The Value of Superstitions

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Abstract

This paper estimates the value of superstitions by studying the auctions of vehicle license plates. We show that the value of superstitions is economically significant, which justifies their persistence in human civilization. We also document the changes of the value of superstitions across different types of plates, across different policy regimes, and across different macroeconomic environments. Interestingly, some of the changes are rather consistent with economic intuition.

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1 Introduction

"When you believe in things that you don't understand,

Then you suffer,

Superstition ain't the way."

Stevie Wonder, *Superstition (1972)*

By how much does one have to pay (or suffer, according to Stevie Wonder) for a superstition? Superstitions, rightly or wrongly, can change a variety of human behaviors. They can also change the allocation of economic resources. It is therefore both interesting and economically relevant to document the significance of superstitions.

Superstitions, beliefs not based on reason or knowledge, have existed as early as human history.[1] While some old ones have eventually vanished, new ones keep developing, while many others persist. Friday the 13th, black cats, and evil eye, among others, are factors that many consider in their everyday decisions. The habitual saying of "God bless you" after someone sneezes, rather than showing politeness, came from a superstition.[2]

If people are rational, it is puzzling why superstitions persist. Many researchers in various disciplines have touched on this issue. Economists, however, have not addressed it much, except for Fudenberg and Levine (2006).[3] The authors look into how superstitions can persist if people are rational, and which types of superstitions would be more likely to persist. They construct a game-theoretic model with rational learning, taking superstitions as beliefs on events off the equilibrium path. They characterize the conditions under which a false belief can persist. Two important implications follow. First, under the rationality

[1] According to the Merriam-Webster Online Dictionary, "superstition" is "a term used by critics for a belief that is not based on reason" (http://www.m-w.com/dictionary/superstition). Superstition is not exclusive to human beings. In fact, Skinner (1948) shows that trapped pigeons can develop behaviors as if they believe that there were a causal relation between their behavior and the presentation of food, although such a relation was lacking. The study concludes that animals also tend to develop behavior to support false belief, which is an act of superstition.

[2] Pope Saint Gregory I the Great ordered the people do so, believing that it would help prevent the spread of the plague around AD 590.

[3] Along the same line, Foster and Kokko (2008) presented a simple model in which the false causalities people develop survive over natural selection, therefore becoming superstitions.

assumption, some superstitions *can* persist. Second, in equilibrium, persistent superstitions in turn *do* affect the behavior of people. The second implication is important, and it forms the theoretical basis of this paper.

Numerous interesting studies lend support to the second implication. Kramer and Block (2007) present experiments in which interviewees were requested to make risky decisions. They found that in facing the same set of risky decisions, interviewees tended to behave more risk-averse on Friday the 13th than they would on other neutral dates.

Consistent with their finding, casual estimates suggest that U.S. businesses lose between $800 and $900 million every Friday the 13th. Peltzer and Renner (2003) conduct survey interviews with taxi drivers in South Africa and conclude that those who are more superstitious tend to drive less carefully, and have incurred more car accidents.

As superstitions do change behaviors, the allocation of resources would depend on superstitions. As such, they must carry economic value. This paper estimates such value for a particular type of superstitions. In addition, we examine whether superstitions, while inherently irrational, would have their value respond to changes in ways consistent with economic intuition.

To estimate the value of superstitions, we need to identify an asset that satisfies several criteria. First, superstitions are potential price-determinants. Second, we can observe prices over a long period of time. Third, other price-determinants can be controlled for. Fourth, the price closely proxies the underlying social value. We select the auction data of vehicle license plates in Hong Kong. Section 2 explains why the data fit these criteria. The data allow us to link one particular type of superstitions to social value: having a license plate with a lucky number brings luck, and vice versa.

Our main result shows that superstitions do carry a significant economic value. This finding lends further support to the fact that many business practices take superstitions seriously.[4] We also show that the value of superstitions changes in response to exogenous

[4]For instance, Mr. Dilip Rangnekar and Miss Elizabeth Young from the Communications Department of Otis Elevator Company, the world's largest elevator manufacturer, confirmed to us on November 20,

changes. In particular, the ways how the value changes, although based inherently on false beliefs, are consistent with economic intuition. In addition, we find some evidence in support of the view that people value superstitions differently in different macro-environments.

Our paper is related to two strands of literature. One strand of literature documents that people "pay" for superstitions. Block and Kramer (2009) find that superstitituous beliefs cause some consumers to buy things that are inconsistent with economic predictions, for instance, buying a product set with a lower but "lucky" (versus greater but neutral) quantity in the package. Wong and Yung (2005) show that many Chinese carefully time their babies' birth year; they believe that the "year of the dragon" would bring their babies good fate. Bourassa and Peng (1999) show that beliefs in numerology affect real estate prices in regions in New Zealand with large Chinese populations. They find that houses ending with a "lucky" number are more expensive. Chau, Ma, and Ho (2001) investigate the lucky number "8" in determining real estate prices. They find that houses with an "8" in their floor numbers sell for higher prices during property booms. Doucouliagos (2004) shows that the Australian stock prices reflect significant number preferences attributable to superstitions.

The second strand of literature, which includes Woo and Kwok (1994), Chong and Du (2008), and Woo et al. (2008), looks into how a car license plate is priced in Hong Kong using the same series of data but in different periods.[5] This paper builds on their work by using the same series of data in a more extended period of time and similar control variables in the estimation.

The questions we address differentiate from those in the three papers. Instead of documenting the underlying pricing mechanism of license plates, we take the price of a plate as an equilibrium outcome that reflects its social value. We are interested in determining how significant the value of superstitions is. In addition, beyond looking at the value of superstitions

2008 that roughly 80 percent of their elevators around the world do not have the 13th-floor button. Many accessories containing an evil eye are sold in Europe. Kramer and Block (2008) give more examples on superstition and marketing practices.

[5]Woo and Kwok (1994) use the data of 1,520 license plates from 1989 to 1991, Chong and Du (2008) use the data of 15,161 license plates from 1998 to 2003, while Woo et al. (2008) use the data of 34,706 license plates from 1990 to 2005.

titions from a static point of view, we look at it from a dynamic perspective. In particular, we ask whether the value would change across the different types of plates, different policy regimes, and different macroeconomic environments.

Two key features in our empirical analysis enable us to address these new and interesting questions. First, our data cover two distinct periods: before and after a major policy change in 2006, which is the introduction of an entirely different type of license plates. It provides us a unique opportunity to study the change in the value of superstitions in response to the policy change. We also link the data to the stock market index and examine whether the value of superstitions varies with the macroeconomic environment. Second, we estimate plates of different types separately, rather than jointly as in Woo and Kwok (1994), and Woo et al. (2008). In addition to being a strategy to disentangle the effect of superstitions from the effect of conspicuous consumption, a point discussed in Section 3.1, our estimation strategy allows us to ask how the value of superstitions changes across different types of plates, a question addressed in Section 4.2.1. It is important to note that although we use a different estimation strategy, our estimated coefficients are consistent with those in Woo and Kwok (1994), and Woo et al. (2008), suggesting that their qualitative results are robust.

To the best of our knowledge, this paper is the first in economics to study how the value of superstitions responds to policy changes, and how the changes per se square with economic intuition. It is also the first one to document that the value of superstitions may vary across different macroeconomic environments.

2 Data and Variables

This study takes advantage of one of the few datasets that makes it possible to link superstitions with social value: the auction data of vehicle license plates in Hong Kong. Over 95% of the Hong Kong population is of Chinese descent, and most understand Cantonese. As the largest ethnic group in the world, the Chinese would have to be quite superstitious

to justify the following observations: the $888 round-trip deal from New York to Beijing by Continental Airlines in 2005, the Beijing Olympics opening ceremony at 2008/08/08 at 8pm, the missing 4th, 14th, and 24th floors in many apartments in Hong Kong, and the peak of cardiac mortality of Chinese Americans and Japanese Americans (for whom "4" is unlucky) on the 4th of the month, a striking pattern absent in White Americans.[6]

2.1 Institutional Background

The Hong Kong government started auctioning license plates in 1973.[7] The government is the only institution that sells plates through an open auction. Table 1 summarizes the main features of the different types of plates available for auctions.[8]

Only traditional plates were available before September 2006. They consist of either no letter prefix or two-letter prefix, followed by a number between 1 and 9999 (e.g., AB 1234, LB 453, and 18).[9]

The law further groups traditional plates into two mutually-exclusive types: ordinary and special.[10] We now briefly explain their key distinctions, namely, assignment and transferability.

The government automatically assigns to Mary, for example, an ordinary plate upon registration of her vehicle (usually by sequence). If Mary does not like the plate, she can return it to the government and bid a plate she likes in an auction. Mary can go to an auction, but there is no guarantee that she would find one there that she likes. Alternatively, she can reserve one unassigned plate (including ordinary and special) in advance and go to the

[6]Phillips et al. (2001) examine mortality data in the U.S. and find such a striking pattern.

[7]In 1973, the legislation whereby vehicle plates could be sold by auction was introduced. The proceeds of the auctions go to a charity fund called Lotteries Fund.

[8]Specifically, it is the right to put a specific number on a license plate that is sold, not the plate per se. The buyer can put the specific number on any plates he likes.

[9]The earliest plates contain numbers only. When the number of vehicles had used up all the plates containing numbers only, the government added Roman alphabet such as "HK" and "XX" as prefixes. After "HK" and "XX" were exhausted, license plates starting with "AA", "AB", "AC", and so on were used.

