

A “China Shock” on the Finance Side: Evidence from Chinese Housing Investment in the US*

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Abstract

This paper documents an unprecedented surge in housing purchases by foreign Chinese in the US over the past decade and analyzes their effects on US local economies. Using transaction-level data on housing purchases, we find that the share of purchases by foreign Chinese in the California real estate market increased more than tenfold during the period of 2007-2013 relative to earlier years. In particular, these purchases have been concentrated in zip codes that are historically populated by ethnic Chinese, making up for more than 10% of the total real estate transactions in these neighborhoods in 2013. We exploit the cross-sectional variation in the concentration of Chinese population settlement across zip codes during the pre-sample period to instrument for the volume of housing purchases by foreign Chinese. Our results show that housing purchases by foreign Chinese significantly increased local housing prices as well as local employment in the non-tradable sectors. Our evidence highlights the role of foreign investments in local employment, especially in times of economic downturns.

JEL Classification: E21, E32, D14, R21

Keywords: China shock, real estate, housing net worth.

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1 Introduction

The rise of China in the global economic scene has been one of the most notable economic phenomena over the past two decades, which a growing literature has dubbed as the “China shock.” While much of the literature focuses on the “China shock” on the real side, specifically the effects of China’s rising international trade activities on local economies in the US (e.g., Autor et al. (2013)), China’s intention to play a more active role in global finance in recent years has prompted a new question: As China becomes more financially integrated into the global economy and allow capital to flow in and out of the country more freely, what are the economic effects and welfare implications of a “China shock” on the finance side for the rest of the world? Our paper is one of the first academic works that studies this increasingly relevant question. In this paper, we call attention to a specific “China shock” on the finance side. We document an unprecedented surge in residential housing purchases by foreign Chinese in the US since 2007 and analyze the effects of these purchases on the US local housing and labor markets.

The surge of housing purchases by foreign Chinese¹ in the US over the past decade has grabbed many headlines in the press. According to the National Association of Realtors, foreign Chinese have taken the lead among all foreign buyers of US real estates by a wide margin, as measured by both value and quantity, and they tend to concentrate the purchases in regions that have been more populated by ethnic Chinese historically such as California and leave them vacant.² While these purchases have been widely reported by the media, to

¹In this paper, we define “foreign Chinese” as Chinese who do not regularly reside in the US, and “ethnic Chinese” as Chinese who live in the US.

²Foreign Chinese buyers spent \$28.6 billion on residential property in the US in 2014, which is a 30% increase from the previous year and more than two and a half times the amount spent by Canadians, the next biggest group of foreign buyers of real estate in the US. Furthermore, a survey published by the California Association of Realtors found that Chinese bought 32% of homes sold to foreigners in California, and a recent RealtyTrac report found that 80% of new construction homes in the city of Irvine were sold to Chinese buyers. Studies by Rosen et al. (2017) and Simons et al. (2016) find that foreign Chinese real estate buyers tend to neither use the purchased properties as primary residences nor rent it out. They show that housing purchases by foreign Chinese in the US has been accompanied by a rise in the number of Chinese investors in the EB-5 Immigrant Investor Visa Program, and they are primarily interested in obtaining a green card for their children instead of actual returns to their real estate investments. The tendency of foreign Chinese real estate buyers to leave housing properties vacant may not be surprising in light of a

the best of our knowledge, no academic study has provided a formal quantification of the phenomenon and explored its implications for the US real economy.

In this paper, we first document two stylized facts about purchasing behavior by foreign Chinese in the US housing market using detailed transaction-level data covering all real estate transactions in the three largest core-based statistical areas (CBSA) in California. First, house purchases by foreign Chinese increased more than tenfold over the 2007-2013 period relative to earlier periods. Figure 1 plots the share of purchases in the US real estate market by foreigners as measured by dollar value over the 2001-2013 period. While the percentage of all housing transactions made by foreign Chinese was small (around 0.3%) and comparable to that of other foreigners over the 2001-2006 period, it began to increase sharply in 2007 and reached more than 5% of total housing purchases in California by 2013, overtaking all other groups as the lead group of foreign buyers in the market. Note the year 2007 was when home prices in the US began to slump, thus our analysis on the effects of housing purchases by foreign Chinese on US local economies also delves into the question of whether housing investments by foreign Chinese played a stabilizing role during the housing market crash of 2007-2011.³

Second, the increase in house purchases by foreign Chinese has been concentrated in zip codes that are historically populated by ethnic Chinese. Figure 2 dissects Figure 1 by zooming in on housing purchases by foreigners in zip codes in the top quartile of the Chinese population based on the 2000 Census. Evidently, the surge of housing purchases by foreign Chinese has been concentrated in zip codes that are historically populated by ethnic Chinese: in 2013, they made up more than 10% of the total real estate transactions in these neighborhoods. As we describe in detail below, we exploit this observation in our empirical

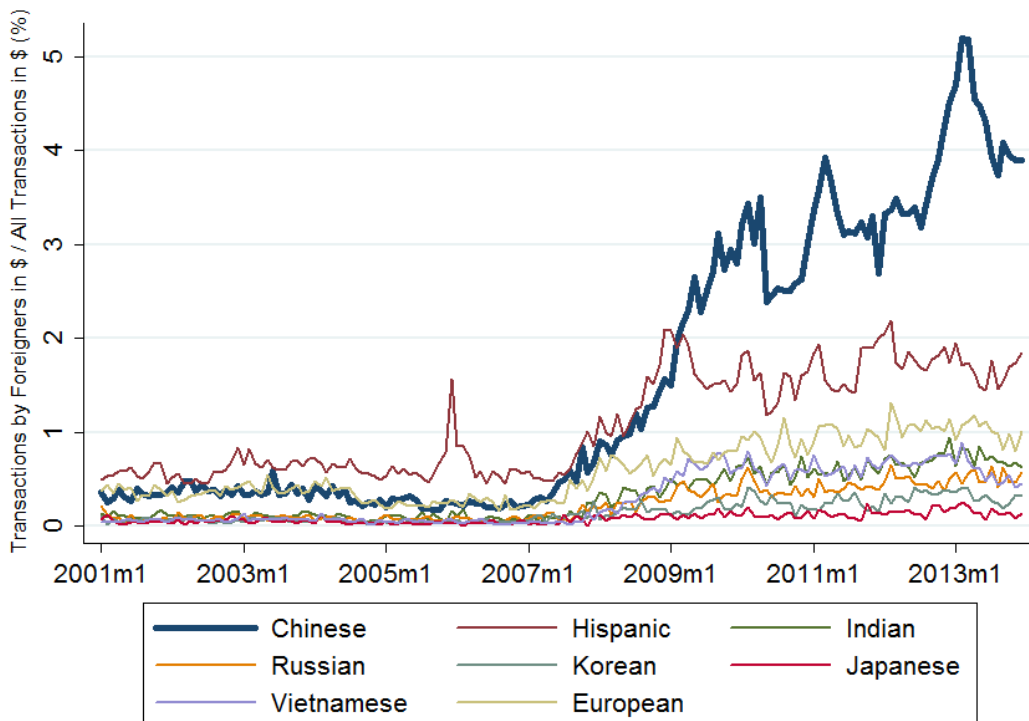
similar practice in China: Glaeser et al. (2017) show that housing vacancy rates in China are much higher than in the US, reaching more than 20% in major Chinese cities in 2012.

³Besides the housing market crash in the US, the 2007/2008 period was also the time that the real estate market in China began to boom significantly and the Chinese government increased the limit on how much Chinese citizens can exchange yuan to other currencies annually (up from \$20,000 to \$50,000). All of these factors likely played a role in inducing the surge of housing purchases by foreign Chinese in the US. Nevertheless, the main focus of this paper is to understand the implications of these purchases on the US economy.

strategy to assess the effects of housing purchases by Chinese on US local economies.

Motivated by these two facts, we proceed to study the effects of housing purchases by foreign Chinese on US local economies in this paper in two steps. First, we estimate the causal impact of these purchases on local housing markets and labor markets in the US. Then we develop a model that rationalizes the empirical results in which we highlight the housing wealth channel through which foreign housing purchases impact US local economies.

