

CHINESE OVERSEAS BUYERS IN U.S. HOUSING MARKETS

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Abstract

Using around 8 million housing transactions in California from 1994 to 2017, I find that Chinese overseas buyers (COB) earn 4.5% lower returns than other cash buyers, controlling for market timing and location factors. The large gap in housing returns is driven by purchase prices instead of sale prices. Controlling cash payment benefits, property, and market timing, COB will pay 8-12% higher prices than other cash buyers. By implementing DID event study and two-way fixed effects DID models, I find that 10% overpayment can be explained by the lack of investment opportunities arising from home-purchase restrictions in China. The remaining overpayment can be due to cultural differences. Combining IV and DID estimation, I explore the influence of COBs on U.S. local housing prices.

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I. Introduction

As an old Chinese saying goes, "Along with house comes about wealth¹." House in Chinese traditional culture has been seen as a sign of wealth since a long time ago. Due to this culture, today China has more than 90% of households owning homes², far exceeding the homeownership rate in other countries, such as Canada, the United States, and Australia (Clark, Huang, and Yi, 2021).

House serves as a place for living and a good investment vehicle in China. From 1998 to 2010, the Housing Price Index of China from the National Bureau of Statistics of China increased by 78 percent (Du and Zhang, 2015). Meanwhile, more than 20% households in China hold more than one house (Huang, Yi, and Clark, 2020) and some even turn to focus on overseas housing markets³. In 2010-2019, Chinese overseas buyers purchased around \$200 billion of US residential real-estate properties⁴. As a huge part of overseas home buyers, the Chinese are becoming increasingly important in global housing markets.

Motivated by the existing research showing the influence of foreign and out-of-town buyers on local communities (e.g., Favilukis and Van Nieuwerburgh (2021); Gorback and Keys (2020); Li, Shen, and Zhang (2020); Sakong (2021)) and the increasing power of Chinese buyers in overseas housing markets in recent years, I choose to research on Chinese overseas buyers (COB). In this paper, I investigate the trading behaviors of Chinese foreigners in the U.S. housing markets and figure out the mechanisms that lead to their behaviors. However, my results are not limited to Chinese overseas buyers. My research findings could also be extended to other foreign buyers at large. Despite extensive research on the influence of foreign buyers as a group on local house prices, to the best of my knowledge, this paper is the only paper to date that explores the trading behaviors of individual foreign buyers.

In this paper, I use around 8 million housing transactions made by individuals in California from 1994 to 2017. The transaction data is from Zillow's Transaction and Assessment Database (ZTRAX), covering sale prices, property characteristics, buyer and seller names and types, and mortgage information. Using the prices of repeat sales, I calculate the annualized returns for home owners for whom I can find their purchase and the subsequent sale transactions. Finally, I create a return sample of 3 million transactions.

¹Chinese translation is "有土斯有财"

²Source: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7546956>

³Gordon, J. (2015). Soaring Vancouver home prices spur anger toward foreign buyers.

⁴Source: 2019 Profile of international activity in u.s. residential real estate

I use first, last names, and cash payments to determine Chinese overseas buyers (COB). This paper refers to Chinese as those born in mainland China, excluding Hong Kong and Taiwan. I define COB as those *Chinese* who work and live in mainland China but purchase houses in the U.S. for vacations, child education, investments, or other reasons. Based on this definition, Non-COBs include Non-Chinese people or the Chinese who were born in China but worked in or immigrated to the United States. I further define Chinese loan buyers (CLB) as those Chinese who finance home purchases with mortgages. To identify COB, I first use buyers' last and first names to narrow down a list of Chinese people. Subsequently, I use the home-purchase payment method (i.e., mortgage or cash) to identify Chinese buyers who pay all cash in their purchases. They are identified as COBs in my research.

My results show that Chinese overseas buyers (COB) underperform relative to other cash buyers in the markets. First, without considering any factors (e.g., locations and market timing), I find that COBs earn around 8% higher returns than all other buyers. However, after controlling for the benefits of paying with cash, the positive returns turn negative. On average, COBs earn 2.2% lower returns than other cash buyers. Their underperformance in returns is not driven by holding length, "house flipping" activity, property locations, or market time. Conversely, my results show that COBs are good at picking the market time of making house transactions. Given the same market condition, they earn 4.5% lower returns than other cash buyers.

I further analyze the channels behind COBs' underperformance by decomposing returns into purchase prices and sale prices. It is purchase prices, instead of sale prices, that mainly drive the return gap between COBs and other cash buyers instead of sale prices. I do not observe a significant gap in sale prices between COBs and other cash buyers. However, after controlling for the property zip and year-month fixed effects, COBs pay 12% and 8% higher purchase prices than other cash buyers based on my full and returns sample, respectively.

Why do Chinese overseas buyers (COB) overpay? One of the reasons is the frictions caused by the home-purchase restrictions released by many cities in China from 2010 to 2011. The regulations prohibit residential households from buying more than two houses and non-residential households from buying more than one house. Using the Difference-in-Difference (DID) event study model and the two-way fixed effect DID model, I find that the home-purchase regulations cause 10% higher purchase prices paid by COBs than by other cash buyers. Excluding the policy effect, COBs overpay by approximately 6% across time on average. Overall, the lack of good alternative investment opportunities caused by home-

purchase restrictions makes COBs willing to pay a premium in overseas housing markets in exchange for good housing investment opportunities.

However, after controlling the Chinese policy effect, the remaining 6% gap in purchase prices between Chinese overseas buyers (COB) and other cash buyers is still a puzzle. To address this, I show that frictions from cultural differences could be one of the channels that explain the overpayments of COBs. To examine the channel, I first subdivide all transactions into four groups based on the Chinese ethnicity of buyers and sellers. My results demonstrate that the execution prices made by COBs with *Chinese sellers* are not significantly higher than the prices made by Non-COBs with Non-Chinese sellers. By contrast, the execution prices would be higher when COBs trade with *Non-Chinese sellers* than the prices made by Non-COBs and Non-Chinese sellers. The reason COBs do not overpay with Chinese sellers is mainly driven by the buyer side rather than the seller side. As a result, a large part of the overpayments by COBs can be explained by their transactions with Non-Chinese sellers.

One caveat could be that the high execution prices made by Chinese overseas buyers (COB) with Non-Chinese sellers are possibly because Non-Chinese sellers are more likely to renovate their houses. Assuming that homeowners with different races have varying preferences on house renovation, my results show very robust overpayments by COBs with sellers across other races. Hence, the overpayment by COBs is not caused by the high renovation costs of Non-Chinese sellers.

If cultural differences increase frictions in bargaining, which cause the overpayment of Chinese overseas buyers (COB), the exact mechanism should be applied to other buyers. Indeed, I find that the execution prices by Chinese loan buyers (CLB) trading with Chinese sellers are significantly lower than the prices by CLBs with Non-Chinese sellers. Similar results are also found for Asian, Black, and Hispanic buyers who trade with sellers of the same ethnicity. The results further confirm the mechanisms of cultural differences in explaining the overpayment by COBs.

In another robustness test, I find that the overpayment by Chinese overseas buyers (COB) cannot be fully explained by their lack of information on local housing markets. Buyers can become more knowledgeable of local markets as purchase experiences accumulate (Malmendier and Nagel, 2016; D'Acunto, Malmendier, Ospina, and Weber, 2021). I confirm that home-purchase experience can indeed make COBs pay 2%-3% lower than COBs without previous purchase experience. However, COBs still pay significantly higher than other cash buyers, controlling for their purchase experiences.

Lastly, I explore the influence of capital flows from Chinese overseas buyers (COB) on local house

prices. I find that 10% higher house transaction values by COBs will only increase the local house prices by 0.08%, on average. Through OLS, IV, and DID estimation techniques, I further examine the effect of Chinese home-purchase restrictions on the U.S. local house price. Surprisingly, I find that the capital flows from COBs do not push up local house prices across time after the policy effect is controlled. However, Chinese home-purchase regulations from 2012 indeed have a positive capital shock on local house prices. The policy effect causes that 10% higher transaction values made by COBs will push up local house prices by around 0.3%.

My paper contributes to many strands of literature. First, some previous literature explore the gender and racial performance in the U.S. housing markets. For example, one recent paper by Goldsmith-Pinkham and Shue (2021) finds that single men earn 1.5% higher returns annually on housing relative to single women. In that paper, almost half of the gender gap can be explained by the property locations and timing of transactions. However, in my paper, these two factors cannot explain the lower returns earned by COBs. More interestingly, COBs seem adept at market timing. Besides, other literature explore the performance of minorities in housing markets. Kermani and Wong (2021) argue that the racial gap in housing returns is driven by differences in distressed home sales (i.e., foreclosures and short sales). Another paper by Early, Carrillo, and Olsen (2019) find that households led by blacks pay more than their white counterparts. This rent gap increases with the fraction of the neighborhood white people. In summary, the gender and racial gap in housing returns and purchase prices are widely documented in literature (Myers, 2004; Bayer, Casey, Ferreira, and McMillan, 2017; Early et al., 2019; Lu, 2019).

Second, my paper also contributes to the field that explores the influence of foreigners and out-of-town buyers on local communities. Favilukis and Van Nieuwerburgh (2021) develop a model that quantifies the welfare effects of out-of-town (OOT) home buyers. They find house prices rise by 6.5% in the city center when OOT buyers represent 10% of housing demand in the city center, assuming that OOT buyers do not rent out their properties. The positive capital shock is also observed in my paper, even though the magnitude of the effect is smaller. Gorback and Keys (2020); Li et al. (2020); Sakong (2021) explore the capital flow impacts of Chinese foreigners on local house prices and rents. They all find that Chinese overseas buyers (COB) cause increases in the local house prices. However, they do figure out the channel that drives the price increases. My paper contributes to this field by finding that one of the factors that push up local house prices caused by COBs is Chinese home-purchase restrictions. These

restrictions make COB willing to pay a premium in exchange for investment opportunities in housing markets. However, after controlling for the regulation effect, the higher capital flow from COB is not significantly associated with higher local house prices.

Third, my paper contributes to the strand of literature in culture and negotiation. Culture plays an essential role in the financial decision-making of individuals and companies. For example, [Li, Griffin, Yue, and Zhao \(2013\)](#) find that national culture can influence managerial decision-making and corporate risk-taking behaviors. In housing markets, [Harding, Rosenthal, and Sirmans \(2003\)](#) estimate the influence of personal characteristics of buyers and sellers on bargaining power and final home sale prices. However, because of the limit of the dataset, they fail to estimate the race effect on bargaining power, which is fully explored in my paper. Many pieces of literature find that differences in cultures can influence negotiation outcomes ([Caputo, Ayoko, Amoo, and Menke, 2019](#); [Osman-Gani and Tan, 2002](#)). [Osman-Gani and Tan \(2002\)](#) find that culture/ethnicity significantly affects the negotiation styles of Asian managers.

Forth, my paper is related to the research field of all-cash payment in financial markets. For example, [Faccio and Masulis \(2005\)](#) find that, in M&A transactions, acquirers prefer cash financing when the voting control of their dominant shareholders is threatened. In housing markets, [Han and Hong \(2020\)](#) find that an all-cash offer is associated with a 33% shorter time to close the transaction and a 5% discount in the sales price. They quantify the 5% discount as the premium that home sellers would like to pay in order to mitigate the financing risk they would face when trade with home buyers using mortgages. All the literature documents that buyers or acquirers can receive benefits by paying cash. Surprisingly, my paper finds that Chinese overseas buyers (COB) tend to pay more than other cash buyers in home purchases, even though they can still get relatively small discounts from sellers because of paying cash. My paper shed light on the mechanisms behind the overpayments by a particular group of cash buyers. While a substantial number of literatures examine the implications of mortgage payments for housing markets ([Hilber and Turner, 2014](#); [Jiang, Nelson, and Vytlačil, 2014](#); [Agarwal, Amromin, Ben-David, Chomsisengphet, Piskorski, and Seru, 2017](#)), only a few pieces of literature explores the role of all-cash payment in housing markets, which is examined in detail in my paper.