[10]As stated in Schedule 5 of the Road Traffic (Registration and Licensing of Vehicles) regulations (Cap. 374 sub.leg. E), a plate is special if it satisfies one or more of the following criteria: (1) no letter prefix, (2) number below 100, (3) number in hundreds or thousands, (4) symmetric mark, (5) sequential mark, (6) two pairs, (7) alternate pairs, (8) mark with identical numbers.

particular auction to bid on the plate she has reserved. Of course, there is still no guarantee that she will win that plate. Mary can also buy a plate from someone else.

The government does not assign special plates, which have generally more appealing numbers. If Mary wants a special plate from the government, she can only get it through the auction.

Owners can legally transfer their ordinary plates. If Mary likes Peter's ordinary plate, they can trade with each other. In contrast, if Mary likes John's special plate, even if John would like to sell it to her, they cannot legally make a deal.

This non-transferability restriction is intended to curb speculation. However, some "clever" practices can get around this restriction.[11] This can have implications on our estimation strategy as we will argue in Section 3.2.

In March 2004, the Hong Kong government first proposed to introduce personalized plates. The motivation was the fiscal budget deficit, a result of SARS in 2003 and the economic downturn from 2002 to 2004.[12] As the sales of traditional plates went to a charity fund instead, the government proposed selling personalized plates to raise government revenue.[13] Subject to certain restrictions, personalized plates allow vehicle owners to personalize their plate numbers up to eight digits (e.g., 1 LOVE U, WWW, RELAX, etc.). The first auction of personalized plates was held in September 2006.

2.2 The Auction

The Hong Kong government sells plates by English oral ascending auctions. Ordinary plates have a reserve price of HKD$1,000 (HKD$7.8 = USD$1). Reserve prices vary for special plates and are set by the government. The auctioneer can raise the minimum bid increment

[11] As vehicles may be registered under the name of a company, some have circumvented the restriction by assigning a special plate to a vehicle registered under the name of a company. Selling all the shares of the company to another party thus effectively means transferring the special plate. These "clever" practices blur the non-transferability feature, the supposedly key distinction between ordinary and special plates.

[12] SARS stands for Severe Acute Respiratory Syndrome, a highly contagious disease that killed 304 people in Hong Kong in 2003.

[13] This motive was clearly documented in many Legislative Council documents, for instance, on a review of personalized plates dated January 2008 (document number CB(1)590/07-08(01).

during the auction. Auctions are usually held during weekends and Chinese Lunar New Year holidays. There is no fixed schedule, and therefore the number of auctions in a given month can vary. On average each auction sells more than a hundred different plates sequentially.

Auction theory suggests that in an English oral ascending auction, if there is no binding minimum bid increment and binding reserve price, and the valuations of bidders are independent, then in equilibrium the winner pays an amount equal to the valuation of the second highest bidder. The winning bid is thus the social opportunity cost. Controlling for other factors, if superstitions determine the prices, the auction data would allow us to link superstitions with social value.

Ideally, if plates are all non-transferable, as is supposedly the case for special plates, then the assumption of independent bidders' valuations seems plausible. As mentioned, however, there are ways to transfer special plates that are supposedly non-transferable "cleverly". Ordinary plates are not subject to any transferability restriction. There are companies bidding plates in auctions, aiming at trading them for profit.[14] Their valuations of a plate, therefore, depend on their estimates of its future price. These bidders' valuations have a common value component. This leads to the possibility of the winner's curse: the winning bidder is the most optimistic one who over-estimates the future price.[15] The common value component makes it non-trivial to map winning bids to social cost. These concerns can constrain our empirical strategies.

[14]This issue should be a legitimate concern. Two pieces of evidence support this claim. First, according to the Official Record of Proceedings on 18 October, 2006 by the Hong Kong Legislative council, the first auction of personalized plate numbers sold 210 plates to 159 buyers. Among whom 143 buyers (68% of plates) only acquired one for their own use, while 16 buyers acquired more than one plates (32% of plates). One buyer acquired 22 plates, believed to be used for trading purposes. Second, one can easily find many companies advertising their inventory of plates for sales. Three companies that do so have their own websites: www.luckynumber.com.hk, www.xx118.com.hk, and www.car8.com.

[15]Garratt and Troger (2006) give a theoretical foundation on auction equilibrium in the presence of speculators in auctions.

2.3 Data

We obtained our data from the Hong Kong Transport Department. They contain 292 auctions of traditional plates from January 1997 to January 2009. The data span two very different periods. Up to August 2006, only traditional plates were available. The introduction of personalized plates in September 2006 marked a transition in this market. There were 46,678 traditional plates available for auction; of which 41,069 were sold. Our dataset does not include the results of the 16 auctions of personalized plates since September 2006. Table 2 gives the breakdown of the number of observations by year.

We observe the plate number, auction date, whether or not the plate was successfully sold in the auction, and if so, the winning bids. We do not, however, observe the reserve prices of the special plates (which are made known at the auction house right before the auction begins), the number of bids, the bidders' identities, the bid increments, and the sequence of the auction.[16] In addition, we do not observe whether the plates sold in the auctions are for personal use or for trade.

Table 3 presents the real prices of plates by types and by year. We denominate the nominal prices by the consumer price index (CPI) of the auction month to adjust for inflation.

3 Empirical Analysis

A license plate serves no other purpose, literally, other than to legalize a car to use the road. The plate number does not change this legal function. Huge variations in the winning bids of plates, therefore, must have reflected some preferences on the plate numbers per se. We hypothesize that superstitions play a role in explaining price variation, that is, having controlled for other factors, superstitions do explain the price variation.

The particular type of superstitions that we would like to focus on is the belief that a number that rhymes similarly to something good(bad) would bring good(bad) luck to the

[16]The data on reserve prices of special plates are not publicly available. For other data, the Transport Department claimed that they did not keep historical records.

owner. It is a false belief because the likelihood of one getting involved in a car accident depends on her driving habit but not on her plate number. Such superstitions can change the allocation of economic resources. For instance, those with "unlucky" plates drive their cars unnecessarily slower is an economic cost. If such superstitions carry significant economic value, their prices must reflect that.

Different numbers rhyme differently in Cantonese, but there is a universal consensus in Hong Kong that "8" is good and "4" is bad. The number "8" rhymes similarly to the word "prosper" or "prosperity". Thus, the superstition is that the number "8" brings prosperity. The number "4" rhymes similarly to the word "die" or "death". Thus, the superstition is that the number "4" increases the odds of dying. Given that these superstitions have persisted for a long time, they must carry a significant economic value. Consistent with this logic, the number "8" would carry a significant premium on a license plate, while the number "4" would carry a significant discount. As such, we aim at empirically estimating the premium and the discount.

3.1 Identification strategy

The estimation involves two inherent difficulties. First, license plates are publicly visible; they are conspicuous goods (also known as Veblen good). People buy an expensive conspicuous good to signal high income and achieve greater social status. The plates that most believe are expensive would serve such a purpose.[17] They are sold at a higher price because everyone expects so, and this is a self-fulfilling equilibrium. This effect, however, has nothing to do with superstitions.

Second, plates with different numbers are visually differentiated. Some number patterns are generally regarded as visually more appealing than others. Differences in visual appeal, therefore, have to be controlled for.

To disentangle the conspicuous effect from the effect of superstitions, we use two strate-

[17]See Biddle (1991), for instance, for the study of conspicous effects of license plates in the United States.

gies. First, we perform estimation on plates with different numbers of digits separately. The idea is to exploit the fact that most expect plates with fewer digits to command higher prices. Table 3 reflects this expectation. However, not many can tell the price difference among plates with the same number of digits. For instance, most expect "LB 36" to be more expensive than "LB 4566" and "DR 388" to be more expensive than "DR 4598". Not many can tell whether "LB 4566" or "LB 3587" is more expensive. Second, in each estimation, we control for plate numbers that most people would expect to be expensive, in particular, those with no prefix, prefix of "HK", and "XX".[18] Most cannot tell the price difference between "DR 3982" and "AG 1793", but they expect "HK 3982" and "XX 1793" to be more expensive than "DR 3982" and "AG 1793", respectively.

To disentangle differences in visual appeal from the effect of superstitions, we control for a variety of different combination patterns. Table 4 summarizes the variables we control for. In particular, we assume that people do not systematically prefer any particular letter or number in terms of their visual appeal. For example, people would not value "AB" systematically higher than "JB", or "KK" higher than "JJ". However, people may value "KK" systematically higher than "JB", as the same-letter prefix is visually more appealing. In addition, people would not systematically value "132" higher than "379", but they would value "1234" higher than "4591" because of the sequential numbers.

3.2 Empirical specification

While the structural estimation of auctions is the usual strategy for empirical auction studies, in addition to data limitation, the presence of (i) common value component, (ii) potentially binding reserve price, (iii) potentially binding minimum bid increment, and (iv) sequential auctions of many plates substantially complicate the use of a structural estimation approach. The theory has yet to draw a mapping between winning bids and the bidders' valuations under all these constraints. We therefore abstract away from the use of structural estimations

[18]The earliest plates containing numbers only and those with "HK" and "XX" as prefixes are substantially more expensive than others perhaps because of their long history.

and instead, use the hedonic pricing estimation.

The hedonic pricing method studies how the price of a commodity relates to its attributes. Court (1939) first introduces the methodology, and Lancaster (1966) and Rosen (1974) further develop it. Woo and Kwok (1994), Chong and Du (2008), and Woo et al. (2008) employ hedonic estimations as well. McDonald and Slawson (2002) use hedonic estimations to study the effect of a seller's reputation in internet auction. As noted in Bajari and Hortacsu (2004), however, using hedonic estimations requires somewhat stringent assumptions to interpret the "implicit prices" as buyer valuations.[19] Interpreting the results of hedonic estimations calls for caution.