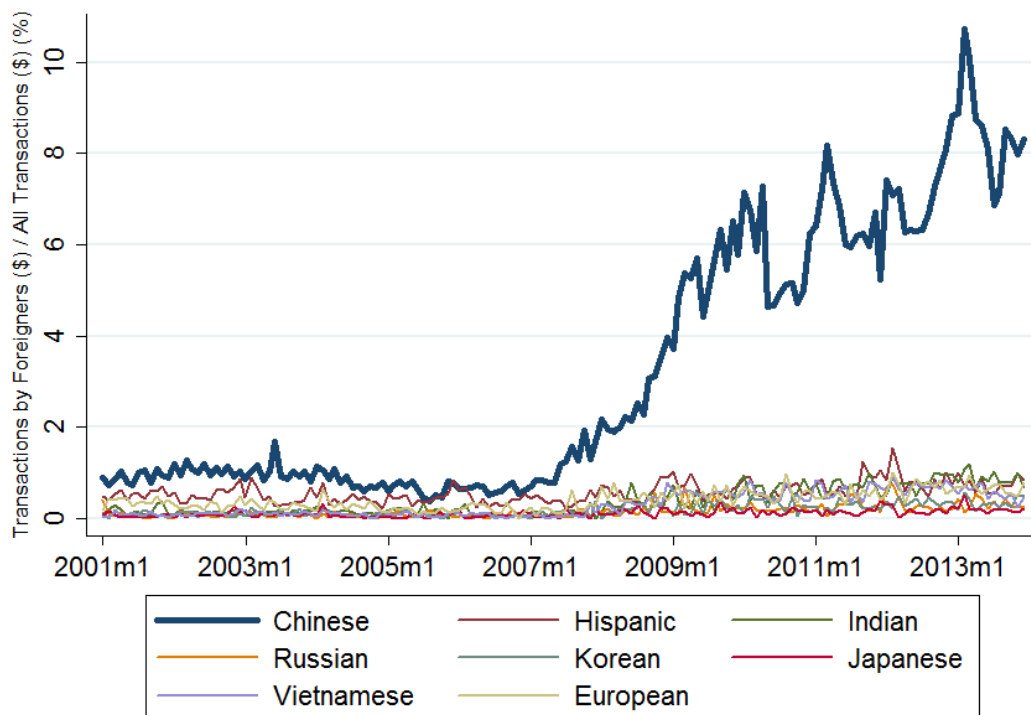
Figure 1: Share of Housing Purchases (\$) by Foreigners



Notes: This figure plots the share of total monthly transaction value of home purchases in the 3 largest CBSAs in California between 2001 and 2013 by buyer ethnicity. Data source: DataQuick.

Empirically establishing the causality from Chinese purchases to local housing markets is challenging due to an issue of endogeneity: it is difficult to distinguish if increasing purchases by foreign Chinese are driving up home prices or if foreign Chinese just happen to be buying in areas that are more likely to experience higher home prices. To deal with this issue, we make use of the second stylized fact by exploiting historical cross-market variation in the concentration of Chinese population across zip codes to analyze the effects of the surge in

Figure 2: Share of Housing Purchases (\$) by Foreigners in Top Chinese Zip Codes



Notes: This figure plots transactions value of home purchases made by each ethnicity monthly in the 3 largest CBSAs in California between 2001 and 2013 for zip codes in the top quartile of ethnic Chinese population based on the 2000 Census. Data source: DataQuick.

housing purchases by Chinese buyers since 2007 on local housing prices and employment. Given Chinese buyers are more likely to buy homes in neighborhoods that are populated by a higher pre-existing percentage of ethnic Chinese, we use the percentage of ethnic Chinese for each zip code in 2000 as an instrument for the volume of housing purchases by foreign Chinese.

Our results show that zip codes that witnessed a higher volume of real estate purchases by foreign Chinese exhibit significantly higher increases in housing prices. We find that a 1% increase in the housing demand by foreign Chinese as measured by transaction value induces a 0.074% increase in home prices between 2007 and 2011 (the period of the housing market crash), which corresponds to an increase of \$433 per home, and a 0.102% increase during 2012 and 2013 (the recovery period), which corresponds to \$597 per home. During the housing market crash of 2007-2011, zip codes that experienced more real estate purchases by foreign Chinese exhibit a lower decline in housing prices, suggesting foreign cash inflow during economic downturns can have a stabilizing effect.

To understand the real effects of the surge of real estate purchases by foreign Chinese, we then proceed to study the impact of the resulting increase in home prices on local labor markets. A number of papers have pointed to a significant link between housing investment and the real economy (e.g., Green (1997), Parker (2000)); in particular, recent papers by Mian et al. (2013) and Mian and Sufi (2014) show that deterioration in housing net worth played a significant role in the sharp decline in US employment between 2007 and 2009, or what they call the housing net worth channel. They argue that housing net worth affect employment by changing consumer demand through either a direct wealth effect or less binding borrowing constraints driven by the rise in collateral value.

In our estimation on the relationship between higher housing prices driven by higher foreign Chinese purchase and employment, we find evidence of greater total employment in zip codes that experienced a higher volume of foreign Chinese housing purchases: a 1% increase in housing demand by foreign Chinese in terms of transaction value induces a 0.102%

increase in a zip code's total employment levels during the housing market crash years and a 0.149% increase during the recovery years. Moreover, we find that zip codes that experience more real estate purchases by foreign Chinese since 2007 exhibit a significantly higher increase in the non-tradable sector employment relative to earlier periods. This result in particular supports the housing net worth channel, which suggests the impact of spending changes in an area due to housing net worth fluctuations on local employment should show up foremost in non-tradable sector employment of that area, since non-tradable sector employment depends primarily on local demand, while the tradable sector is more diversified in its geographic origins of demand.

We build a simple model that incorporates the housing net worth channel to aid our thinking about the economic mechanism and interpreting the empirical estimates. This model shows how a nominal shock through housing wealth affects tradable versus non-tradable employment in the local economy. A key prediction of the housing net worth channel is that changes in housing net worth should be positively related to changes in non-tradable employment and not significantly related to changes in tradable employment. The intuition is that a positive housing wealth shock through housing purchases by foreign Chinese will increase the local demand for non-tradable goods and hence local non-tradable employment because demand for non-tradable goods are centralized in local economies, whereas the increased demand for tradable goods can be supplied by the production elsewhere, diffusing the effect on local employment in the tradable sector. Our results support this prediction as we find that foreign Chinese purchases significantly impact employment in the non-tradable sectors but not the tradable sectors.

This paper is related to several strands of literature and contains important policy implications. First, it contributes to the literature that aims to better understand the impacts and implications of China's increasing integration into the global economy on the rest of the world. A growing literature explores the effects of China's rapid growth in trade activities on US local economies, starting with the paper by Autor et al. (2013) who study the effects of

rising Chinese import competition on US local labor markets and find that such competition explains one-quarter of the aggregate drop in US manufacturing employment. A number of subsequent papers find that Chinese import competition significantly affect innovation (Autor and Shu (2017)), electoral consequences (Autor and Majlesi (2017)), and marriage market outcomes (David Autor et al. (2018)) in the US. While China’s integration into the global economy indeed has been most acutely manifested in its trade activities over the past two decades, China has been seeking to open up its capital markets, which has prompted growing interests in the academic, policy and business community to better understand the implications of a “China shock” on the finance side for the rest of the world. This paper is one of the first academic papers on that front. We focus on a specific source of “China shock” on the finance side, the surge of cash inflows from China to the US for residential real estate purchases, and analyze its economic impacts on the US local economies.

Our paper is also related to a growing literature that studies the effects of housing purchases by foreigners on local housing markets. Badarinza and Ramadorai (2015) examines the effects of housing demand by foreigners on domestic housing prices in London. Using political shocks in a source country as an exogenous instrument, they estimate the effects of foreign buyers on house prices in London neighborhoods with a large pre-existing share of residents born in that source country and find substantial price effects in such areas. Sa (2016) also studies the effect of foreign investment on UK house prices and home ownership rates, using a different data set. Cvijanovic and Spaenjers (2015) finds that non-resident foreigners induce house prices to rise and crowd out residents in highly desirable neighborhoods of Paris. They also show empirically that relatively few properties bought by non-residents are rented out, which corresponds to reports on foreign Chinese and validates an important assumption we make in our model. Favilukis and Van Nieuwerburgh (2017) develop a spatial equilibrium model of a city with heterogeneity among residents to study the welfare implications out-of-town buyers of local housing markets. Our paper contributes to this literature by going beyond the price effects of foreign housing purchases and examines the

consequences on local employment as well as the underlying mechanisms. We aim to bridge the literature in the macro-finance and urban economics by presenting empirical evidence on how a foreign shock on the finance side affects the real economy.