The remainder of this paper is organized as follows: Section [II](#) describes data and the construction of measurements. Section [III](#) describes the estimation approach my paper implements. Section [IV](#) discuss my results. Section [V](#) concludes the paper.

II. Data and Measurement

A. Zillow's Transaction and Assessment Database (ZTRAX)

The Zillow Transaction and Assessment Dataset (ZTRAX) is a large real estate database that contains more than 400 million detailed public deed and tax assessment records across 2,750+ U.S. counties. ZTRAX consists of deed transaction data (ZTrans) and tax assessment data (ZAsmt). ZTrans provides detailed deed transactions, including transaction date, property address, buyer and seller names and types, sales prices, and mortgage information. By contrast, ZAsmt provides detailed characteristics of houses. ZTRAX covers housing data dating back to the early 1990s, but a more reliable data coverage starts from 1994. For this reason, the sample in this research starts from 1994 to 2017.

Before applying the data to analysis, I clean the dataset by the following steps. First, I drop the non-arm's length transaction records listed as the intrafamily transfer, and I exclude mortgage refinancing deed events. Second, I keep only transactions conducted between individuals. In other words, I exclude the transactions where either the sellers or buyers are non-individual such as developer, company, or government. Similarly, I exclude the foreclosure transactions by filtering buyer and seller types. Some deed transactions have missing or unusually low transaction prices (e.g., \$1 or \$5). The low or missing sales prices could be due to data imputing errors or intrafamily transfer events. Hence, I restrict the sample to the deed transactions with sales prices greater than (including) \$10,000⁵.

To calculate the two-way transaction return for a house owner, I find the purchase transaction of the house owner and his subsequent sale transaction of the same house. The unlevered annualized return of property i that was purchased in year b and sold in year s would be

$$ret_{is} = \left(\frac{P_{is}}{P_{ib}} \right)^{\frac{1}{s-b}} - 1$$

I require the holding length greater than or equal to 1 year to be included in the return sample⁶. To make sure the housing returns are correctly calculated, I confirm that the buyer names in the house purchases transaction are matched to the seller names in the consecutive selling transaction. Following Goldsmith-Pinkham and Shue (2021) and using the fuzzy matching algorithm, a housing return will only be considered valid to the current owner of a house if the similarity score between the current

⁵\$10,000 is the one percentile cutoff of housing transaction prices in California in the sample period

⁶I trim the returns at 0.5% and 99.5% percentile cutoffs to alleviate price imputing errors.

owner and the consecutive seller's name of a house is greater than 70. The summary statistics of the full and return samples are reported in Table 1.

B. Identify Chinese Overseas Investors

In this research, I refer to Chinese as those born in mainland China, excluding Hong Kong and Taiwan. Thus, Non-Chinese people are defined as those who were not born in mainland China. I also define Chinese overseas buyers (COB) as those *Chinese* who pay houses in cash. Usually, COBs work and live in mainland China but purchase houses in the U.S. for vacations, child education, investments, or other reasons. Based on this definition, Non-COBs include Non-Chinese people or the Chinese who were born in China but work in or immigrated to the United States. I further define Chinese loan buyers (CLB) as those Chinese who finance home purchases with mortgages. The main research target group of this paper is COBs. To identify them, I first use buyers' last and first names to narrow down a list of Chinese people. Subsequently, I use the home-purchase payment method (i.e., mortgage or cash) to determine whether a buyer is COB or CLB.

B.1. Use Last Names to Identify Chinese

Dating back to the Song dynasty in China, Chinese ancestors published a list called "Hundred Family Surnames," containing the 100 most common surnames used by the Chinese. In a most recent list of "Hundred Family Surnames," my last name "Li" is ranked as the second common surname in China⁷ following the last name "Wang." Moreover, the Chinese Census Bureau and government institutions keep updating the list and even published the 400 most common Chinese surnames. To identify Chinese overseas buyers (COB), I collect the list of the 400 most common Chinese surnames compiled by Fuxi Culture Research Association⁸. I first narrow down a list of home buyers whose last names are contained in the list of the 400 most common Chinese surnames, which I think are most likely Chinese.

However, there might be a concern that this method will include people from Korea, Hong Kong, Taiwan, or Chinese Americans. This may not be an issue because people not from China use different surname romanization spellings, even though surnames could have the same pronunciation. "Hanyu Pinyin," often abbreviated to Pinyin, is the official romanization system for Standard Mandarin Chinese in mainland China. Chinese people usually use Pinyin romanization as the way to write their first and

⁷From here, I denote mainland China as China .

⁸The list is available from Wikipedia https://en.wikipedia.org/wiki/List_of_common_chinese_surnames

last names, while people in other countries or districts adopt a different system. For example, the same last name "Wang" in China will be spelled as "Wong" in Hongkong; and the romanization of "Li" in China is usually "Lee" in Korea. In several rare cases, however, different countries and districts could happen to share the same romanization for certain surnames. For example, people from China or Taiwan both use "Huang" as the romanization for surname "黄". To address this issue, I further use the first name to filter out buyers who are not from China, discussed below.

B.2. Use First Names to Identify Chinese

Although some surnames share the same romanization spellings across countries, non-Chinese people still use their own romanization system, instead of Pinyin, when spelling their first names. For example, Hong Kong and Taiwan have their own romanization system other than Pinyin, such as Wade–Giles and Cantonese romanization. Also, people from Korea, other Asian countries, or Chinese Americans who may share the same common Chinese last name, use English first names or names spelled in different romanization systems. Hence, checking whether the spelling of the first name could help distinguish foreign buyers from Chinese buyers.

However, some first names spelled in Pinyin could be the same as English first names. For example, Linda is a common first name used frequently not only by people from English-speaking countries, but also by Chinese people. To deal with the case where a Pinyin name is also an English name, I use a name frequency list published by The United States Social Security Administration (SSA). This list contains national data on the frequency of given names from 1880 to date in the population of U.S. births where the individual has a Social Security Number. To safeguard privacy, SSA restricts the list of names to those with at least five occurrences. I use this name frequency list to clean out the Americans who were falsely recognized as Chinese because of the similar spelling of first names in English and in Pinyin. If a person's first name is recognized as both a Chinese name in Pinyin and an English name in the name frequency list, the person will not be recognized as Chinese. Filtering out people who have first names recognized as both English and Pinyin will create a more clean measurement for Chinese.

Overall, a buyer or seller will be classified as Chinese if he (she) satisfies three criteria: **1)** his (her) last name is contained in the list of the 400 most common Chinese surnames; **2)** his (her) first name is recognized as Pinyin romanization; **3)** his (her) first name does not appear in the list of the most frequent first names used by American.

B.3. Use Cash Payment to Identify COB

Furthermore, I use the cash payment method to further narrow down the list of Chinese overseas buyers (COB). A Chinese will only be identified as COB if the person pays in cash in the transaction. This is motivated by the fact that non-resident buyers with no income earnings in the U.S. are nearly impossible to get mortgages from Fannie Mae, Freddie Mac, or Federal Housing Administration. On the contrary, resident foreign buyers living in the United States, either as recent immigrants or those visa-holding professionals, tend to use mortgages in house purchases⁹. As a result, the information of house payment methods will help sort out COBs from Chinese buyers but also recognize Chinese loan buyers (CLB) who work and earn income in the U.S. or immigrate to the state.

C. Home-Purchase Experience Measurement

By name matching, I create a variable to measure the prior home-purchase experience of buyers. I follow very stringent rules to measure the purchase experience by buyer names. First, I drop those transaction records that are mortgage refinancing, intrafamily transfers, or have transaction prices of zero. Those transactions are not representative of the home-purchase experience for buyers. Second, to greatly reduce the probabilities of incorrectly identifying different people as the same person, two names will only be identified as the same person if the first, middle, and last names are precisely the same (excluding punctuations). However, some names are prevalent. To address the issue of common names, I will treat the name as the same person if the name appears as buyers in three purchase transactions in a year for different houses. I assume that buying three houses in various locations for an individual is an uncommon behavior and is only a small chance event. Following these rules, I assign a unique ID for each unique buyer's name. The unique ID represents a unique person in my sample. When measuring purchase experience, if the date of two consecutive transactions of a buyer is less than one year, it will not count as a purchase experience. Admittedly, my method of identifying unique people is not perfect. One shortcoming of using exact name matching in identifying people is that people often use name abbreviations (e.g., Joseph sometimes is abbreviated as Joey). Moreover, sometimes people include or ignore the middle names in deeds. Also, female buyers may change their last names after getting married. However, my method can to the most extent minimizes the chances of identifying

⁹According to the 2019 Profile of International Transactions in U.S. Residential published by National Association of Realtors, around 67% foreign resident buyers finance houses with U.S. mortgages.

wrong people as the same person. It reduces the chance of attributing experiences from other people to a person and treating an inexperienced buyer as an experienced one.

III. Estimation Approach

A. Unlevered Return Gap

My main analysis starts from a linear regression that accounts for the difference in unlevered annualized returns earned by Chinese overseas buyers compared to other cash buyers. The specification takes the form below

$$\text{ret}_{is} = \alpha + \beta_1 \mathbb{1}\{\text{Chinese overseas buyer}\}_{is} + \beta_2 \mathbb{1}\{\text{All cash}\}_{is} + \tau X_{is} + \epsilon_{is} \quad (1)$$

where i denotes house transactions, and s denotes time. $\mathbb{1}\{\text{Chinese overseas buyer}\}_{i,s}$ is an indicator that equals one if the house owner is defined as a Chinese overseas buyer. $\mathbb{1}\{\text{All cash}\}_{i,s}$ equals one if the owner pays all cash for the house. The regression is estimated using the returns sample. In creating the return sample, I ensure that the consecutive sale transaction for a purchase transaction is observed and that the buyers in the purchase transaction matches the sellers in the subsequent sale transaction. As a result, β_1 captures the return gap between Chinese overseas buyers and other cash buyers. β_2 captures the return gain or loss of all-cash payment for house owners. I also control for $X_{i,s}$ that represents general house characteristics, such as house holding length, zip code, and trading year-month fixed effects. $X_{i,s}$ captures the return performance due to the house holding length, location, and other local housing market trends.

B. Purchase and Sale Prices

My second part of the analysis focuses on figuring out the selling/buying channels that affect the return gap. I decompose the returns into purchase prices and sale prices. I implement similar specifications but with two different outcome measures: log purchase prices and log sale prices.

$$Y_{it} = \alpha + \beta_1 \mathbb{1}\{\text{Chinese overseas buyer}\}_{it} + \beta_2 \mathbb{1}\{\text{All cash}\}_{it} + \gamma X_{it} + \tau Z_i + \epsilon_{it} \quad (2)$$

In the specification, Y is the log of purchase prices or sale prices in the purchase price and sale price regressions, respectively. In addition to the Chinese overseas buyer dummy and all cash payment dummy, I add the property fixed effect Z_i . The property fixed effect will absorb price differences caused by the unobserved house characteristics that may be correlated with Chinese overseas buyers. Also, $X_{i,t}$ includes the interaction of property zip and trading year-month fixed effect that captures the location factor and local housing market trends.

C. Frictions from Chinese Home-purchase Restrictions

In the early 2000s, Chinese housing market has experienced huge expansion. From 1998 to 2010, the Housing Price Index of China from the National Bureau of Statistics of China increased by 78 percent (Du and Zhang, 2015). To curb the soaring housing prices and suppress speculative activities in the housing markets, in April 2010, Beijing first put forward the regulations that prohibit residential households from buying more than two houses and non-residential households from buying more than one house. Following this, many other cities in China released similar home-purchase restrictions from 2010 to 2011, as shown in the Appendix A.1.