The regression model takes the following form, estimated by plate types:

$$\begin{aligned} \ln(\text{Real price}) \;=\; & \alpha + \beta(\text{letter prefix characteristics}) + \gamma(\text{number patterns}) \\ & + \delta(\text{number counts of "0" to "9"}) \\ & + \lambda(\text{year-month dummies}) + \text{error}. \end{aligned} \tag{1}$$

The notations β, γ, δ, and λ are vectors. The year-month dummies capture the macro-economic environment that systematically affects the winning bids within the month.[20]

Although we do not observe the number and identities of the bidders, we believe that their composition in any particular auction would influence the winning bids in that auction in certain ways. To take this into account, the model assumes that the error terms within an auction date are correlated in some unknown way, but that plates auctioned on different dates do not have correlated errors. We therefore calculate the standard errors clustered by auction date. In addition, to account for heteroscedasticity, White-corrected standard errors

[19] On page 474 of the article, the conditions are as follows: (i) no common value component, (ii) no asymmetric information among bidders about the marginal values of the observed product characteristics, (iii) no minimum bids or reserve prices, (iv) all bidders are ex ante symmetric, (v) all product characteristics are observable, and (vi) entry is exogenous and a dummy variable for the number of bidders is included in the regression.

[20] In another specification (which are available upon request), we use year dummies only, but we include the month-end stock market index (i.e., the Hang Seng index) to proxy for the macro-economic variations. The results are very similar.

are calculated.

Our estimation differs from those in Woo and Kwok (1994), and Woo et al. (2008). In particular, the two papers estimate the plates with different digits jointly. In addition to disentangling the effects of conspicuous consumption from the effects of superstitions, estimating separately has three other advantages. First, it avoids ambiguous interpretation of some estimated coefficients.[21] Second, estimating separately allows the discount of a "4" and the preimum of an "8" to vary across plates with different digit.[22] As we will see in Section 4.2.1, the effect is not constant in general. Third, building on the two papers and yielding consistent results under different estimation specifications in our paper help strengthen the results in the two papers.

4 Empirical results

4.1 Superstitions carry a significant economic value

Table 5 shows the main results of the regressions of different types of plates. In particular, we found that number "8" is associated with plates with significantly higher winning bids, while number "4" is associated with plates with significantly lower winning bids. Controlling for other factors, an ordinary 4-digit plate with one extra "8" was sold 63.5% higher on average, while an ordinary 4-digit plate with one extra "4" was sold 11% lower on average (both relative to the number "7"). The corresponding estimates for ordinary 3-digit plates are

[21] Estimating separately avoids the inherent difficulty of interpreting the estimated coefficients of the dummies that is possible in some but not all types of plates. For instance, in a joint estimation of plates of all digits, the interpretation of the estimated coefficient of the dummy for aabb (two pairs in parallel) is ambiguous. The dummy is equal to 1 if a 4-digit plate has this aabb pattern (e.g., JK 3344). However, it is equal to 0 if either a 4-digit plate does not have this pattern or it is impossible to have this pattern as the plate not 4-digit. Suppose the estimated coefficient is, say, 40%, then it is difficult to interpret it as a 40% increase in the selling price with this pattern, or the possibility of having this pattern, together with the fact that the plate does have this pattern, commands a 40% premium.

[22] To be precise, Woo and Kwok (1994), and Woo et al. (2008) alleviate this concern by using the share of a number in the plate instead of the count of the number in their specification, which instead impose a much milder restriction: that the effect of an increase in the share of a number on the price is constant across plates with different digits.

94.8% and 27.3%, respectively.

These figures mean on average that for an ordinary 4-digit plate, replacing the number "7" with the number "8" would allow the plate to be sold at roughly USD$400 higher.[23] On the other hand, replacing the number "7" by the number "4" woud allow the plate to be discounted for USD$69. If we do the same replacements in ordinary 3-digit plate, an "8" adds USD$1,249 to the price, while a "4" reduces the price tag by USD$360. These numbers are significant even in real economic terms.

We obtain similar results on special plates of all digits. In short, consistent with our hypothesis, an "8" does carry a significant premium, while a "4" does carry a significant discount. Our results on the numbers and the patterns are also consistent with those in Woo and Kwok (1994), and Woo et al. (2008), suggesting that their qualitative results continue to be robust under alternative econometric specifications and with data from a more extended period of time.

4.2 The economics of superstitions

Our results also allow us to address one interesting question: to what extent would the value of superstitions, based on beliefs that are inherently irrational, be explained by economic intuition? We present three pieces of evidence in the next three sections that suggest that the responses of the value of superstitions to changes square with economic intuition well. Section 4.2.4 looks at how the value of superstitions vary with the macroeconomic environment.

4.2.1 Would the premiums and discounts vary across types of plates?

We first look into the change in the premium and the discount of an "8" and a "4", respectively, across different types of plates. An analogy can explain the relevant economic intuition. Suppose that rather than leaving next year's health to randomness, one can buy a healthy year from God. How much in terms of her share of wealth would she be willing to

[23]The amount of United States dollars are at 2005 price.

pay for? The sooner she expects to die, the larger the share she is willing to give up. A year of good health weighs more in a shorter life. Analogously, one's willingness to pay to acquire an "8" (or to get rid of a "4") would increase across plates with fewer digits on average. The increase is due to the bigger share of a number in plates with fewer digits.

The results in Table 5 allow us to examine whether the estimates are consistent with this logic. The discounts on a "4" are all statistically significant across all types of plates. More interestingly, the size increases as we move from ordinary 4-digit plates to ordinary 3-digit plates, with the increase from 11% to 27.3%. Estimates of special plates exhibit a similar pattern: a larger discount when moving from 4-digit, to 3-digit, to 2-digit, and to 1-digit, with figures of 15.6%, 20.9%, 34.5%, and 83.2% respectively. We find the exact same pattern on the premium on an "8". An unlucky "4" is bad, but it is the worst if it is on a 1-digit plate than on a 2-digit plate. On the other hand, a lucky "8" is good, but it is the best if it is on a 1-digit plate. Such a pattern is not generally true for other numbers.[24]

4.2.2 Would the value repond to policy change?

We also use the introduction of personalized plates as a natural experiment. After the introduction of personalized plates in 2006, we ask whether the sizes of the premium on an "8" and the discount on a "4" change, and if so, in which direction.

Although based on irrational beliefs, any particular superstition must have a demand function. Economic intuition suggests that a demand would change under exogenous change: the demand for a superstition would shift down as substitutes are introduced. Expressing oneself by means of a personalized plate rather than having a "lucky" plate did not become an option until 2006.

Formally, in the regressions, we hypothesize that the coefficients of "8" and "4" differ before and after 2006. Precisely when the effect of personalized plates started is hard to say.

[24]Note that our estimated coefficients imply that the effect of an increase in the share of a number on the price is *not* constant across plates of different digits. For instance, if the effect were the same, the estimated coefficient of num4 in column 2 would have been $-11\%(33/25) = 14.52\%$ instead of 27.3% as in our estimation.

We believe it is more reasonable to think that it started at the beginning of 2006 when the bill was finally passed and people started reserving for their personalized plates for auctions rather than when the first auction for personalized plates was held.

Table 6 shows the results. The sizes of the premium on an "8" and the discount on a "4" universally reduced after 2006 for all the 4-digit (including ordinary and special) and 3-digit ordinary plates. The results of the Wald tests on these three types of plates indicate that the estimated coefficients of a "4" and an "8" differ significantly before and after 2006, suggesting that the introduction of personalized plates may have changed the value people place on superstitions. For instance, for an ordinary 4-digit plate on average, an "8" carries a 64.8% premium before 2006 but only 61.4% after 2006. The corresponding figures for an ordinary 3-digit plate are 98.9% before 2006 and 87% after 2006.

The significance of the differences of the estimated coefficients is marginal for 1-, 2-, and 3-digit special plates. Except for these three types of plates that comprise a little less than 10% of the data, we do see a universal pattern of the changes in the premium and discount before and after 2006.

4.2.3 Would the response be stronger among a closer pair of substitutes?

Which types of plates should the value of superstitions be most responsive to the introduction of personalized plates? Consumer theory suggests that the degree of substitutability is larger in a pair of substitutes that sells at similar price ranges than in a pair that sells at very different price ranges. For instance, introducing a new Cadillac model should affect the demand for Mercedez E-class more than that for Honda Civic.

Although we do not have data on the price of personalized plates, we can infer its price range as the government set their reserve price uniformly at $5,000. This is the minimum that anyone who bids for any personalized plate would have to pay. The average price therefore should be at least higher than $5,000 (denominated by CPI, the amount is roughly $4,950 in

real price).[25] Table 3 shows that the average real price for ordinary 3-digit plates was around $9,562 before 2006 and that for ordinary 4-digit plates was roughly $4,532. It is therefore reasonable to expect that the personalized plates should be more appealing to people who would be more inclined to buy ordinary 3-digit plates rather than ordinary 4-digit plates. The degree of substitutability between ordinary 3-digit plates and personalized plates should be higher. We therefore expect that the impact of the introduction of personalized plates on the value of superstitions is larger on ordinary 3-digit plates than on 4-digit ordinary plates.

Table 6 reports the consistent results. The change we look into is the premium on replacing a "4" with an "8" in ordinary plates. On average, such a number replacement adds 134.8% to the price of ordinary 3-digit plates before 2006 but only 97.4% after 2006. The percentage drop was 27.75%. Corresponding figures are 77.8% for the price of ordinary 4-digit plates before 2006 and 61.4% after 2006. The percentage drop was 22.88%. Ordinary 3-digit plates priced at a price range similar to that of personalized plates respond to the introduction of personalized plates in a bigger magnitude compared with ordinary 4-digit plates.

