

# Chinese Capital Flight to the U.S. Real Estate Market \*

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## Abstract

Wealthy foreign real estate buyers have increased rapidly over the past few decades. Of particular note are those from China; in 2016 alone, Chinese buyers were the source of over 100 billion USD of outflows to real estate markets worldwide. In this paper, we investigate the effect that these wealthy Chinese buyers have on local U.S. housing markets, local governments and residents. Using a novel instrument, we demonstrate that an increase in the share of wealthy Chinese buyers in a locality causes an increase in house price growth. As a result of this increased growth, local governments benefit from increased property tax revenues, but do not see a drop in sales tax revenues, suggesting that the vacancy rate for Chinese-owned properties is no different from that of counterfactual buyers. A drop in rental prices suggests that wealthy Chinese buyers are more likely to rent out their houses and less likely to move into them.

**JEL Codes:** D31, F21, H29, R21, R31

**Keywords:** housing markets, real estate, inequality, capital flight, political stability.

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# 1 Introduction

Over the past two decades the United States has experienced a real estate boom and bust that became a core factor in the Great Recession. Furthermore, many major cities in the United States are finding themselves facing housing unaffordability crises, as a limited housing supply continues to fall short of persistently high demand from people wanting to live in a small set of large cities ([Hsieh and Moretti, 2019](#)). At the same time, there has been a rapid increase in wealthy home buyers in international markets. In the past decade, billions of dollars have flowed from countries such as China ([McMullen 2016](#)) and Russia ([Lawford 2018](#)) into foreign residential real estate. China, in particular, has become the largest source of international buyers, with 101 billion USD spent on foreign real estate by Chinese home buyers in 2016 alone. The largest flow has been from China to the US; although previously Canadians were the dominant group among foreign buyers in the US, as of 2013 that distinction now belongs to China. Due to Chinese investors' large presence in the U.S. housing market, shocks to economic and/or political stability in China, driving out capital from China to the US, can have substantial direct impacts on American consumers through the channel of housing prices. As a result of this increase in international home-buying activity, various governments have begun imposing taxes on home purchases by foreigners (including Australia, New Zealand and Canada), suggesting that there is a strong perception that foreign influence on local housing markets is a serious concern. In particular, there is a worry that foreign buyers push up prices and crowd local residents out of the housing market.<sup>1</sup> However, there has been little rigorous empirical evidence to support the scope of this phenomenon.

In this paper we study how wealthy Chinese buyers impact local U.S. housing markets and residents, and how economic conditions in China influence their demand for homes. While economic conditions may affect investors from other countries, China is particularly worth highlighting. As [Glaeser et al. \(2017\)](#) notes, the unusually high savings rate in China means that Chinese people typically have ample cash on hand, domestic investment opportunities other than housing have low and/or volatile returns in China, and Chinese people frequently purchase houses in China as investment properties without actually living in them. This combination of factors suggests that

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<sup>1</sup>See, e.g., The Washington Post: "Foreign investors are making housing more expensive. Should we tax them for it?" ([Badger, 2014](#)), CBS: "'Ghost' Foreign Investors Buying Palo Alto Homes, But Keeping Them Empty" ([Borba, 2015](#)) and Bloomberg: "Trudeau Vows 2-Year Ban on Foreign Home Buyers If Re-Elected" ([Bolongaro, 2021](#)).

the Chinese have strong potential to influence foreign housing markets such as those in the United States, especially as the number of wealthy people in China has grown rapidly in the past decades.

Anecdotally, Chinese investors in the American real estate market tend to be well-off and aggressive in their bidding,<sup>2</sup> so there is the potential for them to be crowding out American home buyers while simultaneously inflating housing markets that already have relatively inelastic housing supply. Because their targets tend to be more expensive homes, any direct effects would be borne on more affluent Americans, but excessive Chinese home buying has the potential to affect households across the wealth distribution by forcing wealthier American home buyers to settle for cheaper homes and pushing up prices in the process. In addition, pushing up average prices can signal strong demand in the market and cause home sellers throughout the market to raise their prices in response.