To examine whether the Chinese policy restrictions lead to the overpayment by Chinese overseas buyers, I implement the Difference-in-Difference (DID) event study model, and the two-way fixed effects DID model. The post-treatment periods start from 2012. The treated group in the model is Chinese overseas buyers. The DID event study specification follows the form below.

$$\begin{aligned} \log(\text{Purchase Price})_{it} = & \alpha + \sum_{\substack{\tau=1994 \\ \tau \neq 2011}}^{2017} \beta_{\tau} \mathbb{1}\{\text{Chinese overseas buyer}\}_i \times \mathbb{1}\{t = \tau\} \\ & + \lambda_t + \theta_i + \delta \mathbb{1}\{\text{Chinese overseas buyer}\}_i \\ & + \gamma \mathbb{1}\{\text{All cash}\}_{it} + \zeta X_{it} + \epsilon_{it} \end{aligned} \quad (3)$$

The outcome measurement is the log of purchase prices in house transaction i at time t . Because the post-treatment periods begin from 2012, I set the year right before 2012 as the base year. Hence, the dummy variable for the year 2011 is dropped out from the specification. As a result, the estimated β_{τ} captures the difference in purchase prices between Chinese overseas buyers (COB) and Non-COBs relative to the year 2011, the year when the house-purchase restrictions were primarily rolled out in China.

Moreover, I use the two-way fixed effects DID specification to estimate the policy effect.

$$\begin{aligned}\log(\text{Purchase Price})_{it} = & \alpha + \beta \mathbb{1}\{\text{Chinese overseas buyer}\}_i \times \mathbb{1}\{\text{Post-2012}\}_t \\ & + \lambda_t + \theta_i + \delta \mathbb{1}\{\text{Chinese overseas buyer}\}_i \\ & + \gamma \mathbb{1}\{\text{All cash}\}_{it} + \zeta X_{it} + \epsilon_{it}\end{aligned}\tag{4}$$

Similarly, the outcome measurement is the log purchase prices of house transaction i at time t . What is different is that the year dummy variable is replaced with the dummy $\mathbb{1}\{\text{Post-2012}\}_t$ that equals one if the transaction year is after (including) 2012. The estimated β captures the average Chinese policy influence on the gap in purchase prices between COBs and Non-COBs.

D. Frictions from Cultural Differences

The difference in cultures including speaking languages and personality could increase frictions in transactions. As a result, the frictions could weaken the bargaining power of buyers in price negotiations and lead to the overpayment of buyers. To examine this cultural channel, I categorize all transactions into four groups: Chinese overseas buyer (COB) with Chinese seller, COB with Non-Chinese seller, Non-COB with Chinese seller, and Non-COB with Non-Chinese seller. Then, I regress the outcome variable, the log of the purchase price, on three group indicator variables and other transaction characteristics variables. My specification takes the form below.

$$\begin{aligned}\text{Log}(\text{Purchase Price})_{it} = & \alpha + \beta_1 \mathbb{1}\{\text{Chinese overseas buyer (COB) with Chinese seller}\}_{it} \\ & + \beta_2 \mathbb{1}\{\text{COB with Non-Chinese seller}\}_{it} \\ & + \beta_3 \mathbb{1}\{\text{Non-COB with Chinese seller}\}_{it} \\ & + \beta_4 \mathbb{1}\{\text{All cash}\}_{it} + \gamma X_{it} + \tau Z_i + \epsilon_{it}\end{aligned}\tag{5}$$

In the specification, the outcome measurement is the log of the purchase price of transaction i at time t . $\mathbb{1}\{\text{Chinese overseas buyer (COB) with Chinese seller}\}_{it}$ is the indicator for transactions where the buyers are identified as Chinese foreigners and the sellers are Chinese. Similar definitions are applied to other group dummy variables. Because the base group is the transactions made between Non-COBs and Non-Chinese sellers, the dummy variable for this type of transactions is dropped out from the specification. As a result, β_1 , β_2 , and β_3 capture the differences in execution prices of the corresponding

buyer-seller group relative to transactions made by Non-COB and Non-Chinese sellers.

Furthermore, I split the transactions made by COBs and Non-Chinese sellers into four subgroups based on sellers' races: COBs with Asian sellers, COBs with Black sellers, COBs with Hispanic sellers, and COBs with White sellers. I substitute $\mathbb{1}\{\text{COB with Non-Chinese seller}\}_{it}$ with dummy variables for the four-seller-race subgroups and perform the similar regression analysis via Equation 5. Separating non-Chinese sellers into the subsets of different races could help determine whether the overpayment by Chinese overseas buyers is due to a particular group of sellers who are more likely to renovate their houses and, hence, would sell higher than other people.

If the difference in cultures increases the frictions in transactions and, as a result, leads to overpayment of Chinese overseas buyers, the cultural difference should also make other types of buyers pay higher when they trade with sellers from different cultures. To further examine and confirm the cultural channel, I replace the Chinese overseas buyers (COB) in Equation 4 with other two types of buyers: Chinese loan buyer and Chinese American buyer. I use the same specifications Equation but 4 for these two types of buyers. Likewise, I apply the specification of Equation 4 to buyers of varying races.

Lastly, I further confirm the cultural channel by checking the purchase experience of house buyers. If the overpayment is due to the lack of information about local markets, trading more could help reduce the information asymmetry of buyers. In other words, buyers can become more knowledgeable of local markets as purchase experiences accumulate (Malmendier and Nagel, 2016; D'Acunto et al., 2021). To examine whether purchase experience may explain the overpayment, I explore the purchases prices of Chinese overseas buyers with varying purchase experiences. The specification takes the form below.

$$\begin{aligned} \text{Log(Purchase Price)}_{it} = & \alpha + \beta_1 \mathbb{1}\{\text{Chinese overseas buyer (COB)}\}_{it} \\ & + \beta_2 \mathbb{1}\{\text{Experience}\}_{it} \\ & + \beta_4 \mathbb{1}\{\text{All cash}\}_{it} + \gamma X_{it} + \tau Z_i + \epsilon_{it} \end{aligned} \quad (6)$$

The outcome measurement is the log of purchase prices of house transaction i at time t . $\mathbb{1}\{\text{Experience}\}_{it}$ equals one if the buyer in the transaction has purchase experience before the transaction. β_2 captures the effect of purchase experience on execution prices. Next, I replace Chinese overseas buyers (COB) with two subgroups: COB with experience and COB with no experience. Buyers with experience are defined as those who have previous purchase transaction records in the full sample. Using the two

subgroups, I can further examine the experience effect on the execution prices made by COBs.

E. Influence on local housing markets

The overpayments of Chinese overseas buyers (COB) could potentially push up the local house prices. To examine the causal influence, I use the Zillow Home Value Index (ZHVI) of single-family residences at the zip level as the measurement for the local house prices. ZHVI of single-family residences is published by Zillow and is a smoothed, seasonally adjusted measure of all single-family home values in the 35th to 65th percentile range in a certain region. I get the annual ZHVI for a zip code by taking the mean of all twelve months of ZHVI in the zip code area.

To measure the influence of Chinese overseas buyers (COB), I calculate the log of total purchase transaction values made by COB in a zip code and year (i.e., "Log(COB Trans. Value)"). To control for the influence from transactions made by Non-COB, I create the measurement of total transaction values (i.e., "Log(Total Trans. Value)"), which is the log of total purchase transaction values in a zip code and year. Likewise, I create the log measurement of total all-cash purchase transaction values (i.e., "Log(Total All-Cash Trans. Value)") to control for the effect of the all-cash payment. To figure out the effect from Chinese home-purchase restrictions, I add the add log(COB Trans. Value) interacted with a post-treatment dummy variable. The specification takes the form below.

$$\begin{aligned} \log(\text{ZHVI})_{it} = & \alpha + \beta_1 \log(\text{COB Trans. Value})_{it} \\ & + \beta_2 \log(\text{COB Trans. Value})_{it} \times \mathbb{1}\{\text{Post-2012}\}_t + \lambda_t + \theta_i \\ & + \gamma \log(\text{Total Trans. Value})_{it} + \zeta \log(\text{All-Cash Trans. Value})_{it} + \epsilon_{it} \end{aligned} \quad (7)$$

However, the endogeneity issue could arise when the measurement of COB transaction values is correlated with unobserved factors that could be omitted in the specification. For example, COBs could prefer living in certain areas that experienced higher income growth after 2012, and the local income growth could be the true factor driving the higher local house prices.

To deal with the endogeneity issue, I apply the 2SLS instrumental variables (IV) method to estimate the influence of COBs. I use the percent of China-born population number in a zip code in 2000 interacted with the post-treatment dummy of 2012 (i.e., $\text{pct of China-born population}_i \times \mathbb{1}\{\text{Post-2012}\}_t$) to instrument for the capital shock of COBs due to the purchase restrictions. I use the China-born population data surveyed by U.S. Census Bureau in 2000. For this reason, I only use the transactions after

2000 as my sample in this part of analysis.

In my IV identification design, Chinese home-purchase restrictions serve as the exogenous shock that shifts the demand of Chinese overseas buyers (COB). Besides, pre-existing Chinese foreigner presence in a area is an important factor that draws COBs. Chinese foreigners are more likely to buy houses in the community with high prior presence of Chines foreigners due to networks, similarity in life styles and speaking language, and low information frictions¹⁰. Also, [Burchardi, Chaney, and Hassan \(2019\)](#) find that the ancestry composition of U.S. counties strongly predicts their foreign direct investment in the countries. In my sample, [Figure A.2](#) shows that the zip code regions with high Chinese foreigner presence in 2000 show larger increases in the share of transactions made by COBs.

The IV satisfies the relevance condition and the exclusion restriction condition. My identification essentially assumes that the percent of China-born population number in a zip code in the pre-sample period (i.e., before 2000) is *positively correlated* with home purchases of COBs. Chinese home-purchase restrictions fully rolled out in 2012 serve as the exogenous shock that increases the demand of COBs in the U.S. housing markets. Moreover, the pre-sample Chinese foreigner presence is assumed to be *not correlated with* local economic factors, such as income growth, that will influence the local house prices in the future.

IV. Results

A. Unlevered Annual Returns

Table 2 reports the difference in unlevered annualized return of Chinese overseas owners relative to other house owners. Column 1 suggests that Chinese overseas buyers (COB) earn around 8% more returns than other house owners without controlling for any fixed effects. However, the significant positive returns of COBs become negative after controlling for the benefits of paying cash. Column 2 indicates that paying with cash will bring house owners higher returns. It is because of the higher bargaining power and, hence, lower purchase price when buying houses with all cash. Surprisingly, after controlling for the benefits of the all-cash payment, Chinese overseas buyers earn 2.2% lower returns than other cash buyers. The lower returns by COBs cannot be explained by the holding length as suggested by Column 3. In Columns 4 and 5, I control for market timing effects. On average, COBs earn 4.5% lower returns relative to other cash buyers. The results show that COBs are good at picking the

¹⁰Source: [2017 profile of international activity in u.s. residential real estate](#)

market time of making house transactions. Given the same market situation, they perform worse than other cash buyers. Although Column 5 shows that Chinese house owners with mortgages also perform worse than other house owners, the magnitude of the underperformance is tiny (i.e., 0.2% annually). The significant underperformance in housing returns is observed only for Chinese overseas house owners.

B. Purchase and Sale Prices

Table 3 further analyzes the channels behind the negative return earned by Chinese overseas buyers (COB). I decompose returns into purchase and sale prices. In the regression, I regress the log of purchase prices, or sale prices, on the dummy variable for COBs. Controlling for the all-cash dummy will absorb the benefits from paying with cash and allow us to compare the purchase prices by COBs with other cash buyers.