4.2.4 Would the value vary with the macro-environment?

The section addresses the dynamics of the value of superstitions. We ask whether people value superstitions differently over time and across different macroeconomic environments. To address this question, we run the following regression on different types of plates.

$$\begin{aligned} \ln(\text{Real price}) \;=\; & \alpha + \beta(\text{letter prefix characteristics}) + \gamma(\text{number patterns}) \\ & + \delta(\text{number counts of "0" to "9"}) \\ & + \theta((\text{number counts of "0" to "9"})(\text{market condition})) \\ & + \lambda(\text{year-month dummies}) + \text{error}. \end{aligned} \tag{2}$$

[25] One price example of a personalized plate is "HAHAHAHA" that was sold for $65,000 on 16 Septmber, 2006.

The notations β, γ, θ, δ, and λ are vectors. We use the natural log of the Hong Kong Hang Seng Index at the end of the month the plate was auctioned to proxy for the macroeconomic environment. The premium for each number "j" now is

$$\partial[\ln(\text{Real Price})]/\partial[\text{num } \text{“}j\text{”}] = \delta_j + \theta_j \ln(\text{Stock market index}). \tag{3}$$

This specification allows the premium or discount of superstitions to vary across different macroeconomic environments.

If we expect people to be more superstitious in bad times, they would discount a "4" even more in bad times. As well, they would place a higher premium on an "8" in bad times. In terms of the estimated coefficients, θ_4 should be significantly positive, and θ_8 should be significantly negative.

Columns 1 to 4 of Table 7 show the results for both special and ordinary 4-digit and 3-digit plates, which comprise 90.3% of our total observations. The results suggest that the size of the discount on a "4" is negatively associated with the market index. People tend to discount a "4" even more in bad times. For instance, the discount on a "4" in 4-digit ordinary plates is on average equal to -201.1% + 19.9%ln(stock market index). A 1% drop in the stock index adds an extra 19.9% in the size of the discount. A "4" is bad, but it is even worse in bad times.

The results suggest that an "8" is associated with a significant premium. For ordinary and special 4-digit plates, the premium does not change under different market conditions. For ordinary and special 3-digit plates, however, the premium tends to be even larger during bad times. For instance, the premium on a "8" in a 3-digit ordinary plate is on average equal to +200.8% - 11.1%ln(stock market index). A one percent drop in the stock market index adds an extra 11.1% in the size of the premium.

It is interesting to note that the premium on an "8" tends to be more stable than the discount on a "4". For 4-digit ordinary plates, the premium on an "8" does not vary with the

market condition, while the discount on a "4" does. For ordinary and special 3-digit plates, the discount on a "4" varies with the market condition in a greater proportion compared with that in the premium on an "8". This is an interesting empirical pattern that the literature on superstitions has not documented. We are not able to come up with a good explanation for the asymmetric effects.

We do not, however, find a similar pattern in 2-digit and 1-digit plates, which comprise a little less than 10% of our data.

4.3 Robustness

4.3.1 Are number preferences per se driving the results?

One may argue that the significance of our results may well be attributed to the number preferences per se rather than to superstitions, that is, people in Hong Kong simply systematically prefer "8" and dislike "4". Such preferences have nothing to do with superstitions. To address this issue, we control for the number preferences by controlling for the numbers that appear on a plate. We estimate the following equation on 3-digit ordinary plates:

$$\begin{aligned} \ln(\text{Real price}) &= \alpha + \beta(\text{letter prefix characteristics}) + \delta(\text{ordered combinations}) \\ &\quad + \lambda(\text{year-month dummies}) + \text{error}. \end{aligned} \tag{4}$$

The bottom panel of Table 4 gives the definition of the variables we use. The idea is to exploit the fact that even for the same set of numbers, what they rhyme similarly to depends on how they are ordered. Numbers ordered in such a way that rhymes similarly to some good(bad) phrases would carry a significant premium(discount), which has nothing to do with number preferences anymore. We estimate this equation on 3-digit ordinary plates separately for four sets of number combinations, (1) "1", "6", and "8", (2) "1", "3", and "8", (3) "1", "4", and "8", and (4) "2", "3", and "8".

The most preferred plate number is "168", which rhymes similarly to "proper all the

way".[26] Controlling for the numbers, if superstitions have value, then "168" would be associated with higher winning bids. Column 1 of Table 8 shows consistent results. A "168" plate is significantly more expensive than an "861" plate. On average, it was sold for close to three times more expensive than that of a "861" plate because "861" is not associated with any phrase that makes sense in Cantonese.[27]

The numbers "138", "813", "148" and "814" rhyme similarly to "I will be wealthy my entire life." Columns 2 and 3 of Table 8 show that they are all associated with plates with higher winning bids.[28]

The numbers "238" and "328" rhyme similarly to "this life is prosperous" and "business is profitable", respectively. Column 4 of Table 8 shows that these numbers are again associated with plates with higher winning bids.

The results suggest that number preferences alone cannot explain the price variations. It is what a plate number rhymes similarly to that determines its price. Thus, plate numbers that allude to good phrases are associated with higher winning bids.

4.3.2 Do the results hold in the secondary market?

To check whether our results also hold in the secondary market, we collect listed prices for license plates from a secondary market seller. A caveat is that we only collect listed prices and not the actual transacted prices.[29] We managed to collect up to eight days of listed prices of car plates spanning from June 2002 to August 2009.[30]

Altogether we have 16,001 plates with their listed prices across the eight days, 8,195

[26]The number "16" rhymes similarly to "all the way" (as an adverb); thus, "168" rhymes similarly to "prosper all the way".

[27]Both "861" and "681" are not associated with any phrase that makes sense in Cantonese. However, "186", "618", and "816" are all variations, in terms of what they mean, of "road to propersity".

[28]Again, "283", "382", "823", and "832" do not rhyme similarly to any phrase that makes sense in Cantonese.

[29]We rely on the seller's website as well as The Internet Archive (web.archive.org) to collect the data. We have contacted the seller to obtain more historical data and the transacted prices, but the seller refused to provide us with their transacted prices.

[30]The eight days are Jun 2, 2002, Dec 9, 2002, Aug 5, 2003, Oct 16, 2003, Feb 20, 2004, Apr 19, 2004, Aug 5, 2004, and Aug 25, 2009.

(51%) of them are 4-digit ordinary plates and 7,806 (49%) are ordinary 3-digit plates.[31] We estimate the same specifications as we have done in the previous sections. Table 9 gives the estimation results.

Columns 1 and 2 of Table 9 illustrate that the results in Table 5 are robust. First, we continue to find that "lucky" number "8" carries a significant premium, while "unlucky" number "4" carries a significant discount. Controlling for other factors, an ordinary 4-digit plate with one extra "8" was listed at 40.1% higher on average, while an extra "4" was listed at 17.8% lower. The corresponding estimates for an ordinary 3-digit plate are 74.7% and 18.5%, respectively. Second, consistent with the results in Section 4.2.1, an "8" commands a higher premium on a 3-digit plate than on a 4-digit plate. Similarly, a "4" is discounted more in a 3-digit plate than in a 4-digit plate.[32]

Columns 3 to 6 of Table 9 check whether the results in section 4.2.2 are robust. The estimates suggest that after the introduction of personalized plate in 2006, the discount of a "4" in both ordinary 3-digit and 4-digit plates drop. The premium on an "8" in ordinary 3-digit plates drops too. However, the premium on an "8" in ordinary 4-digit plates is roughly the same across the two periods. Except for the premium on an "8" in 4-digit plates, the results are consistent with those in Table 7.

Section 4.2.3 argues that the introduction of personalized plate affects the premiums and discounts on numbers in ordinary 3-digit plates more than those in ordinary 4-digit plates, as personalized plates are more of the closer substitutes to ordinary 3-digit plates than to ordinary 4-digit ones. We continue to observe this in Table 9. The change we look

[31] Of the 16,290 listed prices we collected, surprisngly, 1.8% (or 289) of them are special plates. We deleted these plates because, as mentioned, it is by law not legal to transfer special plates. We therefore suspect that the prices involve not only the values of plates but also the service fees to help "get around" with the non-transferable rule.

[32] In another specification, we successfully match 1,299 ordinary 4-digit plates and 1,892 ordinary 3-digit plates with the auction data (i.e., 20% of the data). We run the same specification as in Columns 1 and 2 of Table 9, with the auction price as an extra control variable. Table 10 shows the estimation results. They suggest that controlling for all the variables, the past auction price of a plate continues to be a significant price determinant (statistically significant at the 1% level.) A higher auction price, everything else being equal, leads to a higher listed price in the second-hand market. However, there is still a significant premium on an "8". For a "4", the discount is statistically significant for ordinary 3-digit plates but not for 4-digit plates.

into is the premium on replacing a "4" with an "8" on a plate. On average, such number replacement adds 107.7% to the price of ordinary 3-digit plates before 2006 but only 52.6% after 2006, which is a percentage drop of 51.16%. The corresponding figures are 59.9% to the price of ordinary 4-digit plates before 2006 and 43.7% after 2006. The percentage drop was 27.05%. Ordinary 3-digit plates respond to the introduction of personalized plates in a bigger magnitude compared with ordinary 4-digit plates.

Columns 7 and 8 re-estimate specification (2). For ordinary 3-digit plates, we continue to find that the people discount "4" even more in bad times and value "8" more in bad times. This is consistent with results in Section 4.2.4. We have the right sign of the estimated coefficients for ordinary 4-digit plates, but they are statistically insignificant.

Overall, we find that the listed prices of secondary market plate sellers exbihit very similar statistical patterns compared with the auction data, which lends further support to our main results.

