Lucky addresses are interacted with Non-Chinese buyer, less superstitious buyers defined as those who bought an apartment or registered a firm in the Ghost Month and investor in columns (2), (3), and (4) respectively. Robust standard errors clustered at building level (* p<0.1; ** p<0.05; *** p<0.01).

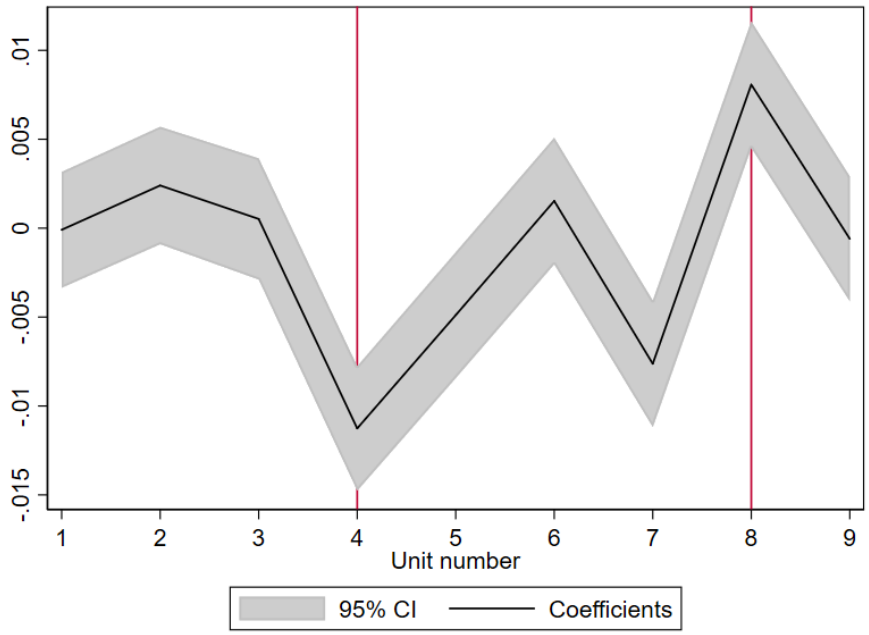


Figure 1: Price and unit number

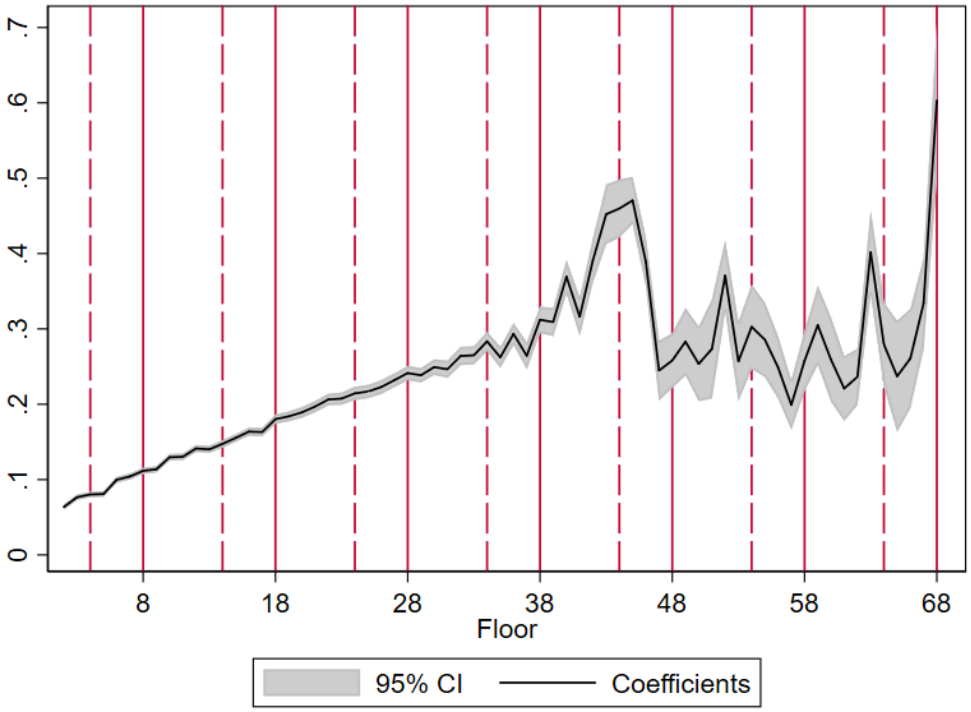
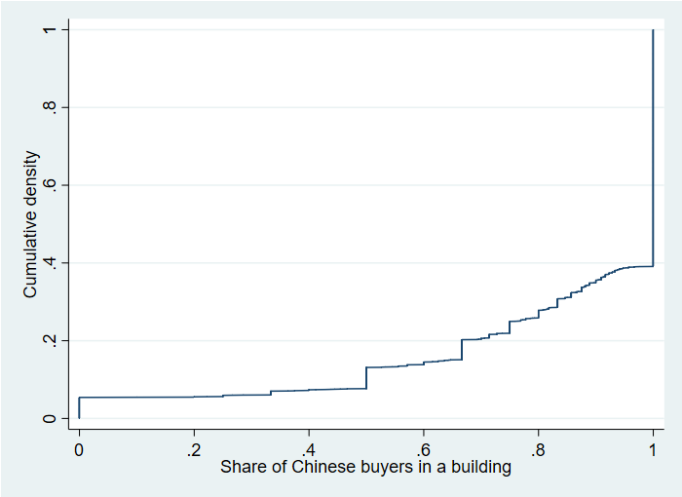
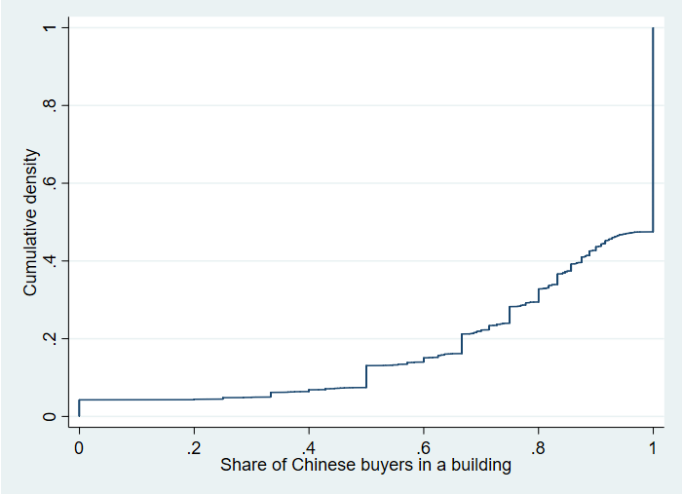