In Columns 1 and 2 of Table 3, I use all housing transactions observed during the sample period. When the property and the purchase year-month fixed effects are added, the results show that COBs pay 15% higher than other cash buyers after controlling for the paying-all-cash effect. After controlling for the effects of property locations and market timing in Column 2, the overpayment by COBs relative to other cash buyers decreases to 12%. In the return sample, I observe a similar overpayment by COBs. When the property fixed effect and the zip-year-month fixed effects are controlled, COBs pay 8% higher than other cash buyers. However, the higher purchased prices made by COBs are not accompanied by higher sale prices. Columns 5 and 6 show that Chinese overseas sellers will not significantly sell higher or lower than other cash buyers.

Figure 2 examines the difference in returns and purchase prices made by Chinese overseas buyers (COB) as the house holding length varies. Panel A shows that COBs who buy and sell the house in less than three years will earn around 10% lower returns than other cash buyers with the same holding length. As the holding length increases to 5 years or more, COBs still earn around 2% lower returns. The magnitude of return difference between COBs and other cash buyers becomes smaller as the holding length increases. It occurs because, when calculating annualized returns, any disadvantages of COBs in house purchase and sale transactions will be divided more over a larger number of the holding periods. By contrast, Panel B of Figure 2 shows that the difference in purchase prices made by COBs relative to other cash buyers does not differ much with varying holding periods. The overpayment of COBs relative to other buyers seems stable around 8% to 12%.

The empirical results in Figure 2 reject the potential channel from "house flipping" behavior in explaining the return gap. Many may suspect that Chinese overseas buyers (COB) earn lower returns because Non-COBs buyers are more likely to get involved in the flipping activities. The "house flipping" activity is usually described as a process of buying, rehabbing, and quickly reselling properties for profit. On average, the flipping strategy could contribute to higher returns for home buyers. If Non-COBs are more likely to implement the flipping strategy, the average lower return made by COBs could be explained by the flipping channel. However, as shown in Figure 2, COBs with holding lengths greater than four years still earn significantly lower returns.

C. Mechanism behind Higher Purchase Prices of Chinese Overseas Buyers (COB)

C.1. Paying Premium in Exchange for Housing Investment Opportunity

In this part, I argue that one of the channels that cause the higher purchase prices paid by Chinese overseas buyers (COB) is the policy restrictions in China. In April 2010, Beijing first put forward the regulations that prohibit Chinese households from buying multiple houses. Following this, many other cities in China also issued similar house-purchase restrictions in 2010 and 2011. Since 2012, more and more Chinese began to focus on overseas housing markets such as Australia, Singapore, Canada, and the United States¹¹. As shown in Figure 1, the number of housing transactions made by COBs increased by 34% in 2012, relative to 2011 in California. The home-purchase restrictions cause the COBs to flood into the U.S. housing markets and could potentially pay a premium in exchange for investment opportunities in the U.S. housing markets. In this section, I examine whether and how much the overpayments of COBs are caused by the house-purchase restrictions starting from 2012.

To examine the policy effect, I implement the Difference-in-Difference (DID) event study model and the two-way fixed effect DID model. Figure 3 shows the DID event study results that reveal the difference in purchase prices between Chinese overseas buyers (COB) and Non-COBs before and after 2012, the year when the house-purchase restrictions were primarily rolled out in China. In this figure, the post-treatment period begins from 2012. Hence, the dummy variable for the year 2011 is dropped out. The estimated β_t , plotted in the graph, represents the difference in purchase prices between COBs and Non-COBs relative to the base year 2011. Briefly, the graph presents the change of overpayment by COBs over time relative to 2011.

¹¹Source: 2019 Profile of international activity in u.s. residential real estate

First, Figure 3 shows that in the pre-treatment periods from 2006 to 2010, the overpayment by Chinese overseas buyers (COB) do not significantly differ from 2011. It implies that the parallel trend assumption required by the DID model is satisfied. I also conduct a joint test on the null hypothesis that all β_{1994} to β_{2010} equal to zero. The test fails to reject the null hypothesis. The figure with the joint test suggests that the gap in purchase prices between COBs and other cash buyers keeps stable in the pre-treatment periods (i.e., before 2012). More strikingly, the overpayment by COBs increases starting from 2012. The gap in purchase prices between COBs and Non-COBs increase by 5% in 2012. From 2013 to 2017, the gap in purchase prices increases by 10% relative to 2011.

Second, I perform the two-way fixed effect DID model as presented in Table 4. In Columns 1 and 3, I control for the property and the year-month fixed effects. In Columns 2 and 4, I add the property and the zip-year-month fixed effects to control location and market timing factors. The table shows that, on average, COBs pay close to 6% higher prices than other cash buyers. Given that COBs overpay on average, the Chinese regulations in home purchase from 2012 make Chinese foreigners pay even higher by around 10%.

Why do Chinese flood into the U.S. housing markets and pay higher than other cash buyers? The reason is that many Chinese people see houses as a place for residences and as lucrative and stable investment vehicles. It is well known that the spectacular economic growth in China since the 1980s has been associated with a high savings rate (Yang, Zhang, and Zhou, 2012). Despite the high savings rate, very limited vehicles are available for households in China to invest their massive savings. Bank deposit accounts are the predominant investment vehicle in China but offer a very low rate of return. Compared to the Chinese stock market, the Chinese housing market shows high returns with relatively low volatility. One example is that, during the 2008 financial crisis, Chinese house prices suffered only a small drop and recovered very quickly. This robust performance of the Chinese house prices was in sharp contrast to the dramatic decline of over 60% in the Chinese stock market in 2008 (Fang, Gu, Xiong, and Zhou, 2016). Moreover, in 2003–2013, the Shanghai Stock Market Index had an average return of 7.3% with a volatility of 51.5%. In contrast, during the same period, houses in Chinese first-tier cities offered an average annual return of 15.7% with a volatility of 15.4%. The houses in second-tier cities experienced an annual return of 13.4% with a volatility of 9.9%. At the same time, the houses in Chinese third-tier cities offered the lowest average return of 11.0% among the three tiers and also the lowest volatility of 7.5% (Fang et al., 2016).

The limited investment vehicles and sharp return gap between the stock market and the housing market in China led to the rampant speculative activities in China in recent years. Hence, Chinese governments began to suppress speculative investments in Chinese housing markets around 2011. Those Chinese homebuyers, who experienced good investment returns from housing markets, found that they would lose the investment vehicle once the domestic home-purchase restrictions were fully rolled out. Hence, after the restrictions were issued, they began to move their focus to abroad housing markets. Overall, the lack of good alternative investment opportunities in China makes COBs willing to pay a premium in foreign housing markets in exchange for good housing investment opportunities.

C.2. Culture-based Friction in bargaining

The previous section shows that around two-thirds of overpayment could be attributed to friction from Chinese housing regulations. However, there is still a 6% gap between Chinese overseas buyers (COB) and other cash buyers. To explain this gap, I explore the alternative channels of frictions arising from cultural differences.

To examine the mechanism of cultural differences, I first classify all transactions into four groups depending on Chinese-ethnicity: Chinese overseas buyer (COB) with Chinese seller, COB with Non-Chinese seller, Non-COB with Chinese seller, and Non-COB with Non-Chinese seller. The base comparison group is the transactions by Non-COBs with Non-Chinese sellers. By this classification, I assume that COBs share the same culture with Chinese sellers but not with Non-Chinese sellers. Next, I examine the differences in execution prices of transactions made by the first three buyer-seller groups relative to the execution prices of the Non-COBs and Non-Chinese sellers.

Table 5 reports the regression results. $\mathbb{1}\{\text{Chinese overseas buyer (COB) with Chinese seller}\}_{it}$ is an indicator for the transactions made by Chinese overseas buyers (COB) and Chinese sellers. As a result, the coefficient of this dummy variable reports the gap in execution prices made by Chinese overseas buyers when seller is Chinese relative to the base group. The results from both the full and the return samples in Table 5 demonstrate that the execution prices made by COBs and Chinese sellers are not significantly higher relative to the prices made by Non-COBs and Non-Chinese sellers. The result is pretty robust even when controlling for the all-cash payment benefit, the property, and the zip-year-month fixed effects.

However, when Chinese overseas buyers (COB) trade with Non-Chinese sellers, the execution prices

are significantly higher than the prices made by Non-COBs and Non-Chinese sellers. The 14% and 9% higher prices paid by COBs to Non-Chinese sellers from the full and the return sample, respectively, are very close to the average overpayment by Chinese overseas buyers, 12.6% and 8.3% in Table 5. Moreover, I also interact the transaction indicator $\mathbb{1}\{\text{COB with Non-Chinese seller}\}_{it}$ with the post-treatment dummy variable $\mathbb{1}\{\text{Post-2012}\}_t$ to determine the fraction of overpayment caused by Chinese home-purchase restrictions. After absorbing the effect of Chinese policy, the overpayment of around 7% - 8% could be explained by cultural differences. Overall, the main results in Table 5 suggest that a large part of overpayments by Chinese overseas buyers can be explained by their transactions with Non-Chinese sellers.

Why is overpayment not observed in the transaction between Chinese overseas buyers (COB) with Chinese sellers? This could be explained from the side of COBs, Chinese sellers, or both. On the one hand, COBs do not overpay to Chinese sellers because COBs tend to appear aggressive in bargaining when they trade with sellers similar to them in the speaking language or other cultures. When the sellers use different languages or from different cultures, the frictions arising from cultural differences could weaken the bargaining power of COBs. The bargaining power of COBs could be further impaired when they have a language barrier and fully delegate house-buying task to realtors who may have a conflict of interest with COBs. On the other hand, the overpayment could occur because Chinese sellers would like to be benevolent and generous to buyers who share the same cultures or are psychologically close to them.

I perform a linear combination test on regression parameters to determine which side, buyer side or seller side, drives the results. In the bottom of Table 5, the first row of the linear combination test examines the difference in execution prices of Chinese sellers with COBs and Non-COBs. The two insignificant differences of coefficients on the first row from both full and return samples suggest that Chinese sellers do not treat COBs and Non-COBs differently. In the second row, I examine the difference in execution prices by COBs with Chinese sellers and Non-COB sellers. The difference of coefficients allows us to see whether Chinese overseas buyers trade differently with Chinese and Non-Chinese sellers. The coefficients on the second row of the tests suggest that, compared to trading with Non-Chinese sellers, the execution prices by COBs trading with Chinese sellers are 12 to 14% lower on average. Combining the results from two linear combination tests, I conclude that the reason Chinese overseas buyers do not overpay with Chinese seller is mainly driven by the buyer side, instead of the seller side.

One caveat could be that the execution prices made by Chinese overseas buyers (COB) with Non-Chinese sellers are high possibly because Non-Chinese sellers are more likely to renovate their houses. Due to the limitation of Zillow data, I cannot obtain the dynamic house renovation and maintenance data over time. However, the preference of renovation could differ by races of house owners. To address the concern, I separate Non-Chinese sellers into four more granular groups based on races of sellers: Asian sellers (excluding Chinese), Black sellers, Hispanic sellers, and White sellers. Then, I perform a similar analysis on purchase prices.

Table 6 shows very robust overpayments by Chinese overseas buyers (COB) across sellers with different races. The average execution prices by COBs with Asian or Hispanic sellers are 12% significantly higher than the prices made by Non-COB and Non-Chinese sellers based on the full sample. The overpayment is even higher and increases to 15%-18% when COB trade with White sellers. COBs still significantly overpay to Black sellers based on the full sample. The reason that the significance of coefficients on $\mathbb{1}\{\text{COB with Black seller}\}_{it}$ becomes weaker is that only a few sellers in the samples are identified as Black due to the imperfect algorithm. However, from the other three groups of seller races, I can still conclude that the overpayment by COB is not caused by the different renovation preferences of Non-Chinese sellers.