5 Conclusion

This paper estimates the value of a particular type of superstitions: a "lucky"("unlucky") number can bring good(bad) luck. We have shown that the value of superstitions can be economically significant. We believe that the results are consistent with the fact that superstitions persist over time.

Although we may not be the first to document the value of superstitions, we are the first in the economics literature to address the question of how such value changes over time, and in response to other policy changes. Interestingly, we find that the value of superstitions changes in ways that are consistent with economic intuition. The dataset we obtain and the exogenous policy change provide us a unique opportunity to address this issue.

We have also shown that some results are consistent with the view that people tend to be more superstitious in bad times. Our results suggest that people tend to discount a

bad number even more in bad times. However, people place a higher premium on a good number in bad times only for a small subset of plates. We conjecture that the value people attach to superstitions change across different macroeconomic environments, but the changes are asymmetric in positive and negative superstitions. By positive superstitions, we mean the false belief that some logically unrelated items or actions bring good luck. Negative superstitions are the opposite case. We are not aware of any theory that distinguishes positive superstitions from negative superstitions.

To conclude, while our empirical analysis documents the value of superstitions and how it changes over time and in response to exogenous changes, it also calls for explicit modeling of different types of superstitions in order to understand the empirical findings. We hope that our study would motivate theoretical research on this particular issue.

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Table 1: Features of license plates by type

		Traditional		Personalized
		Ordinary	Special	–
Features	Structure	no, or 2-Letter prefix, followed by a number between 1-9999		8-digit, combinations of numbers, letters and space
	Examples	AA 347 DR 5689	AA 1 DR 3883	1 LOVE U RELAX
	Expire?	No expiry date	Until the holder dies or the company dissolves	15 years
Allocation	Legally transferable?	Yes	No	No
	Assigned?	Yes	No	No
	Auctioned?	Yes	Yes	Yes
Availability	Before Sep 2006	Yes	Yes	No
	After Sep 2006	Yes	Yes	Yes
Auction	Reserve price	$1,000	Varies	$5,000
	Min. Bid increment	Varies	Varies	Varies

Table 2: Summary of data by year and types of plate

					Total	Breakdown of plate types (sold and unsold)					
		Number of			Nominal	1-digit	2-digit	3-digit		4-digit	
Year	Auctions	Plates	Sold	Unsold	Sales (HKD$)	special	special	special	ordinary	special	ordinary
1997	23	2388	2258	130	$72,000,000	3.02%	6.20%	4.98%	37.44%	7.24%	37.44%
1998	27	2605	2358	247	$54,500,000	2.42%	7.37%	5.68%	37.85%	7.18%	37.85%
1999	28	2487	2158	329	$47,500,000	3.10%	6.88%	5.75%	39.20%	6.84%	39.20%
2000	31	3518	3152	366	$68,100,000	2.42%	4.55%	4.78%	40.62%	6.05%	40.62%
2001	32	3795	3275	520	$62,800,000	3.03%	6.64%	6.56%	38.55%	5.96%	38.55%
2002	27	3100	2679	421	$51,600,000	3.03%	8.26%	6.39%	36.81%	5.84%	36.81%
2003	31	6885	5893	992	$89,500,000	2.88%	7.61%	6.51%	36.85%	6.30%	36.85%
2004	17	3517	3026	491	$47,900,000	1.93%	12.68%	6.48%	37.56%	6.28%	37.56%
2005	19	4355	3846	509	$64,300,000	1.79%	12.01%	6.41%	35.94%	5.26%	35.94%
2006	20	4615	4088	527	$53,800,000	1.73%	9.71%	6.59%	38.70%	5.66%	38.70%
2007	15	3705	3345	360	$50,500,000	1.67%	8.77%	5.34%	39.30%	4.83%	39.30%
2008	21	5428	4776	652	$94,500,000	1.68%	10.17%	6.74%	36.57%	6.06%	36.57%
2009*	1	280	215	65	$2,649,000	1.79%	13.57%	8.93%	30.36%	7.86%	30.36%
Total	292	46678	41069	5609	$759,649,000	2.33%	8.64%	6.15%	37.75%	6.05%	37.75%

* 2009 is up to January only.

Table 3: Average real prices by year and types of plate, in $HKD (base year is Oct 2004 - Sep 2005)

		Breakdown by plate types							
		All types		1-digit	2-digit	3-digit		4-digit	
YEAR	All	Special	Ordinary	Special	Special	Special	Ordinary	Special	Ordinary
1997	$28,220	$90,339	$12,197	$172,220	$114,172	$60,585	$17,241	$48,535	$7,270
1998	$19,876	$63,860	$9,159	$168,733	$49,739	$54,048	$12,311	$48,794	$5,857
1999	$19,697	$69,121	$9,133	$161,301	$49,284	$58,776	$13,271	$48,141	$4,418
2000	$20,119	$87,962	$8,879	$157,339	$113,109	$62,634	$11,634	$48,379	$5,965
2001	$18,145	$74,226	$7,849	$153,095	$54,906	$77,518	$10,868	$39,454	$4,634
2002	$18,800	$61,134	$10,001	$130,508	$60,569	$45,152	$14,321	$34,654	$5,555
2003	$15,220	$53,922	$6,644	$108,158	$40,429	$51,562	$8,787	$35,549	$4,437
2004	$15,925	$47,903	$6,883	$117,762	$43,595	$39,339	$9,032	$38,787	$4,348
2005	$16,685	$50,180	$7,110	$117,305	$44,029	$45,133	$9,562	$43,930	$4,532
2006	$12,860	$37,670	$6,415	$100,443	$28,645	$29,918	$8,512	$41,481	$3,945
2007	$14,433	$47,654	$6,860	$114,604	$41,339	$37,448	$8,393	$42,943	$5,156
2008	$18,210	$69,139	$5,812	$96,600	$80,600	$52,702	$7,127	$54,729	$4,448
All years	$17,530	$59,827	$7,688	$130,135	$54,591	$49,492	$10,275	$43,785	$4,914

Table 4: Definitions of independent variables

Variables	Descriptions	Dummy?	Examples
Letter prefix characteristics			
sameletter	same letter prefix	Y	AA 345, JJ 7
noletter	no letter prefix	Y	18, 3445
hk	the letter prefix is "HK"	Y	HK 80, HK 71
xx	the letter prefix is "XX"	Y	XX 73, XX 167
Number patterns			
n911	"the" classic Porsche model	Y	LB 911, DR 911
n100x	multiple of 100	Y	XX 700, JB 300
n1000x	multiple of 1000	Y	JK 2000, ME 4000
symmetric	symmetric sequence	Y	MB 373, AK 1441
aabb	2 pairs in parallel	Y	MB 3344, LL 4466
abab	2 pairs mixed	Y	MB 3534, LL 4646
aaab	3 of a kind in front	Y	AJ 1113, LA 7779
abbb	3 of a kind at the back	Y	AJ 1333, LA 7999
aaba	3 of a kind on the side I	Y	AG 1131, LE 7797
abaa	3 of a kind on the side II	Y	AG 1311, LE 7977
aab	1 pair in front	Y	NN 660, EL 773
abb	1 pair at the back	Y	NN 677, EL 144
abcd	sequential sequence	Y	AA 1234, HB 567
dcba	reverse sequential	Y	AA 4321, HB 765
aa	2 of a kind	Y	BB 22, AL 66
aaa	3 of a kind	Y	BB 222, AL 666
aaaa	4 of a kind	Y	BB 2222, AL 6666
n13	"13", "131", "113" and "1313"	Y	HK 13, AL 113
Number counts			
num1	the count of number "1"	N	
num2	the count of number "2"	N	
num3	the count of number "3"	N	
num4	the count of number "4"	N	
num5	the count of number "5"	N	
num6	the count of number "6"	N	
num7	the count of number "7"	N	
num8	the count of number "8"	N	
num9	the count of number "9"	N	
num0	the count of number "0"	N	
Ordered combinations			
numxyz	whether the 3 numbers are ordered in "x", "y", "z" pattern	Y	

Table 5: Regressions of superstitions on winning bids by types of plate. Dependent variable: natural log of Winning bids, 1997-2008.