To that end, our paper is related to the line of research that explores the effects of housing investments on the real economy. Green (1997) and Parker (2000) are among the earlier works that point out a significant link between real estate investment and the macro-economy. Recent papers by Mian et al. (2013) and Mian and Sufi (2014) argue that deterioration in household balance sheets, the housing net worth channel, played a significant role in the sharp decline in US spending and employment during the 2007-2009 financial crisis. Our paper presents results that support the housing net worth channel in the context of a positive housing net worth shock driven by foreign Chinese demand.

More broadly, our paper is related to papers that study the impact of foreign investments on domestic local economy, including papers that look into the effects of foreign direct investment on domestic economic growth (e.g., Borensztein et al. (1998)). Our analysis quantifies the effect of foreign housing investment, a specific form of capital inflow that has not been emphasized in the international finance literature, on the local economy and draws a link between international capital inflow to the housing sector and domestic economy. Moreover, given the surge in housing purchases by foreign Chinese coincided with the housing market crash in the US, our results show that investments by foreigners can play a stabilizing role in times of economic downturns. Our work also is related to papers that estimate the effects of stabilization policies such as fiscal stimulus on local economies during economic downturns, including Ramey (2011), Nakamura and Steinsson (2014), and Chodorow-Reich et al. (2012).

The remainder of the paper is organized as follows. Section 2 describes the data and the empirical methodology. Section 3 presents our empirical results. Section 4 presents the model we use to interpret the empirical results. Section 5 concludes.

2 Data and Methodology

2.1 Data

Our main data source for housing transaction data is DataQuick, from which we obtain the universe of housing transaction records in the California from 2001 to 2013.⁴ For each transaction, we can observe the address of the house, the names of the buyer and seller, the transaction price, the transaction date, and characteristics of the house. We restrict our sample to single family residential homes as the focus of this study is residential real estate purchases not business purchases.

Given our objective is to study the impact of housing demand by foreign Chinese on the local economy, we need to generate a measure for foreign Chinese housing transaction value (*CHTV*) in the sample. To this end, we proceed in three steps.

First, we identify the ethnicity of the house buyers in our sample using Bill Kerr's ethnic name-matching algorithms. Kerr (2008) originally created the algorithm to identify the ethnicity of inventors who were granted patents by the US Patent and Trademark Office, and Kerr and Lincoln (2010) used this algorithm to investigate the impact of H-1B Visa reforms on Indian and Chinese inventors and patents. This algorithm exploits the fact that certain names are unique or more common to one ethnicity and assigns each person a probability of belonging to a specific ethnicity, with the probabilities summed up to 100%. If a name is unique to one ethnicity, the person with that name will be assigned with 100% to one ethnicity. For names that are common among multiple ethnicities, the algorithm uses the demographic breakdown in the MSA in which the corresponding buyers reside to assign probabilities. For example, a person named Yi Chen would be assigned to the Chinese ethnicity with 100% probability, while someone with the surname Lee, which could be of Chinese, Korean or American ethnicity, would be assigned to each of the three ethnic groups

⁴In our analysis, we focus on housing transactions in the three largest core-based statistical areas (CBSAs) in California, Los Angeles-Long Beach-Riverside, San Jose-San Francisco-Oakland, and San Diego-Carlsbad-San Marcos, as those are the areas that have witnessed more purchases by foreign Chinese since 2007.

with probabilities based on the proportion of Chinese, Koreans, and Americans in the MSA in which person resides.⁵ In order to ensure that our final foreign Chinese housing demand measure is of the highest accuracy possible, we consider a transaction to be made by an ethnic Chinese buyer if the name matching process assigns that buyer as 100% ethnic Chinese.

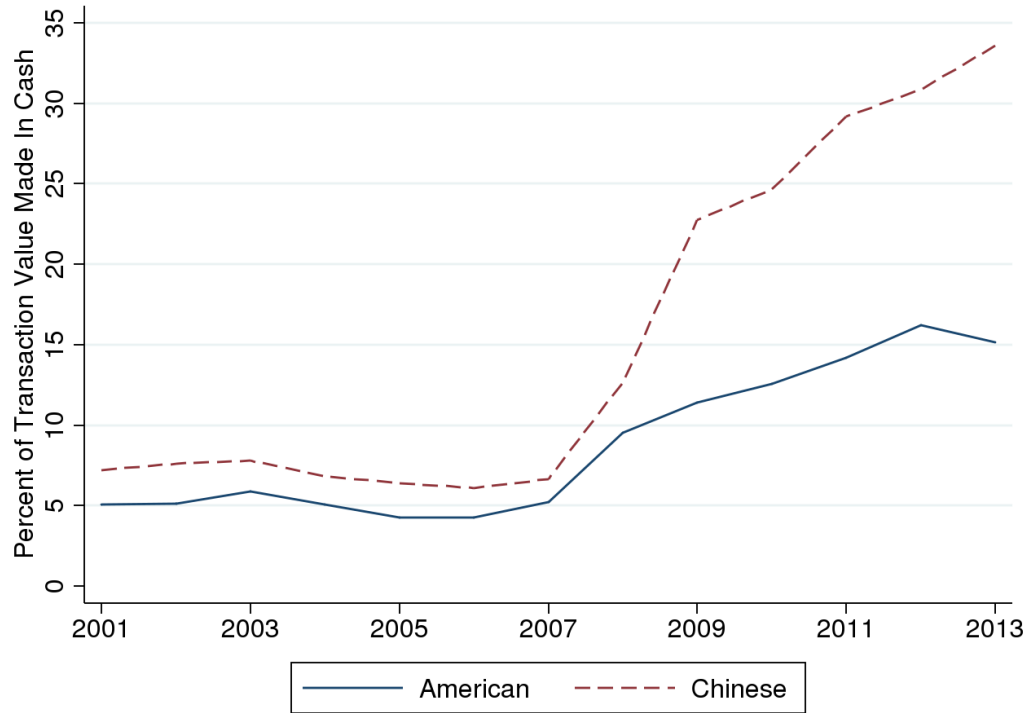
Next, we only keep transactions that were made in cash by ethnic Chinese buyers. This filtering is motivated by the fact that foreign Chinese cannot qualify for mortgage when buying homes in the US, which means they must pay in cash. We therefore assume that all Chinese buyers in the sample that have mortgages attached are ethnic Chinese who regularly lives in the US.

Third, we recognize that restricting the sample to cash purchases by ethnic Chinese is a necessary but not sufficient condition for identifying foreign Chinese housing purchases because ethnic Chinese also can pay cash. To address this concern, we make an assumption that ethnic Chinese who live in the US behave similarly to Americans and take out cash transactions that are likely to be made by Americans for the *CHTV* measure. As shown in Figure 3, the percentage of all transactions that are made in cash for Americans and for ethnic Chinese were comparable prior to 2007. After 2007, the probability of cash transactions increased much faster for ethnic Chinese than for Americans, which is likely driven by the increase in cash purchases by foreign Chinese based on figures reported by the National Association of Realtors. Given this observation, we adjust the ethnic Chinese cash transaction figure by taking out the probability that the cash purchases were made by Americans for each zip code-year to arrive at the final *CHTV* measure.

To study the impact of foreign Chinese housing transactions on the local economy, we merge the housing transactions data with multiple zip code level datasets, including Zillow for local housing values, the 2000 Census for historical ethnic Chinese population, the Census Zip Code Business Patterns for employment size, and the IRS for income. Similar to Mian et al. (2013), we further decompose the employment size measure into two categories, tradable

⁵See Kerr (2008) for more comprehensive details on the names matching process and descriptive statistics from their matching exercises.

Figure 3: US and Chinese Cash Purchase Trends



Notes: This figure plots the percentage of home transaction values bought in cash by both Americans and Chinese between 2001 and 2013. Homes were classified as being purchased by American or Chinese if Kerr’s ethnic name matching process assigns a 100% match for each corresponding ethnicity for the buyer. Based on the trends in this graph, we can calculate an adjusted foreign Chinese housing transactions ($CHTV$) as: $CHTV_{zt} = ethnic\ Chinese\ Cash_{zt} * (1 - Prob(American\ Cash)_{zt})$ for each zipcode-year zt .

and non-tradable, using the four-digit industry classification code.