The results from Table 7 and Appendix Table A.1 reinforce the channel of cultural difference for explaining the overpayment of Chinese overseas buyers. In Table 7, I apply a similar specification as in Table 5, but replace Chinese overseas buyers with Chinese home buyers with a loan which I call Chinese loan buyer (CLB). The results suggest that the execution prices by CLBs and Chinese sellers are significantly 3%-7% lower than the prices by Non-CLBs and Non-Chinese sellers. In contrast, when trading with Non-Chinese sellers, CLBs do not pay significantly different prices than in cases where Non-CLBs trade with Non-Chinese sellers. Furthermore, the linear combination tests on the difference between the coefficients on $\mathbb{1}\{\text{CLB with Chinese seller}\}_{it}$ and $\mathbb{1}\{\text{CLB with Non-Chinese seller}\}_{it}$ imply that, on average, the CLBs have significantly lower execution prices when trading with Chinese sellers than with Non-Chinese sellers. Similar findings can be found from Table A.1 in the Appendix. On balance, Table 7 supports the explanation of cultural differences in the overpayment by Chinese overseas buyers.

I further evidence the culture-based mechanism through transactions made by the buyers and sellers of different races. Table 8 examines the execution prices in transactions of different race combinations

of buyers and sellers. I classify all transactions into four groups based on race: the buyer and seller have the same race denoted in the column title (i.e., Minority Buyer with Minority Seller), the seller is not the same race as the buyer (i.e., Minority Buyer with Non-Minority Seller), the buyer is not the same race as the seller (i.e., Non-Minority Buyer with Minority Seller), both the buyer and the seller are not the denoted race. The type of transactions where both buyers and sellers are not the denoted race is set as the base group, so the indicator variable for this transaction type is dropped in the regression. The race are denoted in the column title (i.e., Asian, Black, and Hispanic). For example, in Column 1 for Asians, $\mathbb{1}\{\text{Minority Buyer with Non-Minority Seller}\}$ is an indicator for transactions made by Asian buyers and Non-Asian sellers.

Table 8 suggests that when buyers trade with sellers with the same race, they do not get higher execution prices than the prices of transactions made by buyers and sellers not in the same denoted race. Specifically, when Asians buy houses from Asians, the results suggest that the execution prices could be on average 4% lower than the prices in transactions where both buyers and sellers are not Asian. For Black and Hispanic buyer-seller groups, as suggested in Columns 2 and 3, respectively, the execution prices in the same-race-buyer-seller transactions are not significantly higher than the prices of the base group of transactions. However, Asian, Black, and Hispanic buyers tend to overpay when trading with sellers of different races. A significant 2% - 3% overpayment by a minority buyer trading with a different-ethnicity seller is very robustly shown across all three races. Overall, the results indicate that similarity in the culture including speaking language between buyer and seller may reduce bargaining frictions in housing transactions.

C.3. Information Asymmetry on Local Housing Markets

One possible explanation of the overpayment by Chinese overseas buyers (COB) is their lack of information on local housing markets. The adverse selection issue could arise when one trading side knows more information than the other side (Akerlof, 1970). As a result, the information asymmetry between buyers and sellers will lead to inefficient prices. Similarly, in housing markets, adverse selection occurs when a seller in a home-purchase negotiation has relevant information the buyer lacks, such as the quality of the house or price trends of local housing markets. The information asymmetry could be one of the factors that lead to the overpayment of Chinese overseas buyers. I will examine the information asymmetry channel in this section.

Table 9 shows the gap of purchase prices between Chinese overseas buyers (COB) and other cash buyers when trading experience is considered. Columns 1 and 3 indicate that, on average, buyers with multiple home-purchase experiences pay 1.5% lower prices than buyers without trading experiences, when controlled for the property and the zip-purchase-year-month fixed effects. The great performance of home buyers with multiple trading experiences in housing markets is a striking contrast to the poor outcome of individual investors who actively trade in stock markets (Barber and Odean, 2000). Barber and Odean (2000) argue that the high trading level and poor performance of individual investors in stock markets can be attributed to overconfidence. However, trading more in housing markets allows home buyers to get lower execution prices than otherwise would. It is because that trading experience could improve the knowledge of local housing markets. Also, multiple home-purchase experiences could hone buyers' skills in negotiating prices, which is another advantage of trading experiences that individual investors in stock markets may not have.

However, the home-purchase experience alone cannot fully explain the overpayment by Chinese overseas buyers (COB). Columns 1 and 3 in Table 9 suggests that COBs still overpay by 13.5% and 8% relative to other cash buyers from the full and return samples, respectively. To investigate in this, I subdivide the transactions by COBs into transactions made by COBs with prior home-purchase experience and without experience. Columns 2 and 4 indicate that COBs with no experience tend to pay higher than COBs with prior home-purchase experience. Although COBs with prior trading experience could pay lower by 2% - 3%, they still overpay relative to other cash buyers.

This section finds that trading experience in housing markets allows homebuyers pay lower than buyers without experience. It could be because the prior trading experience will alleviate the information asymmetry issue. Homebuyers could gain better knowledge of local housing markets through prior home-purchase experiences. The experience could also help hone the negotiation skills of homebuyers and increase their bargaining power in negotiating prices with home sellers. I also find that the trading experience alone cannot fully explain the overpayment of COBs. However, the results in this section confirm that the overpayment of COBs trading with Non-Chinese sellers is not due to information asymmetry but the cultural differences between buyers and sellers.

D. Influence on local house prices

Given that Chinese overseas buyers (COB) pay higher than other cash buyers, do COBs push up local house prices? In this section, I further examine the influence of COBs on local house prices.

In Table 10, I regress the log of ZHVI at the zip-year level on the log of the transaction values made by COBs, the log of total transaction values, and the log of total all-cash transaction values at the zip code and year. Column 1 shows that, on average, 10% higher transaction values by COBs will increase local house prices by 0.12%. However, after controlling for the total transaction values and all-cash transaction values in the zip code region and the year, 10% higher transaction values by COBs will only increase the local house prices by 0.08%. To further examine the effect of Chinese home-purchase restrictions on the U.S. local house prices, I add the interaction term of the log of the COB transaction values and the post-treatment dummy variable. Column 3 suggests that, on average across time, the capital flows from COBs do not push up local house prices. Instead, higher transaction values by COBs tend to lower down local house prices. It occurs because paying all cash in a housing transaction would give the buyer a significant discount on the execution price. Compared with the transactions where the buyer needs a mortgage to finance the purchase, the price discount in all-cash transactions could lower the final transaction prices. Indeed, the negative coefficient on the log of total all-cash transaction values suggests that higher values of transactions paid with cash could lower local house prices. However, Chinese home-purchase regulations from 2012 have a positive capital shock on the U.S. local house prices. The coefficient on the interaction term on Column 3 indicates that 10% higher transaction values made by COBs will push up local house prices by around 0.3% higher than before the treatment. The result from the IV estimation method on Column 4 also demonstrates a significant positive effect of Chinese home-purchase restrictions on local house prices.

V. Conclusion

Using around 8 million housing transactions in California from 1994 to 2017, I find that Chinese overseas buyers (COB) earn 4.5% lower returns than other cash buyers, controlling for market timing and location factors. The large gap in housing returns is driven by purchase prices instead of sale prices. Controlling for the advantages of paying cash and other factors, Chinese overseas buyers will pay 13-15% higher than other buyers. By implementing DID event study and two-way fixed effects models, I find that 10% overpayment can be explained by the lack of investment opportunities arising from

home-purchase restrictions in China. The remaining overpayment can be due to cultural differences. Combining IV and DID estimation, I find that the capital flow from COBs do not push up local house prices across time on average. However, Chinese home-purchase regulations from 2012 indeed have a positive capital shock on local house prices. The policy effect causes that 10% higher transaction values made by COBs will push up local house prices by around 0.3%.

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Figure 1. The Number of Transactions by Chinese Overseas Buyers in California

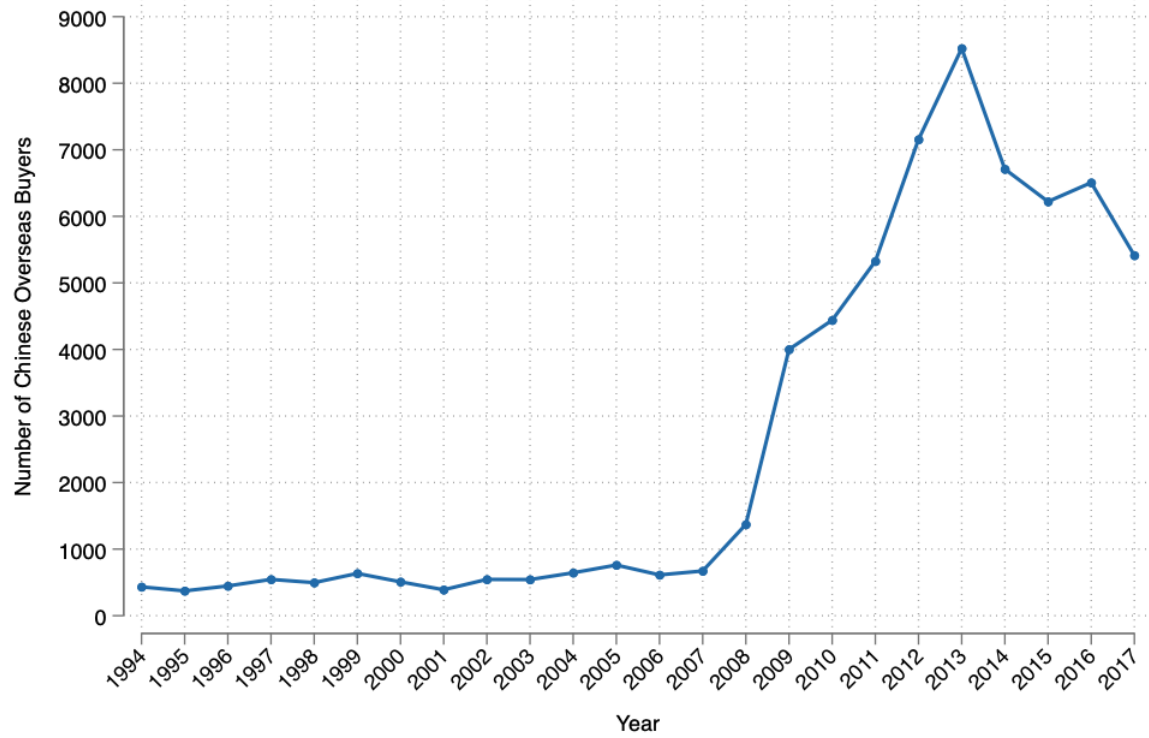


Figure 1 presents the number of housing purchase transactions made by Chinese overseas buyers in California from 1994 to 2017.