	4 ordinary	3 ordinary	4 special	3 special	2 special	1 special
sameletter	0.635***	0.749***	0.795***	0.869***	0.884***	0.955***
	[0.0258]	[0.0286]	[0.0445]	[0.0401]	[0.0463]	[0.0876]
noletter	–	–	3.475***	3.803***	4.569***	no obs
			[0.0717]	[0.125]	[0.449]	
hk	2.563***	2.405***	1.895***	2.209***	2.157***	no obs
	[0.108]	[0.0736]	[0.159]	[0.213]	[0.153]	
xx	1.900***	1.575***	1.077***	1.192***	1.023***	0.619*
	[0.0709]	[0.0671]	[0.142]	[0.138]	[0.153]	[0.325]
n911	–	0.894***	–	–	–	–
		[0.0520]				
n100x	–	–	-0.231***	0.674***	–	–
			[0.0817]	[0.198]		
n1000x	–	–	0.665**	–	–	–
			[0.274]			
symmetric	–	–	1.004***	0.530***	–	–
			[0.0804]	[0.131]		
aabb	–	–	1.319***	–	–	–
			[0.0737]			
abab	–	–	1.085***	–	–	–
			[0.0780]			
aaab	0.749***	–	0.719***	–	–	–
	[0.0225]		[0.218]			
abbb	0.801***	–	0.485**	–	–	–
	[0.0222]		[0.233]			
aaba	0.289***	–	0.245	–	–	–
	[0.0247]		[0.172]			
abaa	0.330***	–	0.506***	–	–	–
	[0.0271]		[0.158]			
aab	–	0.530***	–	0.505***	–	–
		[0.0164]		[0.117]		
abb	–	0.424***	–	0.324**	–	–
		[0.0162]		[0.137]		
abcd	–	–	1.014***	1.120***	–	–
			[0.140]	[0.136]		
dcba	0.0859	0.207***	–	–	–	–
	[0.145]	[0.0494]				
aa	–	–	–	–	0.731***	
					[0.0265]	
aaa	–	–	–	1.942***	–	–
				[0.136]		
aaaa	–	–	2.416***	–	–	–
			[0.0862]			
n13	–	0.221***	0.706***	-0.337***	0.0192	–
		[0.0558]	[0.240]	[0.0956]	[0.0678]	
num1	0.332***	0.469***	0.0580**	0.0935***	0.317***	1.481***
	[0.0131]	[0.0131]	[0.0259]	[0.0221]	[0.0279]	[0.0697]
num2	0.321***	0.427***	0.128***	0.101***	0.244***	0.293***
	[0.0131]	[0.0136]	[0.0302]	[0.0217]	[0.0295]	[0.0610]
num3	0.325***	0.554***	0.206***	0.189***	0.300***	0.453***
	[0.0136]	[0.0144]	[0.0278]	[0.0212]	[0.0293]	[0.0625]
num4	-0.110***	-0.273***	-0.156***	-0.209***	-0.345***	-0.832***
	[0.0191]	[0.0220]	[0.0592]	[0.0484]	[0.0510]	[0.0740]
num5	-0.125***	-0.195***	-0.0312	-0.149***	-0.149***	-0.157**
	[0.0195]	[0.0181]	[0.0386]	[0.0251]	[0.0337]	[0.0633]
num6	0.292***	0.365***	0.0685**	-0.0163	0.127***	0.0762
	[0.0147]	[0.0147]	[0.0312]	[0.0254]	[0.0280]	[0.0574]
num8	0.635***	0.948***	0.365***	0.382***	0.655***	0.809***
	[0.0126]	[0.0164]	[0.0288]	[0.0218]	[0.0315]	[0.0584]
num9	0.215***	0.294***	0.0351	0.0733***	0.105***	0.278***
	[0.0140]	[0.0136]	[0.0298]	[0.0233]	[0.0278]	[0.0614]
num0	0.124***	0.300***	0.181***	0.232***	0.205***	
	[0.0152]	[0.0161]	[0.0347]	[0.0471]	[0.0412]	
Constant	6.462***	7.234***	7.532***	8.151***	9.417***	11.09***
	[0.0429]	[0.0321]	[0.119]	[0.137]	[0.0463]	[0.0426]
Year-month fixed effect	Y	Y	Y	Y	Y	Y
Observations	15993	17149	1809	1937	3042	924
R-squared	0.461	0.559	0.843	0.858	0.681	0.78

Note: Robust standard errors in brackets (clustered by auction date).
Key: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, – not applicable, no obs no observation.

Table 6: Regressions of superstitions on winning bids by types of plate, pre- and post- 2006. Dependent variable: natural log of Winning bids, 1997-2008.

	4 ord pre	4 ord post	3 ord pre	3 ord post	4 spe pre	4 spe post	3 spe pre	3 spe post	2 spe pre	2 spe post	1 spe pre	1 spe post
sameletter	0.632***	0.631***	0.814***	0.629***	0.728***	0.928***	0.802***	1.022***	0.786***	1.054***	0.936***	0.948***
	[0.0315]	[0.0459]	[0.0365]	[0.0385]	[0.0527]	[0.0762]	[0.0531]	[0.0565]	[0.0529]	[0.0798]	[0.0929]	[0.240]
noletter	–	–	–	–	3.358***	3.831***	3.607***	4.451***	4.102***	5.930***	no obs	no obs
					[0.0724]	[0.113]	[0.122]	[0.205]	[0.422]	[0.386]		
hk	2.452***	3.055***	2.294***	3.031***	1.708***	2.356***	2.004***	2.564***	1.877***	2.632***	no obs	no obs
	[0.114]	[0.233]	[0.0718]	[0.175]	[0.194]	[0.165]	[0.282]	[0.230]	[0.152]	[0.262]		
xx	1.922***	1.870***	1.469***	1.900***	0.927***	1.451***	1.090***	1.373***	0.733***	1.283***	0.822**	0.460**
	[0.0960]	[0.0826]	[0.0796]	[0.100]	[0.196]	[0.185]	[0.166]	[0.126]	[0.167]	[0.200]	[0.368]	[0.230]
n911	–	–	0.869***	0.961***	–	–	–	–	–	–	–	–
			[0.0601]	[0.105]								
n100x	–	–	–	–	-0.239***	-0.0736	0.550**	1.059***	–	–	–	–
					[0.0905]	[0.129]	[0.212]	[0.342]				
n1000x	–	–	–	–	1.082***	0.411*	–	–	–	–	–	–
					[0.259]	[0.236]						
symmetric	–	–	–	–	1.064***	0.979***	0.541***	0.689***	–	–	–	–
					[0.0845]	[0.136]	[0.132]	[0.215]				
aabb	–	–	–	–	1.389***	1.209***	–	–	–	–	–	–
					[0.0823]	[0.115]						
abab	–	–	–	–	1.173***	0.962***	–	–	–	–	–	–
					[0.0826]	[0.131]						
aaab	0.767***	0.712***	–	–	0.669***	0.639	–	–	–	–	–	–
	[0.0283]	[0.0368]			[0.239]	[0.401]						
abbb	0.868***	0.708***	–	–	0.184	0.532**	–	–	–	–	–	–
	[0.0286]	[0.0291]			[0.209]	[0.211]						
aaba	0.321***	0.226***	–	–	0.353*	-0.0567	–	–	–	–	–	–
	[0.0326]	[0.0368]			[0.186]	[0.333]						
abaa	0.386***	0.228***	–	–	0.583***	0.835***	–	–	–	–	–	–
	[0.0357]	[0.0359]			[0.147]	[0.158]						
aab	–	–	0.574***	0.441***	–	–	0.402***	0.329**	–	–	–	–
			[0.0201]	[0.0249]			[0.139]	[0.143]				
abb	–	–	0.431***	0.399***	–	–	0.321**	0.241	–	–	–	–
			[0.0199]	[0.0293]			[0.147]	[0.220]				
abcd	–	–	–	–	1.018***	0.985***	1.039***	1.439***	–	–	–	–
					[0.154]	[0.212]	[0.146]	[0.221]				
dcba	0.0492	0.0952	0.246***	0.127	–	–	–	–	–	–	–	–
	[0.158]	[0.227]	[0.0606]	[0.0809]								
aa	–	–	–	–	–	–	–	–	0.665***	0.862***	–	–
									[0.0277]	[0.0490]		
aaa	–	–	–	–	–	–	1.864***	2.315***	–	–	–	–
							[0.139]	[0.222]				
aaaa	–	–	–	–	2.469***	2.318***	–	–	–	–	–	–
					[0.0916]	[0.133]						
n13	–	–	0.142**	0.411***	0.798***	-0.313*	-0.457***	-0.151	-0.0577	0.109	–	–
			[0.0671]	[0.0974]	[0.149]	[0.171]	[0.122]	[0.148]	[0.0888]	[0.0972]		
num1	0.340***	0.314***	0.481***	0.446***	0.0748**	-0.00889	0.0886***	0.130***	0.297***	0.349***	1.541***	1.326***
	[0.0163]	[0.0185]	[0.0165]	[0.0209]	[0.0316]	[0.0426]	[0.0274]	[0.0346]	[0.0338]	[0.0484]	[0.0770]	[0.147]
num2	0.333***	0.297***	0.439***	0.406***	0.156***	0.00313	0.131***	0.0399	0.197***	0.310***	0.340***	0.185
	[0.0162]	[0.0185]	[0.0168]	[0.0216]	[0.0353]	[0.0510]	[0.0248]	[0.0423]	[0.0374]	[0.0447]	[0.0673]	[0.165]
num3	0.337***	0.310***	0.565***	0.525***	0.236***	0.114***	0.205***	0.133***	0.265***	0.375***	0.590***	-0.0146
	[0.0167]	[0.0214]	[0.0183]	[0.0209]	[0.0326]	[0.0405]	[0.0262]	[0.0362]	[0.0360]	[0.0485]	[0.0661]	[0.125]
num4	-0.130***	-0.0468	-0.359***	-0.104***	-0.221***	-0.00554	-0.250***	-0.124	-0.384***	-0.252***	-0.708***	-1.169***
	[0.0221]	[0.0363]	[0.0241]	[0.0350]	[0.0708]	[0.0959]	[0.0573]	[0.0850]	[0.0828]	[0.0539]	[0.0821]	[0.133]
num5	-0.123***	-0.126***	-0.221***	-0.129***	-0.0172	-0.0952*	-0.185***	-0.0961**	-0.131***	-0.216***	-0.0994	-0.365**
	[0.0234]	[0.0322]	[0.0223]	[0.0266]	[0.0484]	[0.0560]	[0.0301]	[0.0451]	[0.0407]	[0.0621]	[0.0695]	[0.145]
num6	0.287***	0.307***	0.381***	0.336***	0.0686*	0.035	-0.0233	-0.0175	0.0803**	0.204***	0.201***	-0.351***
	[0.0182]	[0.0220]	[0.0178]	[0.0245]	[0.0393]	[0.0495]	[0.0290]	[0.0493]	[0.0327]	[0.0488]	[0.0622]	[0.121]
num8	0.648***	0.614***	0.989***	0.870***	0.388***	0.292***	0.394***	0.342***	0.598***	0.737***	0.884***	0.571***
	[0.0159]	[0.0174]	[0.0197]	[0.0254]	[0.0330]	[0.0525]	[0.0260]	[0.0390]	[0.0385]	[0.0533]	[0.0663]	[0.120]
num9	0.209***	0.235***	0.280***	0.325***	0.0285	0.0407	0.0696**	0.0699*	0.0516	0.177***	0.317***	0.173
	[0.0166]	[0.0252]	[0.0167]	[0.0213]	[0.0346]	[0.0556]	[0.0314]	[0.0355]	[0.0354]	[0.0395]	[0.0680]	[0.139]
num0	0.108***	0.172***	0.319***	0.266***	0.204***	0.0747	0.265***	0.214***	0.104**	0.362***	–	–
	[0.0183]	[0.0252]	[0.0198]	[0.0254]	[0.0417]	[0.0517]	[0.0611]	[0.0720]	[0.0475]	[0.0623]		
Constant	6.484***	6.389***	7.262***	7.151***	7.537***	7.549***	8.338***	7.603***	9.670***	8.984***	11.05***	11.20***
	[0.0525]	[0.0630]	[0.0400]	[0.0504]	[0.140]	[0.175]	[0.137]	[0.225]	[0.0576]	[0.0684]	[0.0469]	[0.0850]
Year-month fixed effect	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	11328	4665	12004	5145	1312	497	1304	633	1974	1068	723	201
R-squared	0.449	0.506	0.564	0.551	0.848	0.866	0.859	0.866	0.668	0.673	0.786	0.774
Wald test ∨	$F(2,281)=6.54$		$F(2,280)=34.40$		$F(2,284)=2.87$		$F(2,280)=1.00$		$F(2,284)=0.78$		$F(2,266)=2.25$	
	Prob > F = 0.0017		Prob > F = 0.0000		Prob > F = 0.0585		Prob > F = 0.3701		Prob > F = 0.4591		Prob > F = 0.1069	