Table 1 presents the summary statistics of our dataset. In total, we have 9,986 zip code-year observations over the period 2001-2013. We break down the sample into three sub-periods: the housing market boom period (2001-2006), the housing market crash period (2007-2011) and the housing market recovery period (2012-2013). As shown in the top four rows, there was a dramatic increase in housing transactions by foreign Chinese during the post-2007 period relative to earlier years. On average, while each zip code witnessed 0.8 housing transactions by foreign Chinese for a total value of \$0.45 million per year between 2001-2006, those figures jumped to 11 transactions and \$5 million by 2013, respectively. The share of Chinese transaction out of all housing transactions in California in terms of counts and values also increased from 0.28% to 4.5% and from 0.28% to 4.36% respectively. The bottom four rows of Table 1 show that the average local economic conditions, as measured by home prices, employment and income, were similar across the three periods. Given the surge in housing purchases by foreign Chinese began in 2007, we focus on the the sample period 2007-2013 in the subsequent empirical analysis.

Table 1: Summary Statistics

| | N (total) | 2001-2006 | | 2007-2011 | | 2012-2013 | |
|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | | Mean | SD | Mean | SD | Mean | SD |
| Foreign Chinese Housing Transaction | | | | | | | |
| Counts | 9,986 | 0.80 | 2.21 | 7.87 | 13.33 | 10.95 | 16.90 |
| Value (\$) | 9,986 | 0.45M | 1.30M | 3.18M | 5.49M | 5.00M | 8.91M |
| Counts (%) | 9,986 | 0.28 | 0.73 | 3.26 | 4.23 | 4.50 | 5.56 |
| Value (%) | 9,986 | 0.28 | 0.75 | 3.08 | 4.15 | 4.36 | 5.62 |
| Zillow Single Family Home Price Index | 9,986 | 0.54M | 0.36M | 0.54M | 0.36M | 0.54M | 0.40M |
| Log of Non-Tradable Employment | 9,986 | 7.34 | 1.26 | 7.63 | 0.97 | 7.61 | 1.00 |
| Log of Tradable Employment | 9,986 | 5.88 | 1.99 | 5.89 | 1.92 | 5.80 | 1.93 |
| Average Household Income | 9,986 | 68,562.23 | 57,776.78 | 76,097.31 | 62,394.53 | 85,152.74 | 82,349.33 |

Notes: This table presents summary statistics and counts of key variables for 2001-2013 and further broken down into the housing market boom period (2001-2006), the housing market crash period (2007-2011) and the housing market recovery period (2012-2013). The unit of observation is at the zip code by year level.

2.2 Methodology

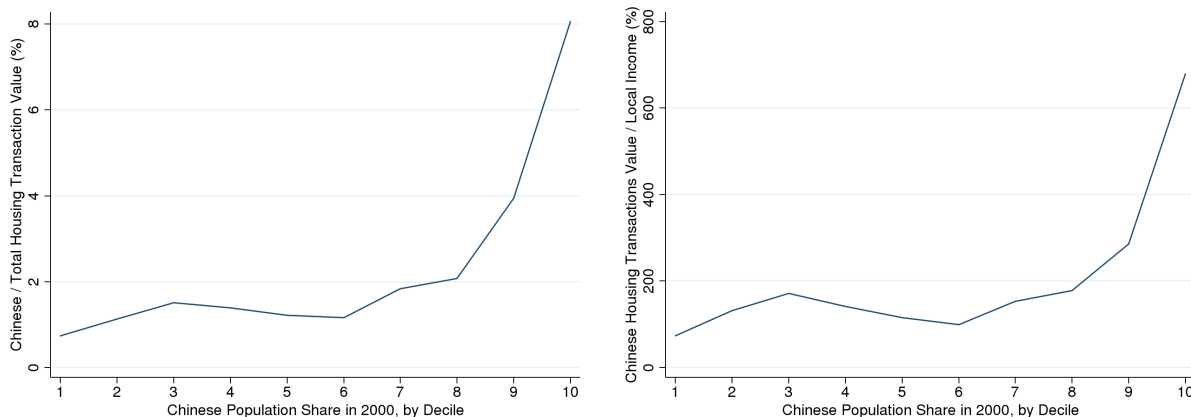
Our goal is to estimate the impact of the increase in housing transactions by foreign Chinese on the local economy. However, establishing causality is difficult due to an issue of endogeneity: it is difficult to distinguish if the increase in foreign Chinese purchases drives up home prices or if foreign Chinese seek to buy homes in zip codes that are more likely experience higher rates of home price appreciation. To address this issue, we implement an instrumental variable approach and use the ethnic Chinese population percentage share reported in the 2000 Census in each zip code as an instrument for the foreign Chinese housing transaction value measure (*CHTV*). This instrument is motivated by the observation in Figure 2 that foreign Chinese prefer to buy homes in areas that have a higher percentage of pre-existing ethnic Chinese in the population. The identification assumption is that percentage of ethnic Chinese in the pre-existing population in 2000 is independent from factors that may affect local housing prices after 2007.⁶ This strategy is equivalent to a Bartik instrument, whose source of identification is cross-sectional (Goldsmith-Pinkham et al., 2018). Since this percentage was measured prior to the sample period of the empirical analysis, it is unlikely to be correlated with other factors that could be driving up home prices in later periods. We also control for population, education, and pre-trends to alleviate concerns about omitted variables bias.

Figure 4 provides evidence that this instrumental variable has significant predictive power for foreign Chinese housing purchases. In the graph, we plot the *CHTV* measure normalized by total transaction value (left plot) and total income (right plot) for each zip code decile based on the percentage of the ethnic Chinese population in the zip code in 2000. In both plots, zip codes in the top two deciles have noticeably higher foreign Chinese housing transaction values.

As an additional illustration of the statistical power of our instrument, we plot the quar-

⁶A similar instrument has been used to study the impact of immigrants on the labor markets by Card (2001).

Figure 4: Variation in foreign Chinese Housing Purchases by Historical Ethnic Chinese Population Percentage



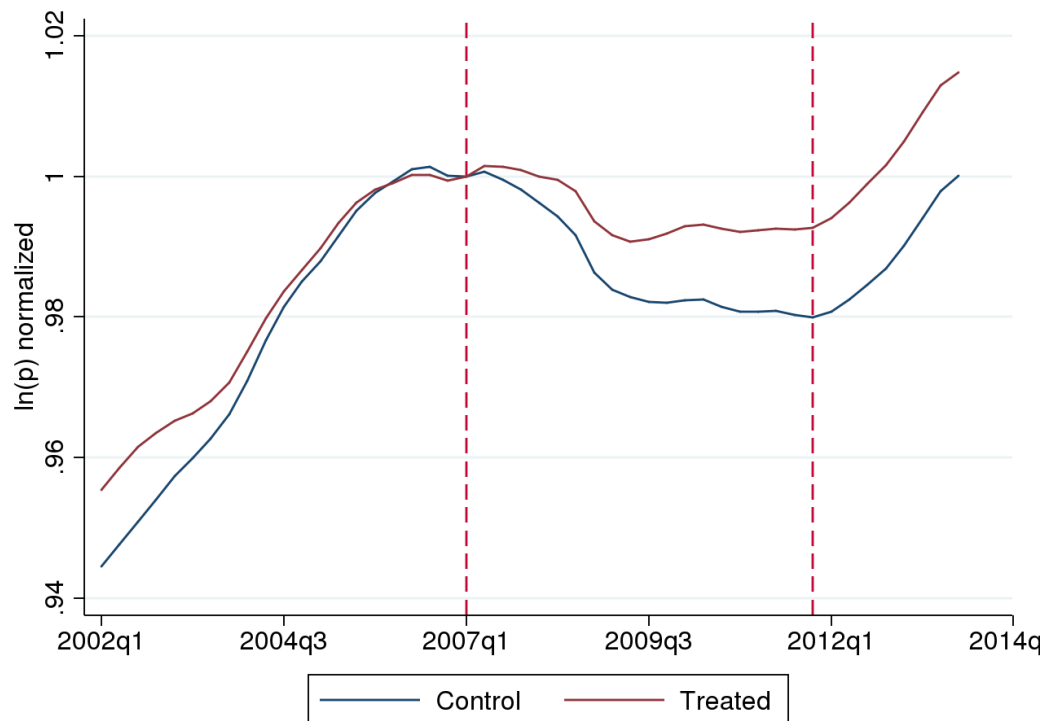
Notes: This figure shows two plots on foreign Chinese housing purchases between 2007 and 2013 for each zip code decile based on the year 2000 ethnic Chinese population percentage. The left figure normalizes foreign Chinese purchases measure by total transaction value, and the right figure normalizes the measure by total income.

terly Zillow Home Value Index for zip codes in the top two deciles by ethnic Chinese population percentage in 2000 (treated group) versus zip codes in the bottom eight deciles (control group), with the Index normalized to 1 in 2007Q1 in Figure 5. As shown, while the patterns of home prices between the two zip code groups were similar prior to 2007, a price gap between the two groups began to emerge in 2007 and continued to increase thereafter, with the home prices of the treated group at an increasingly higher level than that of the control group. The positive relationship between the share of ethnic Chinese population and home prices further suggests that the share of ethnic Chinese population as an instrumental variable has significant predictive power for foreign Chinese housing purchases.