Figure 2. Difference between Chinese Overseas and Other Buyers by Holding Length

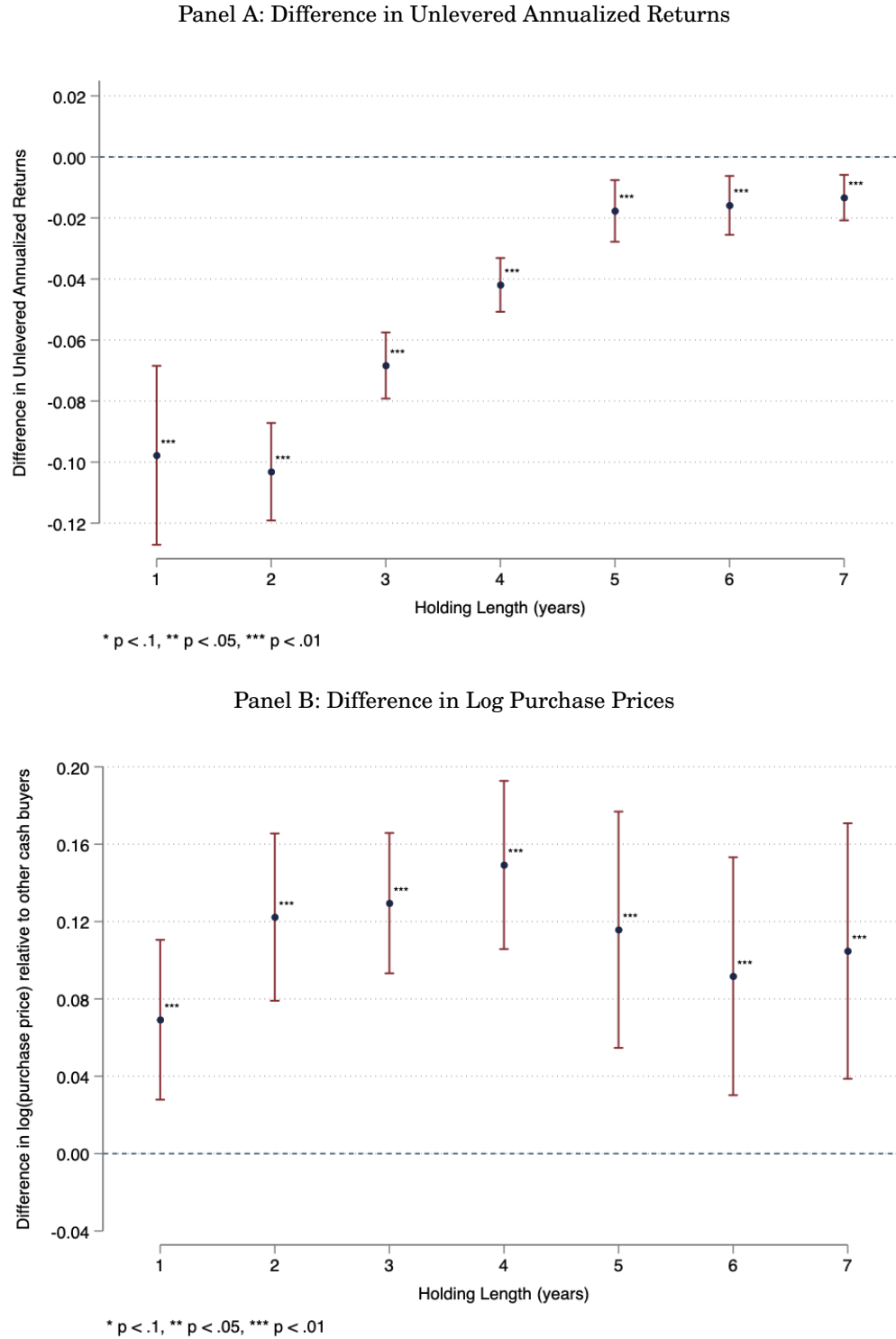


Figure 2 shows the difference between Chinese overseas buyers and other cash buyers by different holding periods. Panel A plots the difference in unlevered returns, which is the coefficient β_1 on the Chinese overseas buyer dummy variable in Equation 1 for different holding periods. Panel B plots the difference in log purchase prices by Chinese overseas buyers relative to other cash buyers. The difference in log purchase prices are from the coefficient β_1 in Equation 2.

Figure 3. Difference-in-Difference Event Study of Log Purchase Prices

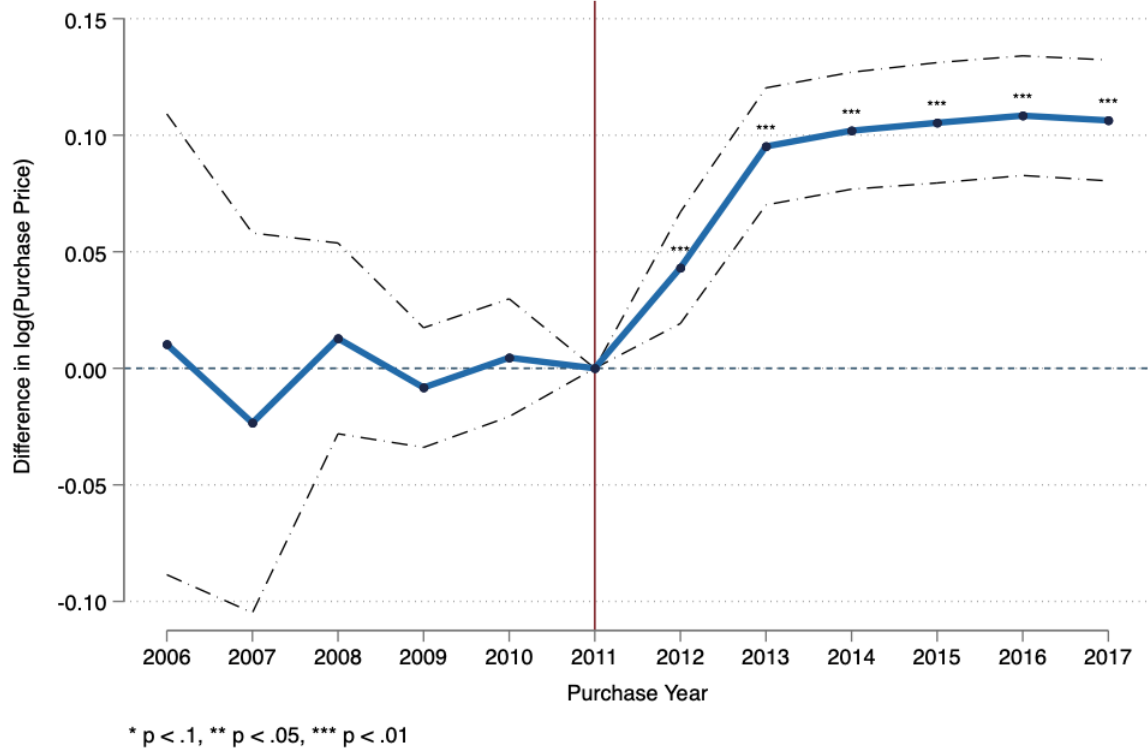


Figure 3 shows the results of Difference-in-Difference event study that reveals the difference in purchase prices between Chinese overseas buyers (COB) and Non-COBs over years.

$$\begin{aligned} \log(\text{Purchase Price})_{it} = & \alpha + \sum_{\substack{\tau=1994 \\ \tau \neq 2011}}^{2017} \beta_{\tau} \mathbb{1}\{\text{Chinese overseas buyer}\}_i \times \mathbb{1}\{t = \tau\} \\ & + \lambda_t + \theta_i + \delta \mathbb{1}\{\text{Chinese overseas buyer}\}_i \\ & + \gamma \mathbb{1}\{\text{All cash}\}_{it} + \zeta X_{it} + \epsilon_{it} \end{aligned}$$

The outcome measurement is the log purchase prices of house transaction i at time t . The estimated β_{τ} , drawn in the graph, represents the difference in purchase prices between COBs and Non-COBs before and after the treatment over time. The post-treatment period begins from 2012. Hence, the dummy variable for the year 2011, the year right before 2012, is the base group and dropped out.

Table 1. Summary Statistics

Panel A: Full Sample												
	Total Sample			Non-Chinese Buyer			Chinese Overseas Buyer			Chinese Loan Buyer		
	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median	N
Sale Prices	390,226	290,000	8,290,361	385,531	288,000	8,102,986	599,950	389,000	53,847	590,593	472,000	133,528
Lot Size (sq ft)	41,072	7,194	8,290,361	41,513	7,200	8,102,986	30,025	6,926	53,847	18,773	6,325	133,528
Num. of rooms	3	0	8,290,361	3	0	8,102,986	3	0	53,847	4	5	133,528
Num. of bedrooms	3	3	8,290,361	3	3	8,102,986	3	3	53,847	3	3	133,528
All-cash ratio	.16	0	8,290,361	.16	0	8,102,986	1	1	53,847	0	0	133,528
Age of house	32	29	8,290,361	32	29	8,102,986	34	30	53,847	33	30	133,528
Panel B: Return Sample												
	Total Sample			Non-Chinese Buyer			Chinese Overseas Buyer			Chinese Loan Buyer		
	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median	N
Sale Prices	346,427	270,000	3,354,550	345,177	269,000	3,317,343	469,474	303,000	7,505	455,009	370,000	29,702
Lot Size (sq ft)	37,423	7,000	3,354,550	37,580	7,000	3,317,343	28,262	7,051	7,505	22,206	6,510	29,702
Num. of rooms	3	0	3,354,550	3	0	3,317,343	3	0	7,505	4	4	29,702
Num. of bedrooms	3	3	3,354,550	3	3	3,317,343	3	3	7,505	3	3	29,702
All-cash ratio	.1	0	3,354,550	.1	0	3,317,343	1	1	7,505	0	0	29,702
Age of house	29	25	3,354,550	29	25	3,317,343	33	27	7,505	28	23	29,702

Table 1 reports the summary statistics of the full and return samples in this research.

Table 2. Returns of Chinese Overseas Buyers

	Unlevered Return				
	(1)	(2)	(3)	(4)	(5)
Chinese Overseas Owner	0.079*** (0.005)	-0.022*** (0.005)	-0.033*** (0.005)	-0.045*** (0.004)	-0.045*** (0.004)
All Cash		0.114*** (0.003)	0.111*** (0.003)	0.089*** (0.002)	0.088*** (0.002)
Holding Length			-0.008*** (0.000)		
Chinese Loan Owner					-0.002* (0.001)
R-squared	0.000	0.027	0.050	0.534	0.534
Observations	3,800,344	3,800,344	3,800,344	3,703,178	3,703,178
Zip X Sale Year-Month FE	No	No	No	Yes	Yes
Zip X Buy Year Month FE	No	No	No	Yes	Yes
Sale Year-Month X Buy Year-Month	No	No	No	Yes	Yes

Table 2 reports the regression results of unlevered returns on Chinese overseas buyer dummy and other transaction characteristics. Our main regression is expressed below.

$$ret_{i,s} = \alpha + \beta_1 \mathbb{1}\{\text{Chinese overseas buyer}\}_{i,s} + \beta_2 \mathbb{1}\{\text{All cash}\}_{i,s} + X_{i,s} + FEs$$

where i denotes house transactions and t denotes time. The return is calculated by dividing the subsequent sale prices of a house by the original purchase price and annualizing it:

$$ret_{i,s} = \left(\frac{P_{i,s}}{P_{i,b}} \right)^{\frac{1}{s-b}} - 1$$

The dummy variable, Chinese overseas buyer, equals 1 if the house owner is defined as Chinese overseas buyer. The dummy variable, All Cash, equals 1 if the owner pays with all cash. In Columns 1, I regress annualized unlevered returns on the Chinese overseas buyer dummy and the all cash dummy without controlling for any fixed effects. In Columns 2, I further add the holding length of houses by house owners. In Columns 3, I add the zip and sale year-month, zip and buy year-month, and sale year-month and buy year-month fixed effects. In Columns 4, I add the dummy variable, Chinese loan buyer, which equals 1 if the house owner use mortgage when buying the house. Standard errors are clustered by property zip code. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 3. Purchase and Sale Prices of Chinese Overseas Buyers

	Log(Purchase Price)		Log(Purchase Price)		Log(Sale Price)	
	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample	Full sample	Ret. sample	Ret. sample	Ret. sample	Ret. sample
Chinese overseas owner	0.152*** (0.013)	0.126*** (0.007)	0.108*** (0.020)	0.083*** (0.013)	-0.004 (0.011)	-0.009 (0.012)
All Cash	-0.269*** (0.007)	-0.251*** (0.006)	-0.237*** (0.008)	-0.216*** (0.008)	-0.004 (0.002)	-0.006** (0.003)
R-squared	0.891	0.915	0.918	0.946	0.832	0.871
Observations	6,422,852	6,359,935	2,099,923	2,048,457	2,099,923	2,048,457
Property FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	No	Yes	No	Yes	No
Zip X Year-Month FE	No	Yes	No	Yes	No	Yes