Note: Robust standard errors in brackets (clustered by auction date). Key: *** $p<0.01$, ** $p<0.05$, * $p<0.1$, – not applicable, no obs no observation.
∨ Hypothesis: whether coefficients of num4 and num8 differ signficantly between pre- and post-2006 estimations

Table 7: Regressions of superstitions on winning bids by types of plate, with the Hong Kong Hang Seng Index. Dependent variable: natural log of Winning bids, 1997-2008.

	4 ordinary	3 ordinary	4 special	3 special	2 special	1 special
sameletter	0.634***	0.750***	0.794***	0.877***	0.878***	0.943***
	[0.0259]	[0.0282]	[0.0446]	[0.0404]	[0.0458]	[0.0869]
noletter	–	–	3.465***	3.810***	4.561***	no obs
			[0.0668]	[0.119]	[0.446]	
hk	2.559***	2.402***	1.884***	2.221***	2.150***	no obs
	[0.107]	[0.0737]	[0.151]	[0.203]	[0.152]	
xx	1.908***	1.580***	1.072***	1.152***	1.022***	0.668**
	[0.0717]	[0.0683]	[0.152]	[0.139]	[0.153]	[0.311]
n911	–	0.898***	–	–	–	–
		[0.0522]				
n100x	–	–	-0.244***	0.691***	–	–
			[0.0802]	[0.189]		
n1000x	–	–	0.681**	–	–	–
			[0.275]			
symmetric	–	–	0.995***	0.534***	–	–
			[0.0764]	[0.125]		
aabb	–	–	1.293***	–	–	–
			[0.0719]			
abab	–	–	1.072***	–	–	–
			[0.0745]			
aaab	0.750***	–	0.706***	–	–	–
	[0.0226]		[0.228]			
abbb	0.803***	–	0.461**	–	–	–
	[0.0220]		[0.230]			
aaba	0.289***	–	0.225	–	–	–
	[0.0247]		[0.169]			
abaa	0.330***	–	0.513***	–	–	–
	[0.0271]		[0.120]			
aab	–	0.531***	–	0.461***	–	–
		[0.0163]		[0.111]		
abb	–	0.421***	–	0.305**	–	–
		[0.0162]		[0.130]		
abcd	–	–	1.040***	1.117***	–	–
			[0.141]	[0.131]		
dcba	0.0831	0.204***	–	–	–	–
	[0.137]	[0.0497]				
aa	–	–	–	–	0.727***	–
					[0.0263]	
aaa	–	–	–	1.947***	–	–
				[0.130]		
aaaa	–	–	2.357***	–	–	–
			[0.0812]			
n13	–	0.220***	0.684***	-0.343***	0.0175	–
		[0.0559]	[0.232]	[0.0958]	[0.0688]	
num1	0.398	0.628*	1.371*	0.803	0.143	5.657**
	[0.347]	[0.362]	[0.810]	[0.606]	[1.070]	[2.193]
num2	0.421	0.849**	1.886*	1.510**	-0.869	3.262*
	[0.354]	[0.384]	[0.961]	[0.676]	[0.997]	[1.895]
num3	0.246	0.473	1.091	0.977	-1.075	5.783***
	[0.358]	[0.403]	[0.890]	[0.624]	[1.004]	[1.736]
num4	-1.977***	-3.826***	-3.728**	-2.720**	-1.581	5.072**
	[0.495]	[0.510]	[1.655]	[1.377]	[1.536]	[2.187]
num5	0.0537	-1.643***	-0.97	-1.801**	0.648	1.701
	[0.612]	[0.495]	[1.263]	[0.761]	[1.311]	[2.078]
num6	-0.257	0.0745	-0.0555	-0.465	-1.168	5.842***
	[0.383]	[0.381]	[0.990]	[0.885]	[1.030]	[1.763]
num8	0.756**	2.008***	1.813*	1.548**	-0.453	3.374*
	[0.334]	[0.454]	[0.994]	[0.687]	[1.063]	[1.849]
num9	-0.474	-0.679*	-0.444	0.23	-1.740**	1.644
	[0.370]	[0.403]	[0.897]	[0.718]	[0.847]	[2.098]
num0	-1.026**	0.643	1.519*	0.666	-1.984	–
	[0.412]	[0.451]	[0.864]	[0.805]	[1.323]	
num1 * ln(hsi)	-0.00694	-0.0166	-0.138	-0.0739	0.0178	-0.440*
	[0.0361]	[0.0378]	[0.0844]	[0.0629]	[0.112]	[0.231]
num2 * ln(hsi)	-0.0105	-0.0441	-0.185*	-0.147**	0.116	-0.313
	[0.0370]	[0.0401]	[0.100]	[0.0710]	[0.104]	[0.201]
num3 * ln(hsi)	0.00841	0.00842	-0.0932	-0.0825	0.143	-0.561***
	[0.0373]	[0.0420]	[0.0929]	[0.0654]	[0.105]	[0.184]
num4 * ln(hsi)	0.196***	0.371***	0.371**	0.264*	0.128	-0.619***
	[0.0521]	[0.0532]	[0.172]	[0.143]	[0.158]	[0.231]
num5 * ln(hsi)	-0.0188	0.152***	0.0985	0.174**	-0.0838	-0.197
	[0.0641]	[0.0515]	[0.131]	[0.0794]	[0.137]	[0.220]
num6 * ln(hsi)	0.0576	0.0306	0.0127	0.0468	0.135	-0.607***
	[0.0399]	[0.0396]	[0.103]	[0.0929]	[0.108]	[0.185]
num8 * ln(hsi)	-0.0125	-0.111**	-0.152	-0.122*	0.115	-0.27
	[0.0347]	[0.0474]	[0.104]	[0.0717]	[0.112]	[0.194]
num9 * ln(hsi)	0.0722*	0.102**	0.0501	-0.0163	0.192**	-0.143
	[0.0389]	[0.0422]	[0.0938]	[0.0745]	[0.0885]	[0.222]
num0 * ln(hsi)	0.121***	-0.0356	-0.141	-0.0454	0.228	–
	[0.0432]	[0.0472]	[0.0900]	[0.0826]	[0.138]	
Constant	6.459***	7.232***	7.567***	8.142***	9.426***	11.09***
	[0.0422]	[0.0321]	[0.118]	[0.131]	[0.0454]	[0.0420]
Year-month fixed effect	Y	Y	Y	Y	Y	Y
Observations	15993	17149	1809	1937	3042	924
R-squared	0.463	0.562	0.847	0.861	0.683	0.786

Note: Robust standard errors in brackets (clustered by auction date).
Key: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, – not applicable, no obs no observation.

Table 8: Regressions of superstitions on winning bids, with the number combinations held constant. Dependent variable: natural log of Winning bids, 1997-2008.

	168-Model		138-Model		148-Model		238-Model
sameletter	0.890***	sameletter	0.622***	sameletter	0.592***	sameletter	0.857***
	[0.174]		[0.106]		[0.150]		[0.124]
hk	2.330***	hk	2.478***	hk	no obs	hk	1.940***
	[0.528]		[0.0558]				[0.0664]
xx	0.816***	xx	1.740***	xx	no obs	xx	0.940***
	[0.177]		[0.132]				[0.164]
num168	2.730***	num138	1.991***	num148	2.702***	num238	0.630***
	[0.164]		[0.140]		[0.292]		[0.146]
num186	0.367*	num183	0.745***	num184	0.880***	num283	(dropped)
	[0.218]		[0.186]		[0.312]		
num618	0.921***	num318	0.924***	num418	1.397***	num328	1.303***
	[0.166]		[0.131]		[0.305]		[0.154]
num681	-0.193	num381	(dropped)	num481	0.663	num382	0.29
	[0.323]				[0.647]		[0.367]
num816	0.379**	num813	0.728***	num814	1.798***	num823	0.075
	[0.184]		[0.134]		[0.271]		[0.154]
num861	(dropped)	num831	0.106	num841	(dropped)	num832	-0.0371
			[0.153]				[0.165]
Constant	8.296***	Constant	8.384***	Constant	6.662***	Constant	9.117***
	[0.144]		[0.124]		[0.266]		[0.136]
Year-month	Y	Year-month	Y	Year-month	Y	Year-month	Y
fixed effect		fixed effect		fixed effect		fixed effect	
Observations	339	Observations	350	Observations	185	Observations	312
R-squared	0.927	R-squared	0.873	R-squared	0.868	R-squared	0.893

Note: Robust standard errors in brackets (clustered by auction date).
Key: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, – not applicable, no obs no observation.