Using the foreign Chinese housing transaction (CHTV) measure and data on local economic conditions, we estimate the impact of the increase in housing transactions by foreign Chinese on the local housing market and labor market using the following specification:

$$\ln(Y_{zt}) = \alpha + \theta \ln CHTV_{zt} + \beta \ln CHTV_{zt} \times \mathbb{I}\{year \geq 2007\} + \gamma X_z + \eta_{ct} + \varepsilon_{zt} \quad (1)$$

Figure 5: Zillow Home Price Index by Historical Ethnic Chinese Population Percentage



Notes: This figure shows the average quarterly Zillow Home Value index for zip codes in the top two deciles based on the year 2000 Chinese population percentage versus those in the bottom eight deciles. For both groups, the index is normalized to one in the first quarter of 2007.

where Y_{zt} is the Zillow Home Value Index (in log) or employment size (in log) for zip code z in year t , $CHTV_{zt}$ is the foreign Chinese housing transactions value measure (in log), $\mathbb{I}\{year \geq 2007\}$ is an indicator variable if the year is 2007 or later, X_z are time-invariant zip code level controls including population, education measured as the percentage of the population with a bachelor degree and a pre-sample trend variable for the dependent variables calculated as the difference between Zillow Home Value Index or employment in 1996 and 2000, and η_{ct} are county-year fixed effects. β is the coefficient of interest.

To mitigate endogeneity concerns regarding the foreign Chinese housing transaction value measure ($CHTV$), we instrument for it using the ethnic Chinese population percentage share reported in the 2000 Census in each zip code. The first stage regression is as follows:

$$\ln(CHTV_{zt}) = \tilde{\alpha} + \tilde{\theta}CH_Share_{zt} + \tilde{\beta}CH_Share_{zt} \times \mathbb{I}\{year \geq 2007\} + \tilde{\gamma}X_z + \tilde{\eta}_{ct} + \tilde{\varepsilon}_{zt} \quad (2)$$

where CH_Share_{zt} is the share of ethnic Chinese population in 2000, and the other controls are the same as those in 1. The identification assumption is that conditional on the county-time fixed effects and our zip code level controls the cross-sectional variation in the concentration of ethnic Chinese in the pre-existing population in 2000 across local areas (zip codes) does not correlate with factors that may affect local housing prices and employment after 2007.

We conjecture the coefficient of impact, β , to be positive for both housing market and labor market effects. Increasing housing purchases by foreign Chinese pushes up the demand for homes, which we predict would increase home prices as a first order effect. In addition, a change in home prices can also impact local labor markets through the housing net worth channel.

3 Empirical Results

3.1 Housing Price and Employment Effects

In Table 2, we show our main regression results based on Equation 1 with log Zillow Home Value Index as the dependent variable. Column 1 shows results over the housing market crash period of 2007-2011, and Column 2 presents results for the housing market recovery period of 2011-2013, respectively. All the regressions control for log population, education, and a pre-trend of housing prices. The F-statistics on the first stage regression are highly significant, which indicates that the instrument has strong predictive power for foreign Chinese housing purchases. The coefficient in the first row is the estimated impact of foreign Chinese housing purchases on local house prices.

The results support our conjecture that foreign Chinese housing purchases have a significant effect on local housing prices in the US. We find zip codes that witnessed a higher volume of real estate purchases by foreign Chinese exhibit significantly higher increases in housing prices: a 1% increase in the housing demand by foreign Chinese as measured by transaction value induces a 0.074% increase in local home prices during the 2007-2011 period. Using a mean Zillow Home Value Index of \$584,553 during the 2007-2011 period, a 0.074% home price increase corresponds to an increase of \$432.57 per home.

We can also use this estimate to roughly compare how home prices reacted across zip codes with different levels of changes in $CHTV$. Between 2007 and 2011, while the median zip code experienced an average annual increase in $CHTV$ of 47%, a zip code in the 90th percentile experienced an annual increase in $CHTV$ of 139%. Having a 92% higher increase in $CHTV$ leads to 6.8% higher home prices for the 90th percentile zip code compared to the median zip code. During the housing market crash period of 2007-2011, housing prices declined across all zip codes but zip codes that experienced more real estate purchases by foreign Chinese exhibit a lower decline in housing prices. This suggests cash inflow from foreign Chinese during economic downturns played a stabilizing role for US local economies

over the period.

In addition to comparing the housing boom years to the housing crash years, we also compare the boom years to the recovery years of 2012 and 2013. The results in Column 2 shows that a 1% increase in $CHTV$ increases home prices by 0.102% during the recovery years. During the recovery years, the median zip code experienced an annual increase in $CHTV$ of 36% while a zip code in the 90th percentile experienced an annual increase in $CHTV$ of 174%. This difference leads to a 14.1% difference in home prices.

Table 2: Home Price Effects Using Zillow Home Price Index

| | (1) | (2) |
|---|----------------------|---------------------|
| $\ln(CHTV) \times \mathbb{I}\{year \geq 2007\}$ | 0.074*** (0.014) | 0.102*** (0.015) |
| $\ln(CHTV)$ | 0.001 (0.021) | -0.004 (0.023) |
| $\ln(\text{Population})$ | -0.043*** (0.017) | -0.031* (0.016) |
| $\Delta \ln(\text{HNW}), 00-96$ | 1.232*** (0.204) | 1.304*** (0.242) |
| Education | 4.134*** (0.251) | 4.250*** (0.303) |
| County Year Fixed Effects | X | X |
| Post Period | 2007-2011 | 2012-2013 |
| Model Statistics: | | |
| First Stage F-statistic | 98.95 | 85.53 |
| Observations | 3474 | 2470 |

Notes: This table presents results from the IV regression testing for impact of home purchases made by foreign Chinese on home prices as measured by the Zillow Home Value Index. $CHTV$ denotes foreign Chinese housing transaction values instrumented by historical share of ethnic Chinese. Education is measured as the percentage of the population with a bachelor degree. Additional control variable includes a pre-sample trend variable for the dependent variable calculated as the difference between Zillow Home Value Index in 1996 and 2000. Columns 1 shows results for the housing crash period 2007-2011, Column 2 for the recovery period 2012-2013. Standard errors are clustered at the zip code level. *, **, *** denote 10%, 5% and 1% significance respectively.

Furthermore, we also estimate Equation 1 using housing transaction prices from DataQuick as the dependent variable. Results are presented in Table 3. In addition to the set of controls specified in Equation 1, we also control for home characteristics, which includes the

number of bathrooms, the square footage, and age of the home. We obtain similar results for both periods, although the coefficient estimates on the interaction term are slightly larger in magnitude compared to the estimates in Table 2.

Table 3: Home Price Effects Using Transaction Prices

| | (1) | (2) |
|---|----------------------|---------------------|
| $\ln(\text{CHTV}) \times \mathbb{I}\{\text{year} \geq 2007\}$ | 0.121*** (0.013) | 0.119*** (0.013) |
| $\ln(\text{CHTV})$ | -0.046*** (0.017) | -0.036** (0.017) |
| $\ln(\text{Population})$ | -0.003 (0.013) | 0.009 (0.013) |
| $\Delta \ln(\text{HTV}), 00-96$ | 0.219*** (0.073) | 0.250*** (0.077) |
| Education | 3.475*** (0.169) | 3.335*** (0.172) |
| County Year Fixed Effects | X | X |
| Post Period | 2007-2011 | 2012-2013 |
| Model Statistics: | | |
| First Stage F-statistic | 124.27 | 103.64 |
| Observations | 3699 | 2631 |

Notes: This table presents results from the IV regression testing for impact of home purchases made by foreign Chinese on home prices as measured by the average zip code level transaction values from DataQuick. *CHTV* denotes foreign Chinese housing transaction values instrumented by historical share of ethnic Chinese. Education is measured as the percentage of the population with a bachelor degree. Additional control variables include a pre-sample trend variable for the dependent variable calculated as the difference between average zip code level transaction values in 1996 and 2000, number of bathrooms, square footage and age. Column 1 shows results for the housing crash period 2007-2011, Column 2 for the recovery period 2012-2013. Standard errors are clustered at the zip code level. *, **, *** denote 10%, 5% and 1% significance respectively.