Table 3 reports the regression results of purchase and sale prices on Chinese overseas house owner dummy and other transaction characteristics. The specification is expressed below.

$$Y_{i,t} = \beta_1 \mathbb{1}\{\text{Chinese overseas buyer}\}_{i,t} + \beta_2 \mathbb{1}\{\text{All cash}\}_{i,t} + \gamma X_{i,t} + \tau Z_i + \epsilon_{i,t}$$

where i denotes the house transaction and t denotes time. The dummy variable, Chinese overseas owner, equals 1 if the house buyer (seller) in the house purchase (sale) transaction is defined as Chinese foreigner. The dummy variable, All Cash, equals 1 if the owner pays with all cash when buying the house. Columns 1 and 2 use the full sample where all house transactions from 1994 to 2017 are included. Columns 3 to 6 use the return sample where the both the purchase and the consecutive sale transactions for a house owner are observed. In Columns 1, 3, and 5, I add the property and the year-month fixed effects. In Columns 2, 4, and 6, the property and the interaction of property zip code and transaction year-month fixed effects are controlled. Standard errors are clustered by property zip code. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 4. Two-Way Fixed Effects Difference-in-Difference of Chinese Overseas Buyers

	Log(Purchase Price)			
	(1) Full sample	(2) Full sample	(3) Ret. sample	(4) Ret. sample
Chinese Overseas Buyer X Post 2012	0.185*** (0.012)	0.109*** (0.009)	0.137*** (0.021)	0.091*** (0.021)
Chinese Overseas Buyer	0.037** (0.016)	0.059*** (0.010)	0.057** (0.023)	0.055*** (0.017)
All Cash	-0.269*** (0.007)	-0.251*** (0.006)	-0.237*** (0.008)	-0.216*** (0.008)
R-squared	0.891	0.915	0.918	0.946
Observations	6,422,852	6,359,935	2,099,923	2,048,457
Property FE	Yes	Yes	Yes	Yes
Year-Month FE	Yes	No	Yes	No
Zip X Year-Month FE	No	Yes	No	Yes

Table 4 reports the estimation results of two-way fixed effects Difference-in-Difference model that reveals the difference in purchase prices between Chinese overseas buyers (COB) and Non-COBs before and after the treatment.

$$\begin{aligned}
\log(\text{Purchase Price})_{it} = & \alpha + \beta \mathbb{1}\{\text{Chinese overseas buyer}\}_i \times \mathbb{1}\{\text{Post-2012}\}_t \\
& + \lambda_t + \theta_i + \delta \mathbb{1}\{\text{Chinese overseas buyer}\}_i \\
& + \gamma \mathbb{1}\{\text{All cash}\}_{it} + \zeta X_{it} + \epsilon_{it}
\end{aligned}$$

The outcome measurement is the log purchase prices of house transaction i at time t . The estimated β represents the difference in purchase prices between COBs and Non-COBs after the treatment relative to the pre-treatment periods. The post-treatment period begins from 2012. Hence, the dummy variable, Post 2012, equals one if the transactions occur after (including) 2012. Columns 1 and 2 use the full sample, while Columns 3 and 4 use the return sample. Standard errors are clustered by property zip code. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 5. Purchase Prices of Buyer-Seller Groups

	Log(Purchase Price)			
	(1) Full sample	(2) Ret. sample	(3) Full sample	(4) Ret. sample
Chinese overseas buyer (COB) with Chinese seller	-0.002 (0.025)	-0.029 (0.055)	-0.003 (0.025)	-0.029 (0.055)
COB with Non-Chinese seller	0.140*** (0.007)	0.094*** (0.013)	0.081*** (0.009)	0.071*** (0.017)
COB with Non-Chinese seller X Post-2012			0.096*** (0.009)	0.074*** (0.020)
Non-COB with Chinese seller	0.019*** (0.003)	0.012** (0.005)	0.018*** (0.003)	0.011** (0.005)
All Cash	-0.251*** (0.006)	-0.216*** (0.008)	-0.251*** (0.006)	-0.216*** (0.008)
R-squared	0.915	0.946	0.915	0.946
Observations	6,359,935	2,048,457	6,359,935	2,048,457
Property FE	Yes	Yes	Yes	Yes
Zip X Year-Month FE	Yes	Yes	Yes	Yes
Test on linear combination of parameters				
COB with Chinese seller - Non-COB with Chinese seller	-0.021 (0.025)	-0.040 (0.054)		
COB with Chinese seller - COB with Non-Chinese seller	-0.142*** (0.023)	-0.123** (0.055)		

Table 5 reports the regression results of purchase and sale prices on Chinese overseas house owner dummy and other transaction characteristics. The specification is expressed below.

$$\begin{aligned}
\text{Log(Purchase Price)}_{it} = & \alpha + \beta_1 \mathbb{1}\{\text{COB with Chinese seller}\}_{it} \\
& + \beta_2 \mathbb{1}\{\text{Chinese overseas buyer (COB) with Non-Chinese seller}\}_{it} \\
& + \beta_3 \mathbb{1}\{\text{Non-COB with Chinese seller}\}_{it} \\
& + \beta_4 \mathbb{1}\{\text{All cash}\}_{it} + \gamma X_{it} + \tau Z_i + \epsilon_{it}
\end{aligned}$$

The outcome variable, Y_{it} , is the log purchase price in house transaction i in time t . The main interest of coefficient is the dummy variable, Chinese overseas buyer (COB) with Chinese seller, which equals 1 if the buyer of the transaction i Chinese foreigner and the seller is Chinese. The definition for other two buyer-seller is also similar. The dummy variable, All Cash, equals 1 if the buyer pays with all cash. Columns 1 and 2 use the full sample and return sample, respectively. The bottom of the Table reports the results of linear combination test of two parameters. The first row of the test examines the difference in execution prices between the COB with Chinese seller group and the Non-COB buyer with Chinese seller group. The second row examines the difference in execution prices between the COB with Chinese seller group and COB with Non-COB seller group. Standard errors are clustered by property zip code. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 6. Purchase Prices of Chinese Overseas Buyers (COB) with Sellers of Different Races

	Log(Purchase Price)	
	(1) Full sample	(2) Ret. sample
Chinese overseas buyers (COB) with Chinese seller	-0.017 (0.024)	-0.037 (0.055)
COB with Asian seller	0.126*** (0.010)	0.090*** (0.026)
COB with Black seller	0.046* (0.025)	0.070 (0.054)
COB with Hispanic seller	0.124*** (0.010)	0.090*** (0.024)
COB with White seller	0.178*** (0.007)	0.153*** (0.023)
Non-COB with Chinese seller	0.012*** (0.003)	0.009* (0.005)
All Cash	-0.249*** (0.006)	-0.216*** (0.008)
R-squared	0.915	0.946
Observations	6,359,935	2,048,457
Property FE	Yes	Yes
Zip X Year-Month FE	Yes	Yes

Table 6 examines the difference in purchase prices of Chinese overseas buyers (COB) with different races of sellers. The specification is expressed as below.

$$\begin{aligned}
Y_{i,t} = & \alpha + \beta_1 \mathbb{1}\{\text{Chinese overseas buyer (COB) with Chinese seller}\}_{i,t} \\
& + \beta_2 \mathbb{1}\{\text{COB with Asian seller}\}_{i,t} + \beta_3 \mathbb{1}\{\text{COB with Black seller}\}_{i,t} \\
& + \beta_4 \mathbb{1}\{\text{COB with Hispanic seller}\}_{i,t} + \beta_5 \mathbb{1}\{\text{COB with White seller}\}_{i,t} \\
& + \beta_6 \mathbb{1}\{\text{Non-COB with Chinese seller}\}_{i,t} + \lambda \mathbb{1}\{\text{All cash}\}_{i,t} + \gamma X_{i,t} + \tau Z_i + e_{i,t}
\end{aligned}$$

The outcome variable, Y_{it} , is the log purchase price in house transaction i in time t . I split the transactions made by COBs and Non-Chinese sellers into four subgroups based on sellers' races: COBs with Asian sellers, COBs with Black sellers, COBs with Hispanic sellers, and COBs with White sellers. I substitute $\mathbb{1}\{\text{COB with Non-Chinese seller}\}_{it}$ with dummy variables for the four-seller-race subgroups and perform the similar regression analysis with Equation 5. Standard errors are clustered by property zip code. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 7. Purchase Prices of Chinese Loan Buyers

	Log(Purchase Price)	
	(1)	(2)
	Full sample	Return sample
Chinese loan buyer (CLB) with Chinese seller	-0.070*** (0.009)	-0.030* (0.017)
CLB with Non-Chinese seller	-0.003 (0.003)	0.006 (0.004)
Non-CLB with Chinese seller	0.008** (0.004)	0.012** (0.005)
All Cash	-0.247*** (0.006)	-0.215*** (0.008)
R-squared	0.915	0.946
Observations	6,359,935	2,048,457
Property FE	Yes	Yes
Zip X Year-Month FE	Yes	Yes
<i>Test on linear combination of parameters</i>		
CLB with Chinese seller – Non-CLB buyer with Chinese seller	-0.079*** (0.010)	-0.041** (0.016)
CLB with Chinese seller – CLB with Non-Chinese seller	-0.067*** (0.010)	-0.036** (0.017)

Table 7 reports the regression results of purchase and sale prices on Chinese loan buyers (CLB) and other transaction characteristics. Chinese loan buyers are those who finance home purchases with mortgages. The specification is expressed below.

$$\begin{aligned}
\text{Log(Purchase Price)}_{it} = & \alpha + \beta_1 \mathbb{1}\{\text{Chinese loan buyer (CLB) with Chinese seller}\}_{it} \\
& + \beta_2 \mathbb{1}\{\text{CLB with Non-Chinese seller}\}_{it} \\
& + \beta_3 \mathbb{1}\{\text{Non-CLB with Chinese seller}\}_{it} \\
& + \beta_4 \mathbb{1}\{\text{All cash}\}_{it} + \gamma X_{it} + \tau Z_i + \epsilon_{it}
\end{aligned}$$

The outcome variable Y_{it} is the log purchase price in house transaction i in time t . $\mathbb{1}\{\text{Chinese loan buyer (CLB) with Chinese seller}\}_{it}$ is an indicator which equals one if the buyer in the transaction i is a Chinese loan buyer and the seller is Chinese. The definition for the other two types of buyer-seller transactions is also similar. $\mathbb{1}\{\text{All cash}\}_{it}$ equals one if the buyer pays in cash. Columns 1 and 2 use the full sample and return sample, respectively. The bottom of the table reports the results of the linear combination test of two parameters. The first row of the test examines the difference in execution prices of Chinese sellers trading with CLBs and Non-CLBs. The second row examines the difference in execution prices of CLBs trading with Chinese sellers and Non-Chinese sellers. Standard errors are clustered by property zip code. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 8. Purchase Prices of Different Race Buyers

	Log(Purchase Price)		
	(1) Asian	(2) Black	(3) Hispanic
Minority Buyer with Minority Seller	-0.0427*** (0.00483)	0.00878 (0.00851)	0.00461 (0.00469)
Minority Buyer with Non-Minority Seller	0.0235*** (0.00162)	0.0342*** (0.00316)	0.0189*** (0.00125)
Non-Minority Buyer with Minority Seller	0.0194*** (0.00211)	0.0186*** (0.00424)	0.0265*** (0.00182)
All Cash	-0.246*** (0.00621)	-0.246*** (0.00621)	-0.246*** (0.00621)
R-squared	0.915	0.915	0.915
Observations	6,359,935	6,359,935	6,359,935
Property FE	Yes	Yes	Yes
Zip X Year-Month FE	Yes	Yes	Yes