Table 9: The regressions of superstitions in the second-hand market listed prices by types of plate. Dependent variable: natural log of real listed price.

	4 ordinary	3 ordinary	4 ord pre	4 ord post	3 ord pre	3 ord post	4 ordinary	3 ordinary
sameletter	0.437***	0.789***	0.376***	0.756***	0.706***	0.971***	0.438***	0.778***
	[0.0609]	[0.0720]	[0.0274]	[0.0450]	[0.0370]	[0.0385]	[0.0616]	[0.0662]
noletter	-	-	-	-	-	-	-	-
hk	2.336***	2.738***	2.427***	2.308***	2.673***	no obs	2.342***	2.705***
	[0.0394]	[0.0720]	[0.0376]	[0.243]	[0.0498]		[0.0352]	[0.0578]
xx	2.601***	1.982***	2.857***	1.848***	2.308***	1.572***	2.602***	1.958***
	[0.220]	[0.191]	[0.135]	[0.252]	[0.0491]	[0.146]	[0.233]	[0.200]
n911	-	0.482***	-	-	no obs	0.478***	-	0.537***
		[0.0482]				[0.125]		[0.0441]
n100x	-	-	-	-	-	-	-	-
n1000x	-	-	-	-	-	-	-	-
symmetric	-	-	-	-	-	-	-	-
aabb	no obs	-	no obs	no obs	-	-	no obs	-
abab	no obs	-	no obs	no obs	-	-	no obs	-
aaab	0.570***	-	0.648***	0.364***	-	-	0.565***	-
	[0.0816]		[0.0710]	[0.0628]			[0.0835]	
abbb	0.704***	-	0.803***	0.420***	-	-	0.701***	-
	[0.0936]		[0.0586]	[0.0645]			[0.0954]	
aaba	0.222*	-	0.298**	-0.0354	-	-	0.221*	-
	[0.100]		[0.0943]	[0.0694]			[0.108]	
abaa	0.233*	-	0.335***	-0.0707	-	-	0.237*	-
	[0.107]		[0.0748]	[0.0660]			[0.107]	
aab	-	0.530***	-	-	0.623***	0.324***	-	0.537***
		[0.0768]			[0.0363]	[0.0445]		[0.0744]
abb	-	0.431***	-	-	0.473***	0.354***	-	0.442***
		[0.0414]			[0.0441]	[0.0487]		[0.0430]
abcd	-	-	-	-	-	-	-	-
dcba	-0.0858	0.133**	0.296***	-0.405***	0.133	0.223	-0.103	0.172**
	[0.239]	[0.0478]	[0.0525]	[0.130]	[0.0777]	[0.148]	[0.229]	[0.0534]
aa	-	-	-	-	-	-	-	-
aaa	-	-	-	-	-	-	-	-
aaaa	-	-	-	-	-	-	-	-
n13	no obs	0.123**	no obs	no obs	0.148*	0.177	no obs	0.139**
		[0.0488]			[0.0759]	[0.160]		[0.0467]
num1	0.269***	0.499***	0.267***	0.299***	0.532***	0.402***	0.444	2.738***
	[0.0135]	[0.0326]	[0.0154]	[0.0441]	[0.0198]	[0.0396]	[0.472]	[0.441]
num2	0.204***	0.490***	0.204***	0.250***	0.529***	0.393***	0.668	2.308***
	[0.0221]	[0.0335]	[0.0268]	[0.0419]	[0.0144]	[0.0374]	[0.797]	[0.584]
num3	0.224***	0.473***	0.227***	0.264***	0.515***	0.355***	0.564	2.576***
	[0.0128]	[0.0361]	[0.0165]	[0.0416]	[0.0131]	[0.0390]	[0.579]	[0.596]
num4	-0.178***	-0.185**	-0.194***	-0.0344	-0.253***	-0.0108	-1.623	-4.383***
	[0.0267]	[0.0589]	[0.0286]	[0.0646]	[0.0209]	[0.0493]	[1.216]	[0.184]
num5	-0.0774***	-0.137**	-0.0871***	-0.0486	-0.181***	0.0173	0.299	-3.047***
	[0.0203]	[0.0406]	[0.0204]	[0.0717]	[0.0182]	[0.0472]	[1.014]	[0.650]
num6	0.195***	0.264***	0.199***	0.215***	0.296***	0.208***	0.0382	1.830***
	[0.0102]	[0.0256]	[0.0128]	[0.0425]	[0.0123]	[0.0374]	[0.256]	[0.206]
num8	0.401***	0.747***	0.405***	0.437***	0.824***	0.526***	0.791	4.880***
	[0.0269]	[0.0663]	[0.0335]	[0.0446]	[0.0159]	[0.0398]	[0.779]	[0.927]
num9	0.140***	0.217***	0.120***	0.268***	0.218***	0.219***	-0.759	0.372
	[0.0286]	[0.0110]	[0.0275]	[0.0457]	[0.0165]	[0.0366]	[1.242]	[0.260]
num0	0.0804***	0.327***	0.0872***	0.130**	0.338***	0.311***	-0.747	0.827
	[0.0155]	[0.0281]	[0.0184]	[0.0561]	[0.0350]	[0.0461]	[0.614]	[0.699]
num1 * ln(his)	-	-	-	-	-	-	-0.0184	-0.236***
							[0.0498]	[0.0454]
num2 * ln(his)	-	-	-	-	-	-	-0.0489	-0.191**
							[0.0840]	[0.0609]
num3 * ln(his)	-	-	-	-	-	-	-0.0358	-0.222***
							[0.0611]	[0.0627]
num4 * ln(his)	-	-	-	-	-	-	0.153	0.443***
							[0.128]	[0.0191]
num5 * ln(his)	-	-	-	-	-	-	-0.04	0.308***
							[0.108]	[0.0683]
num6 * ln(his)	-	-	-	-	-	-	0.0167	-0.165***
							[0.0264]	[0.0210]
num8 * ln(his)	-	-	-	-	-	-	-0.0411	-0.435***
							[0.0813]	[0.0979]
num9 * ln(his)	-	-	-	-	-	-	0.0955	-0.0163
							[0.132]	[0.0271]
num0 * ln(his)	-	-	-	-	-	-	0.088	-0.0525
							[0.0636]	[0.0723]
Constant	7.684***	7.961***	7.583***	7.961***	7.787***	8.444***	7.682***	7.967***
	[0.0749]	[0.0578]	[0.0919]	[0.158]	[0.0305]	[0.0820]	[0.0757]	[0.0208]
Year-month fixed effect	Y	Y	Y	N	Y	N	Y	Y
Observations	8195	7806	6593	1602	5710	2096	8195	7806
R-squared	0.421	0.482	0.38	0.264	0.541	0.269	0.422	0.495

Note: Robust standard errors in brackets (clustered by date).
Key: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, – not applicable, no obs no observation.

Table 10: The regressions of superstitions in the second-hand market listed prices by types of plate and with auction price. Dependent variable: natural log of real listed price.

	4 ordinary	3 ordinary
Auctioned price	1.90e-05***	3.22e-05***
	[2.31e-06]	[3.54e-06]
sameletter	0.558***	0.453***
	[0.101]	[0.0945]
noletter	-	-
hk	1.325***	-0.966*
	[0.0403]	[0.481]
xx	-0.684	-1.047***
	[0.420]	[0.254]
n911	-	no obs
n100x	-	-
n1000x	-	-
symmetric	-	-
aabb	no obs	-
abab	no obs	-
aaab	0.321***	-
	[0.0894]	
abbb	0.477***	-
	[0.0389]	
aaba	-0.0385	-
	[0.0439]	
abaa	-0.163***	-
	[0.0253]	
aab	-	0.179*
		[0.0805]
abb	-	0.162***
		[0.00979]
abcd	-	-
dcba	-0.499***	0.188***
	[0.0749]	[0.0309]
aa	-	-
aaa	-	-
aaaa	-	-
n13	no obs	0.165**
		[0.0634]
num1	0.274***	0.218***
	[0.0369]	[0.0228]
num2	0.166***	0.241***
	[0.0403]	[0.0526]
num3	0.231***	0.237***
	[0.0304]	[0.0466]
num4	-0.0296	-0.190***
	[0.0425]	[0.0489]
num5	-0.201**	-0.118***
	[0.0683]	[0.0299]
num6	0.255**	0.0979**
	[0.0738]	[0.0398]
num8	0.434***	0.484**
	[0.0532]	[0.160]
num9	0.137**	0.109***
	[0.0400]	[0.0150]
num0	0.0714*	0.0595**
	[0.0315]	[0.0246]
Constant	8.115***	8.758***
	[0.109]	[0.0863]
Year-month fixed effect	Y	Y
Observations	1299	1892
R-squared	0.597	0.692

Note: Robust S.E. clustered by date in brackets.