We then proceed to study if the increase in home prices driven by higher demand from foreign Chinese significantly affect the local real economies. Specifically, we estimate Equation 1 with zip code level employment size as the outcome variable. As shown in Table 4, zip codes that experienced a higher volume of foreign Chinese housing purchases exhibit greater total employment: a 1% increase in housing demand by foreign Chinese in terms of transaction value induces an increase of 0.10% during the housing market crash period

of 2007-2011 and of 0.15% during the recovery period of 2012-2013 in a zip code’s total employment levels.

Table 4: Total Employment Effects

| | (1) | (2) |
|---|---------------------|---------------------|
| $\ln(\text{CHTV}) \times \mathbb{I}\{\text{year} \geq 2007\}$ | 0.102** (0.044) | 0.149*** (0.051) |
| $\ln(\text{CHTV})$ | 0.028 (0.079) | 0.018 (0.082) |
| $\ln(\text{Population})$ | 0.752*** (0.079) | 0.741*** (0.090) |
| $\Delta \ln(\text{Emp}), 00-96$ | 0.380* (0.197) | 0.332 (0.210) |
| Education | 2.246*** (0.680) | 2.402*** (0.714) |
| County Year Fixed Effects | X | X |
| Post Period | 2007-2011 | 2012-2013 |
| Model Statistics: | | |
| First Stage F-statistic | 110.97 | 93.24 |
| Observations | 3712 | 2643 |

Notes: This table presents results from the IV regression testing for impact of home purchases made by foreign Chinese on total employment. *CHTV* denotes foreign Chinese housing transaction values instrumented by historical share of ethnic Chinese. Education is measured as the percentage of the population with a bachelor degree. Additional control includes a pre-sample trend variable for the corresponding dependent variable calculated as the difference between employment in 1996 and 2000. Columns 1 shows results for the housing crash period 2007-2011, Column 2 for the recovery period 2012-2013. Standard errors are clustered at the zip code level. *, **, *** denote 10%, 5% and 1% significance respectively.

3.2 Employment Effects by Sector

We explore the channels that potentially give rise to the relationship between higher housing prices driven by higher foreign Chinese purchase and local employment. Recent papers by Mian et al. (2013) and Mian and Sufi (2014) argue that higher home prices can lead to higher rates of employment through the housing net worth channel: higher housing wealth could affect employment by changing consumer demand through either a direct wealth effect or less binding borrowing constraints driven by the rise in collateral value. One of the key

predictions of the housing net worth channel is that the impact of demand changes in an area due to housing net worth fluctuations on local employment should show up foremost in the non-tradable sector employment of that area, since non-tradable sector employment depends primarily on local demand while the tradable sector is more diversified in its geographic origins of demand.

To test for this effect, we categorize the employment measure into tradable employment and non-tradable employment based on 4-digit SIC codes, following the practice in Mian and Sufi (2014), and estimate the following regression:

$$\ln(Emp)_{zt} = \alpha + \beta_1 \ln(C\tilde{H}TV_{zt}) + \beta_2 \ln(C\tilde{H}TV_{zt}) \times \mathbb{I}\{year \geq 2007\} + \gamma X_z + \eta_{ct} + \varepsilon_{zt} \quad (3)$$

where Y_{zt} is tradable or non-tradable sector employment (in log) for zip code z in year t , $C\tilde{H}TV_{zt}$ is the foreign Chinese housing transactions value measure (in log) instrumented by the share of ethnic Chinese population in 2000, $\mathbb{I}\{year \geq 2007\}$ is an indicator variable that takes the value 1 if year is post-2007 and 0 otherwise, X_z are time-invariant zip code level controls including population, education measured as the percentage of the population with a bachelor degree, and a pre-sample trend variable for the corresponding dependent variables calculated as the difference between tradable/non-tradable employment in 1996 and 2000, and η_{ct} are county-year fixed effects.

The results from Equation 3 are reported in Table 5. We find that a 1% increase in $C\tilde{H}TV$ increases zip code level non-tradable employment by 0.122% and 0.137% during the housing market crash period and housing market recovery period, respectively, as shown in Columns 1 and 3. On the other hand, estimates in Columns 2 and 4 show that the increase in housing purchases by foreign Chinese have no statistically significant impact on local tradable employment.

Table 5: Tradable and Non-Tradable Employment Effects

| | (1) | (2) | (3) | (4) |
|--|---------------------|----------------------|---------------------|----------------------|
| | ln(NT Emp) | ln(T Emp) | ln(NT Emp) | ln(T Emp) |
| ln(CHTV) $\times \mathbb{I}\{year \geq 2007\}$ | 0.122*** (0.043) | 0.046 (0.099) | 0.137*** (0.044) | 0.144 (0.116) |
| ln(CHTV) | -0.057 (0.078) | 0.246 (0.175) | -0.060 (0.076) | 0.259 (0.181) |
| ln(Population) | 0.894*** (0.071) | 0.889*** (0.146) | 0.887*** (0.070) | 0.822*** (0.158) |
| $\Delta \ln(\text{NT}/\text{T Emp}), 00-96$ | -0.074 (0.136) | -0.153 (0.120) | -0.103 (0.129) | -0.113 (0.121) |
| Education | 2.524*** (0.655) | -4.738*** (1.352) | 2.570*** (0.611) | -5.102*** (1.453) |
| County Year Fixed Effects | X | X | X | X |
| Post Period | 2007-2011 | 2007-2011 | 2012-2013 | 2012-2013 |
| Model Statistics: | | | | |
| First Stage F-statistic | 111.49 | 107.49 | 122.57 | 90.85 |
| Observations | 3708 | 3668 | 4876 | 2607 |

Notes: This table presents results from the IV regression testing for impact of home purchases made by foreign Chinese on both tradable and non-tradable employment. *CHTV* denotes foreign Chinese housing transaction values instrumented by historical share of ethnic Chinese. Education is measured as the percentage of the population with a bachelor degree. $\Delta \ln(\text{NT}/\text{T Emp}), 00-96$ is a pre-sample trend variable for the corresponding dependent variables calculated as the difference between tradable/non-tradable employment in 1996 and 2000. Columns 1 and 2 shows results for the housing crash period 2007-2011, Column 3 and 4 for the recovery period 2012-2013. Standard errors are clustered at the zip code level. *, **, *** denote 10%, 5% and 1% significance respectively.

3.3 Robustness

To address potential additional concerns related to endogeneity between foreign Chinese housing purchases and local employment, we perform a placebo test to examine if changes in housing purchases by foreign Chinese after 2007 is related to local employment prior to 2007. To do so, we estimate the following regression of ex-post foreign Chinese housing purchases on ex-ante local employment:

$$\ln(\text{Emp}, 01-06)_z = \alpha_0 + \beta \ln\left(\sum_{2007}^{2013} \text{CHTV}\right)_z + \gamma X_z + \varepsilon_{zt} \quad (4)$$

where $\ln(\text{Emp}, 01-06)_z$ is the zip code level change in employment between 2001 and 2006 and $\ln\left(\sum_{2007}^{2013} \text{CHTV}_z\right)$ is the log of the total value of Chinese purchases between 2007 and 2013 in each zip code. The results in Table 6 show that ex-post foreign Chinese purchases do not predict ex-ante employment, which support the findings that foreign Chinese home purchases induced a significant change in local employment, and they were not targeting zip codes that had previously experienced a home price growth.