Table 8 reports the regression results of log purchase prices on buyer-seller groups for three different races. For each of the three-race groups, I classify transactions into four groups: the buyer and seller are the same race as denoted in the column title (i.e., Minority Buyer with Minority Seller), the seller is not the same race as the buyer (i.e., Minority Buyer with Non-Minority Seller), the buyer is not the same race as the seller (i.e., Non-Minority Buyer with Minority Seller), the buyer and seller both are not the race denoted in the column titles. The race groups are denoted in the column titles (i.e., Asian, Black, and Hispanic) For example, in Column 1 for Asians, the dummy variable, Minority Buyer with Non-Minority Seller, equals one if the buyer is defined as Asian, but the seller is not Asian. A similar definition is applied to the other two race dummy variables. The variable, All Cash, equals one if the owner pays with all cash. Standard errors are clustered by property zip code. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 9. Purchase Prices of Chinese Overseas Buyers with Purchase Experience

	Log(Purchase Price)			
	(1) Full sample	(2) Full sample	(3) Ret. sample	(4) Ret. sample
Chinese overseas buyer (COB)	0.135*** (0.007)		0.082*** (0.013)	
COB with no experience		0.160*** (0.008)		0.112*** (0.017)
COB with experience		0.138*** (0.007)		0.093*** (0.018)
Experience	-0.015*** (0.001)	-0.015*** (0.001)	-0.015*** (0.001)	-0.015*** (0.001)
All Cash	-0.261*** (0.007)	-0.260*** (0.007)	-0.215*** (0.008)	-0.215*** (0.008)
R-squared	0.917	0.917	0.947	0.947
Observations	6,147,061	6,147,061	2,035,102	2,035,102
Property FE	Yes	Yes	Yes	Yes
Zip X Year-Month FE	Yes	Yes	Yes	Yes

Table 9 reports the estimation results of the difference in purchases prices of Chinese overseas buyers with the varying purchase experience. The outcome measurement is the log purchase prices of house transaction i at time t . The variable "Chinese overseas buyer" equals one if the buyer is identified as a Chinese foreigner. The variable "Experience" equals one if the buyer in the transaction has at least one purchase experience. The variable "COB with no experience" equals one if the Chinese overseas buyer has no purchase record before. A similar definition is applied to the variable "COB with experience." The detailed steps of measuring purchase experience is discussed in Section II.C. Columns 1 and 2 use the full sample, while Columns 3 and 4 use the return sample. Standard errors are clustered by property zip code. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 10. Median Prices at Zip-Year Level and Total Transaction Values of Chinese Overseas Buyers (COB)

	Log(Purchase Price)			
	(1) OLS	(2) OLS	(3) OLS	(4) IV
Log(COB Trans. Value)	0.010*** (0.003)	0.003 (0.002)	-0.015*** (0.003)	-0.033 (0.149)
Log(COB Trans. Value) X Post 2012			0.032*** (0.002)	0.072*** (0.025)
Log(Total Trans. Value)		0.202*** (0.011)	0.203*** (0.011)	0.214*** (0.015)
Log(Total All-Cash Trans. Value)		-0.024*** (0.006)	-0.039*** (0.006)	-0.058 (0.110)
R-squared	0.981	0.984	0.984	0.149
Observations	9,422	9,422	9,422	8,201
Property FE	Yes	Yes	Yes	Yes
Zip X Year FE	Yes	Yes	Yes	Yes

Table 10 examines the influence of Chinese overseas buyers' transactions on local housing prices.

$$\begin{aligned}
\log(\text{ZHVI})_{it} = & \alpha + \beta_1 \log(\text{COB Trans. Value})_{it} \\
& + \beta_2 \log(\text{COB Trans. Value})_{it} \times \mathbf{1}\{\text{Post-2012}\}_t + \lambda_t + \theta_i \\
& + \gamma \log(\text{Total Trans. Value})_{it} + \zeta \log(\text{All-Cash Trans. Value})_{it} + \epsilon_{it}
\end{aligned}$$

The outcome measurement is the log of Zillow Home Value Index (ZHVI) of single-family residences at zip code i at year t . The variable $\log(\text{COB Trans. Value})$ denotes the log of total transaction values made by Chinese overseas buyers. $\log(\text{COB Trans. Value}) \times \text{Post-2012}$ is a variable that equals the log of total transaction values made by Chinese overseas buyers at zip code i at year t if year t is after (including) 2012, otherwise 0. Similarly, $\log(\text{Total Trans. Value})$ is the log of total transaction values at zip code i and year t . $\log(\text{Total All-Cash Trans. Value})$ is the log of total transaction values using cash payment. Columns 1 to 3 are estimated by OLS. Columns 4 use 2SLS IV method to estimate coefficients. The Standard errors are clustered by property zip code. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Appendix

Figure A.1. The Time Line of the Home-purchase Restrictions in China



Figure A.1 shows the time line of rolling out home-purchase restrictions in China. It is from [Du and Zhang \(2015\)](#).

Figure A.2. The Share of Transactions by Chinese Overseas Buyers in California

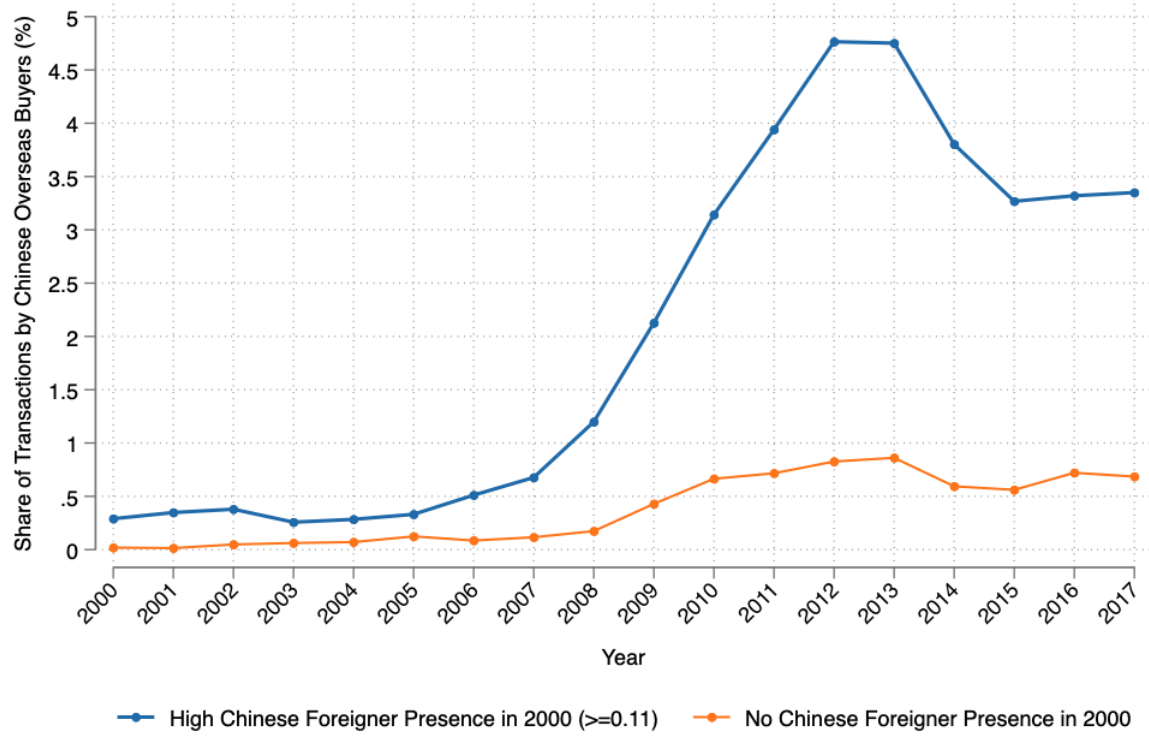


Figure A.2 presents the average share of housing purchase transactions made by Chinese overseas buyers in zip codes with high Chinese foreigner presence and with no Chinese foreigner presence in 2000.

Table A.1. Purchase Prices of Chinese American Cash Buyers (CACB)

	Log(Purchase Price)	
	(1)	(2)
	Full sample	Return sample
Chinese American cash buyer (CACB) with Chinese American seller (CAS)	-0.181*** (0.032)	-0.158*** (0.057)
CACB with Non-CAS	0.096*** (0.006)	0.056*** (0.014)
Non-CACB with Chinese American seller	0.007*** (0.002)	-0.002 (0.004)
All Cash	-0.248*** (0.006)	-0.215*** (0.008)
R-squared	0.915	0.946
Observations	6,359,935	2,048,457
Property FE	Yes	Yes
Zip X Year-Month FE	Yes	Yes

Table A.1 reports the regression results of purchase and sale prices on Chinese American cash buyers (CACB) and other transaction characteristics. Chinese American cash buyers are those who are identified as Chinese American and pay in cash in home purchases. The specification is expressed below.

$$\begin{aligned}
\text{Log(Purchase Price)}_{it} = & \alpha + \beta_1 \mathbb{1}\{\text{Chinese American cash buyers (CACB) with Chinese seller}\}_{it} \\
& + \beta_2 \mathbb{1}\{\text{CACB with Non-Chinese seller}\}_{it} \\
& + \beta_3 \mathbb{1}\{\text{Non-CACB with Chinese seller}\}_{it} \\
& + \beta_4 \mathbb{1}\{\text{All cash}\}_{it} + \gamma X_{it} + \tau Z_i + \epsilon_{it}
\end{aligned}$$

The outcome variable Y_{it} is the log purchase price in house transaction i in time t . $\mathbb{1}\{\text{Chinese American cash buyer (CACB) with Chinese seller}\}_{it}$ is an indicator which equals one if the buyer in the transaction i is a Chinese American cash buyer and the seller is Chinese. The definition for the other two types of buyer-seller transactions is also similar. $\mathbb{1}\{\text{All cash}\}_{it}$ equals one if the buyer pays in cash. Columns 1 and 2 use the full sample and return sample, respectively. The bottom of the table reports the results of the linear combination test of two parameters. The first row of the test examines the difference in execution prices of Chinese sellers trading with CACBs and Non-CACBs. The second row examines the difference in execution prices of CACBs trading with Chinese sellers and Non-Chinese sellers. Standard errors are clustered by property zip code. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table A.2. Purchase Prices of Chinese Overseas Buyers (COB) with House Characteristics

	Log(Purchase Price)	
	(1)	(2)
	Full sample	Ret. sample
Chinese overseas buyer	0.112*** (0.005)	0.093*** (0.010)
All Cash	-0.207*** (0.004)	-0.222*** (0.005)
Log(assessed value)	0.554*** (0.005)	0.531*** (0.006)
Log(square feet)	0.019*** (0.003)	0.013*** (0.003)
Log(house age)	-0.047*** (0.002)	-0.047*** (0.002)
Total rooms	0.003*** (0.001)	0.004*** (0.001)
Bedroom num.	0.026*** (0.001)	0.030*** (0.001)
Bathroom num.	0.024*** (0.002)	0.031*** (0.002)
Waterfront	0.158*** (0.027)	0.163*** (0.029)
Pool	0.065*** (0.003)	0.072*** (0.003)
R-squared	0.815	0.835
Observations	7,404,477	2,884,497
Zip X Year-Month FE	Yes	Yes

Table A.2 reports the estimation results of difference in purchases prices of Chinese overseas buyers with varying house characteristics. The outcome measurement is the log purchase prices of house transaction i at time t . Columns 1 use the full sample, while Columns 3 use the return sample. Standard errors are clustered by property zip code. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.