Figure 2: Price and floor number



(a) Lucky addresses



(b) Unlucky addresses

Figure 3: The distribution of share of Chinese buyers of lucky and unlucky addresses in a building

A Appendix

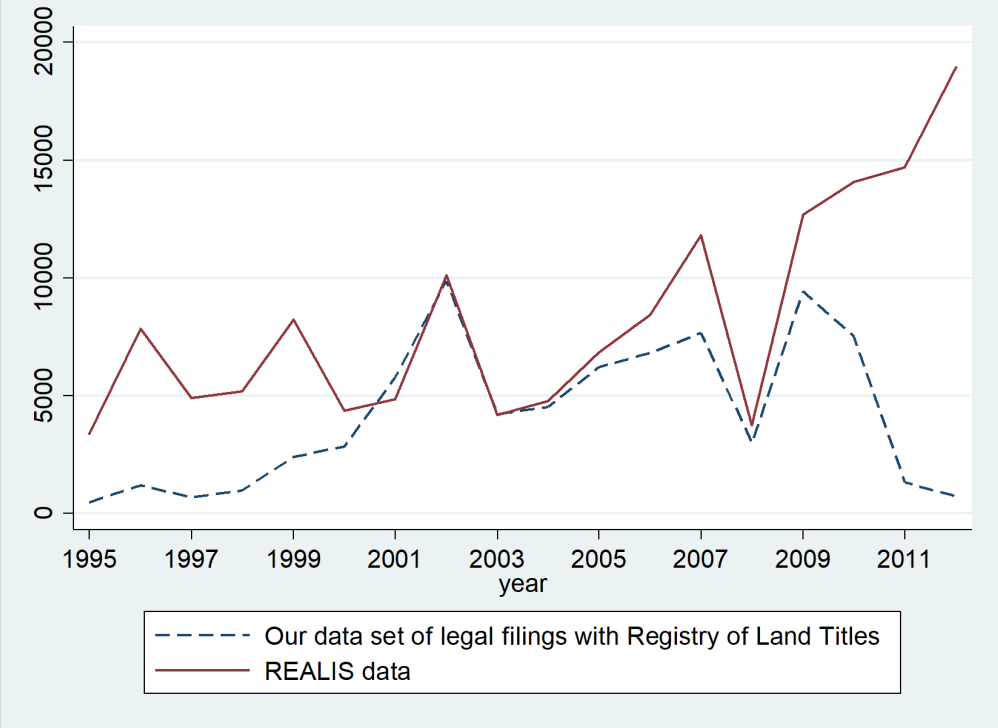


Figure A.1: Transactions by year

Note: Number of new sales, by year from 1995 to 2012. Solid red line depicts the number of new sales as recorded in the Urban Redevelopment Authoritys REALIS database. Broken blue line depicts the number of new sales as recorded in our data-set of legal filings with the Registry of Land Titles.