Table 6: Placebo Test

| | (1) | (2) |
|---------------------------|----------------------|----------------------|
| $\ln(\text{CHTV}, 07-13)$ | -0.000 (0.009) | 0.001 (0.010) |
| $\ln(\text{Population})$ | -0.074*** (0.028) | -0.077*** (0.030) |
| Education | | -0.049 (0.154) |
| First Stage F-statistic | 413.02 | 328.32 |
| Observations | 717 | 717 |

Notes: This table presents results from the IV regression testing for impact of total home purchases made by foreign Chinese between 2007-2013 on the growth in aggregate employment between 2001-2006. This specification is used to confirm that foreign Chinese home purchases induced a change in employment and that they were not targeting zip codes that had previously experienced a home price growth. Standard errors are clustered at the zip code level. *, **, *** denote 10%, 5% and 1% significance respectively.

3.4 A Summary of Empirical Results

We summarize the findings of our empirical results. Using an instrumental variables approach, we find that an influx of foreign Chinese housing investment increases local housing prices and local employment in nontraded sectors. However, we do not find statistically significant evidence that local employment in the tradable sector is affected. These results support the notion that the housing net worth channel played an important role: regions with more housing purchases by foreign Chinese experience higher housing prices, which raise consumer demand through either a direct housing wealth effect or a relaxation of borrowing constraints due to the rise in collateral value. A higher local demand raises local employment, and the employment effect should reflect more prominently in the nontradable sector since non-tradable sector employment depends on local demand while the supply for tradable goods is spread across regions. In the next section, we attempt to provide an explanation of these features using a simple model.

4 A Simple Model

We develop a simple partial equilibrium framework to show how housing purchases by foreign Chinese affect house prices and employment in the local economy. We then discuss how the model predictions match our empirical findings.

4.1 Baseline

Consider an economy consisting of Z equally-sized regions indexed by z . Each region produces two types of goods, tradable (indexed by T) and non-tradable (indexed by N). The tradable good is nationally traded and serves as a numeraire good with $P^T = 1$. There is a fixed stock of housing in each region (indexed by H). Regions can freely trade the tradable good, but must consume the non-tradable good produced locally. For simplicity, we impose the restriction that labor cannot move across islands but can move freely between the trad-

able and non-tradable sectors within an island. Let D_z denote the nominal income in each region, which consists of wages and rental income (rebated to local workers).

Preference Workers in region z have Cobb-Douglas preferences over tradable and non-tradable goods as well as housing (C_z^N , C_z^T , and C_z^H) with prices P_z^N , P^T , and P_z^H , and they spend income shares α , β , and $1 - \alpha - \beta$ on the three goods.

Budget Constraint The budget constraint of workers is $P_z^N C_z^N + C_z^T + P_z^H C_z^H = D_z$. From the Cobb-Douglas preference specification, $P_z^N C_z^N = \alpha D_z$, $C_z^T = \beta D_z$, and $P_z^H C_z^H = (1 - \alpha - \beta) D_z$ on the nontradable, tradable, and housing consumption, respectively.

Output All regions face the same tradable good price, while the non-tradable good price may be region-specific since non-tradable goods are produced locally. Production is governed by a constant returns technology for tradable and non-tradable goods with employed labor, e as the only factor input and produces output according to $y_z^T = b e_z^T$, and $y_z^N = a e_z^N$, respectively, where b and a are productivity parameters. The housing supply is fixed at H_z .

Employment Total employment in each region is normalized to one with $e_z^T + e_z^N = 1$. Wages in the non-tradable and tradable sectors are given by $w_z^N = a P_z^N$ and $w_z^T = b P^T = b$. Free mobility of labor across sectors equates the two wages, which implies $w_z = w = b$ and $P_z^N = \frac{b}{a}$.

Equilibrium In equilibrium the goods markets clear. For nontradable goods, $y_z^N = C_z^N$ in each region. For tradable goods, the total demand equate to the total production across all regions: $\sum_{z=1}^Z y_z^Z = \sum_{z=1}^Z C_z^T$. We solve the model with a symmetry assumption that, in the initial state, all regions have the same housing stock $H_z = H_0$ and that the economy achieves full employment. The housing demand is equal to the supply in equilibrium: $C_z^H = H_0$. Since the nominal income is $D_z = w + P_z^H H_0$, we could obtain equilibrium house prices and the

nominal income. The equilibrium variables in this simple framework are collected as follows:

$$\text{Prices : } \quad P_z^{*N} = \frac{b}{a}; \quad P^{*T} = 1; \quad P_z^{*H} = \frac{1 - \alpha - \beta}{\alpha + \beta} \frac{b}{H_0} \equiv P_0;$$

$$\text{Employment : } \quad e_z^{*N} = \frac{\alpha}{\alpha + \beta} \equiv e_0^N; \quad e_z^{*T} = \frac{\beta}{\alpha + \beta} \equiv e_0^T;$$

$$\text{Wages : } \quad w_z^{*N} = w_z^{*T} = b \equiv w;$$

$$\text{Nominal income : } \quad D_z^* = w + P_0 H_0 = b + \frac{1 - \alpha - \beta}{\alpha + \beta} b \equiv D_0.$$

4.2 Effects of House Demand by Foreigners

Suppose now that there is heterogeneous housing demand by foreign Chinese across regions (denoted by $C_{\text{chn},z}^H$):

$$H_0 = C_z^H + C_{\text{chn},z}^H,$$

where C_z^H is the housing demand by local workers and C_{chn}^H is the (exogenous) demand by foreign Chinese. Since $C_z^H = (1 - \alpha - \beta) \frac{D_z}{P_z^H}$ and $D_z = b + P_z^H H_0$, we obtain the housing prices:

$$P_z^H = \frac{(1 - \alpha - \beta)b}{(\alpha + \beta)H_0 - C_{\text{chn},z}^H},$$

which shows that regions with more housing purchases from foreign Chinese have higher house prices (a housing boom). Consider two regions, one with a house demand from foreigners (treated region, $C_{\text{chn},z}^H > 0$) and one without (control region, $C_{\text{chn},z}^H = 0$). The cross-sectional difference in house prices between the two regions is

$$P_{z,\text{treated}}^H - P_{z,\text{control}}^H = \frac{(1 - \alpha - \beta)b}{(\alpha + \beta)H_0 - C_{\text{chn},z}^H} - P_0,$$

which is an increasing function of $C_{\text{chn},z}^H$ with

$$\frac{\partial(P_{z,\text{treated}}^H - P_{z,\text{control}}^H)}{\partial C_{\text{chn},z}^H} = \frac{(1 - \alpha - \beta)b}{[(\alpha + \beta)H_0 - C_{\text{chn},z}^H]^2} > 0. \quad (5)$$

The prediction from Equation 5 is confirmed by our empirical analysis.

The nominal income now becomes

$$D_z = b + P_z^H H_0 = b + \underbrace{\frac{(1 - \alpha - \beta)bH_0}{(\alpha + \beta)H_0 - C_{\text{chn},z}^H}}_{\text{housing net worth channel}},$$

so the house demand by foreign Chinese raises the nominal demand via a housing net worth channel. Now the non-tradable employment becomes

$$e_z^N = \frac{\alpha}{b} D_z = \alpha + \frac{\alpha(1 - \alpha - \beta)H_0}{(\alpha + \beta)H_0 - C_{\text{chn},z}^H},$$

which shows that the nontradable sector expands in regions with higher house demand from foreigners. The cross-sectional difference in local employment in the nontradable sector between the treated and control regions is an increasing function of $C_{\text{chn},z}^H$:

$$\frac{\partial(e_{z,\text{treated}}^N - e_{z,\text{control}}^N)}{\partial C_{\text{chn},z}^H} = \frac{\alpha(1 - \alpha - \beta)}{[(\alpha + \beta)H_0 - C_{\text{chn},z}^H]^2} > 0. \quad (6)$$

The prediction on the employment effect in the nontradable, as shown in Equation 6, is confirmed by our empirical results. Based on the full employment condition, however, output and employment in the tradable sector, will shrink in treated regions:

$$e_z^T = 1 - e_z^N = 1 - \alpha - \frac{\alpha(1 - \alpha - \beta)H_0}{(\alpha + \beta)H_0 - C_{\text{chn},z}^H},$$

so the cross-sectional difference in local employment in the tradable sector between the

treated and control regions is a decreasing function of $C_{\text{chn},z}^H$:

$$\frac{\partial(e_{z,\text{treated}}^T - e_{z,\text{control}}^T)}{\partial C_{\text{chn},z}^H} < 0. \quad (7)$$

In our partial equilibrium setup, the increased demand for tradable good is met by imports from other regions outside the local economy since we assume that the tradable good is nationally traded with a fixed price $P^T = 1$. So the inflow of Chinese real estate investment acts as financial transfers to recipient regions, allowing them run a trade deficit. To see this, note that we could obtain the deficit as the difference between consumption and output in the traded sector:

$$\begin{aligned} \text{Deficit}_z &= C_z^T - be_z^T \\ &= \beta D_z - b \left(1 - \frac{\alpha}{b} D_z\right) \\ &= (\alpha + \beta) D_z - b \\ &= (\alpha + \beta) D_z - D_z + P_z^H H_0 \\ &= P_z^H H_0 - (1 - \alpha - \beta) D_z \\ &= P_z^H H_0 - P_z^H C_z^H \\ &= P_z^H C_{\text{chn},z}^H. \end{aligned}$$

In the aggregate, the production and employment in the tradable sector decrease due to the inflow of real estate purchases by foreign Chinese.⁷ Unfortunately, the prediction in Equation 7 has not been confirmed by our empirical analysis as we find statistically insignificant effect of Chinese real estate purchases on the employment in the tradable sector.

Overall, our simple model predicts that housing purchases by foreign Chinese has the following effects: 1) raise local house prices; 2) increase local employment in the nontradable sector via a housing net worth channel; and 3) local employment in the tradable sector.

⁷This negative impact on the tradable sector is a form of a ‘‘Dutch disease.’’

Predictions 1) and 2) are consistent with our empirical results, but 3) is not. It does not seem obvious how to generate a null effect on the tradable employment in the model without introducing some friction such as economic slack or allowing migration. In that regard, the static and partial equilibrium nature of our model is not completely satisfactory because it fails to capture the effect on the tradable sector. Nonetheless, it delivers an intuition on the economic mechanism underlying the effects of house purchases from foreigners on house prices and nontradable employment in the local economy.

4.3 Discussion

Our model has made many simplifications such as assuming no migration or commuting across regions. A more general framework should relax these assumptions. In such a setting, competing forces will arise in driving the effects of an increase in housing demand by foreigners on local employment across sectors. Suppose that prices and wages are flexible and workers can move and commute across regions. We have to consider the differential effects of an injection of foreign housing demand on local homeowners versus renters. A positive housing price shock in the local economy through housing purchases by foreign Chinese will increase the wealth of local homeowners, whose increased spending on nontradable goods tends to raise local employment in the nontradable sector. However, due to the higher rents, renters will move out of treated regions and into cheaper areas (control regions), which tends to lower the consumption demand and employment for nontradable goods in the treated region. If the positive force from housing net worth channel exceeds the negative force from the outflow of renters (subject to migration and commuting costs), then nontradable employment in treated regions will still increase, a prediction matching our empirical results.

On the other hand, the effect on the employment in the tradable sector is less clear. Homeowners' increased demand for tradable goods in treated regions can be supplied by the production elsewhere, so the employment effect of a rising real estate demand from foreign Chinese in the tradable sector is more diffused than the effect on the nontradable sector.

But to have a model with a more general setup than our current one predict a null effect on tradable employment—a result from our empirical analysis—we may need to ensure that the tradable sector in both treated and the control regions expand to the same extent, despite that fact that living costs in treated regions have risen, a prediction that is difficult to generate in a general equilibrium framework with flexible prices and full employment. For that to happen, we may need to introduce agglomeration spillovers in the treated region. Otherwise, the model may even predict a reduction in the tradable employment in treated regions, contradicting our empirical findings. We are currently working to extend our simple framework to formalize these intuitions.

5 Conclusion

In this paper, we document an unprecedented surge in housing purchases by foreign Chinese in the US over the past decade and analyzes the effects of the purchases on US local economies. Using detailed transaction-level housing purchase data, we utilize an instrumental variable method that exploits cross-zip code variation in the concentration of Chinese population stemming from pre-sample period differences in Chinese population settlement to instrument for the volume of housing purchases by foreign Chinese. We find that housing investment by foreign Chinese significantly induces higher local area housing net wealth, and it leads to higher local employment, particularly in the non-tradable sectors. We then develop a simple model that helps to illustrate how housing purchases by foreign Chinese affect the local employment through the housing wealth channel.

This paper is one of the first academic papers that studies the effects of a “China shock” on the finance side for US local economies. Given China has been seeking to open up its capital markets, a better understand the implications of a “China shock” on the finance side for the rest of the world is of utmost importance. Our results point to potential welfare gains and losses that come with China’s opening up for the rest of the world. Moreover, our

evidence highlights the role of capital inflow and foreign investments on the domestic output and employment, especially in times of economic downturns. During the housing market crash period between 2007-2011, the improvement in household balance sheet resulting from capital inflows of housing investment played a mitigating role for the US local economies.

References

- Autor, David, D. D. G. H. and K. Majlesi (2017). Importing political polarization? the electoral consequences of rising trade exposure. *Working Paper*.
- Autor, David, D. D. G. H. G. P. and P. Shu (2017). Foreign competition and domestic innovation: Evidence from u.s. patents. *Working Paper*.
- Autor, D. H., D. Dorn, and G. H. Hanson (2013). The China syndrome: Local labor market effects of import competition in the united states. *The American Economic Review* 103(6), 2121–2168.
- Badarinza, C. and T. Ramadorai (2015). Home away from home? foreign demand and london house prices.
- Borensztein, E., J. De Gregorio, and J.-W. Lee (1998). How does foreign direct investment affect economic growth? *Journal of international Economics* 45(1), 115–135.
- Card, D. (2001). Immigrant inflows, native outflows, and the local labor market impacts of higher immigration. *Journal of Labor Economics* 19(1), 22–64.
- Chodorow-Reich, G., L. Feiveson, Z. Liscow, and W. G. Woolston (2012). Does state fiscal relief during recessions increase employment? evidence from the american recovery and reinvestment act. *American Economic Journal: Economic Policy* 4(3), 118–145.
- Cvijanovic, D. and C. Spaenjers (2015). Real estate as a luxury good: Non-resident demand and property prices in paris.
- David Autor, D. D., D. D. Gordon Hanson David Autor, D. D. Gordon Hanson Autor, David, and G. Hanson (2018). When work disappears: Manufacturing decline and the falling marriage-market value of young men. *Working Paper*.
- Favilukis, J. and S. Van Nieuwerburgh (2017). Out-of-town home buyers and city welfare.
- Glaeser, E., W. Huang, Y. Ma, and A. Shleifer (2017). A Real Estate Boom with Chinese characteristics. *The Journal of Economic Perspectives* 31(1), 93–116.
- Goldsmith-Pinkham, P., I. Sorkin, and H. Swift (2018). Bartik instruments: What, when, why, and how. Technical report, National Bureau of Economic Research.
- Green, R. (1997). Follow the leader: How changes in residential and non-residential investment predict changes in GDP. *Real Estate Economics* 25(2), 253–70.
- Kerr, W. R. (2008). The ethnic composition of US inventors.
- Kerr, W. R. and W. F. Lincoln (2010). The supply side of innovation: H-1b visa reforms and us ethnic invention. *Journal of Labor Economics* 28(3), 473–508.
- Mian, A., K. Rao, and A. Sufi (2013). Household balance sheets, consumption, and the economic slump. *The Quarterly Journal of Economics*, qjt020.

- Mian, A. and A. Sufi (2014). What explains the 2007–2009 drop in employment? *Econometrica* 82(6), 2197–2223.
- Nakamura, E. and J. Steinsson (2014). Fiscal stimulus in a monetary union: Evidence from us regions. *The American Economic Review* 104(3), 753–792.
- Parker, J. (2000). Real estate and the macroeconomy: Discussions. *Brookings Papers on Economic Activity* 2, 150–162.
- Ramey, V. A. (2011). Can government purchases stimulate the economy? *Journal of Economic Literature* 49(3), 673–685.
- Rosen, K., A. Margon, R. Sakamoto, and J. Taylor (2017). Breaking Ground: Chinese Investment in US Real Estate. Fisher Center Working Papers.
- Sa, F. (2016). The effect of foreign investors on local housing markets: evidence from the uk.
- Simons, R. A., J. Wu, J. Xu, and Y. Fei (2016). Chinese Investment in US Real Estate Markets Using the EB-5 Program. *Economic Development Quarterly* 30(1), 75–87.