Using an OLS panel fixed-effects regression, we find that Chinese real estate purchases are positively correlated with local-level U.S. home price growth. However, this alone does not tell us whether home price growth is caused by Chinese real estate purchases or if Chinese investors simply target homes in areas or times with high growth potential, nor does it explain by what mechanism Chinese real estate purchases have an effect on U.S. home price growth. In addition, because we are interested in *wealthy* Chinese purchases, proxying with general Chinese purchases will introduce significant measurement error if the activity of wealthy and non-wealthy Chinese buyers substantially differs. To account for these and other potential endogeneity issues, we construct an instrument for real estate purchases using fluctuations in Chinese GDP growth interacted with travel times from China to tracts to predict the share of wealthy Chinese purchases in a tract-year, where low growth and low travel times each predict more Chinese purchases. The idea behind using growth is that wealthy Chinese people are more likely to divest their money abroad following a drop in economic performance in China. This rationale comes from the fact that wealthy individuals' income tends to be highly sensitive to business cycles relative to the average person, and so growth shocks act as a proxy for income uncertainty. Travel times provide spatial variation, in that demand in places with lower travel costs in terms of time are going to be more sensitive to these temporal shocks,

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<sup>2</sup>Poon (2017) and Levin (2018) both note that Chinese investors (as well as foreign investors in general) are significantly more likely to offer all-cash bids, which are typically more appealing to home sellers than mortgage-backed ones, as all-cash means a quicker and more straightforward transaction process. Poon (2017) also notes that wealthier Chinese investors often pay significantly above asking price, sometimes reaching a 60 percent markup.

especially since use as a vacation home is a commonly cited reason among Chinese home buyers.

In a 2SLS regression, we find that there is a positive causal effect of wealthy Chinese real estate purchases on local U.S. home price growth, and show that this effect is robust to various alternative explanations. Moreover, we find that the magnitude of the instrumented coefficient is much larger than that of the OLS regression. This finding suggests that the behavior of wealthy Chinese does significantly differ from the average Chinese buyer; specifically, it suggests that tracts with more ordinary Chinese buyers do not have significantly higher growth than those with fewer. We conduct a series of robustness checks to rule out potential concerns about spurious correlations driving the effect or issues involving exclusion restriction violations. Using a heterogeneous treatment regression looking at county income, we also show that while wealthy Chinese buyers tend to purchase in wealthier areas, their effect on price growth is actually decreasing in the wealth of an area, which we argue suggests that part of the reason Chinese buyers are willing to pay high prices is to push out competitors, a strategy which works better in less wealthy neighborhoods where competitors are more liquidity constrained.

In order to better understand what wealthy Chinese buyers do with their houses after they purchase and how locals are affected by Chinese activity in the U.S. housing market, we look both at direct indicators of their activity as well as a number of outcomes that proxy for their behavior. As expected, we find that as a result of home price growth, local governments benefit from wealthy Chinese buying through an increase in property tax revenues. Interestingly, we also find a drop in the price of studio rentals as a result of wealthy Chinese purchases, implying that Chinese buyers tend to not move into their houses and instead are more likely than their local competitors to rent them out. Using a small sample of the largest MSAs, we show that vacancy rates do not change as a result of increased Chinese purchases, which is further supported by sales tax evidence at the county level that suggests that the occupancy rate of houses with increased wealthy Chinese is not significantly different.

An additional aspect to consider is how localities may be incentivized to enact policies that draw in more foreign buyers if they believe that they will lead to more tax revenues. Looking at pull factors, we also find no evidence that aspects such as lower income taxes or higher school quality, which one might think would be alluring to people moving into their houses, are driving the location choice of investors, and also find that Chinese buyers actually purchase houses in counties with

*higher* average property tax rates, suggesting that the preferences of Chinese buyers weigh heavily towards travel convenience, and little on factors that locals may be interested in.

## 1.1 Related literature

This paper contributes to a number of strands of literature. Firstly, this paper is related to the literature on globalization and China's international economic influence, particularly with respect to the effect that Chinese exports have had on U.S. manufacturing employment and the general U.S. economy (e.g., [Autor et al. 2013](#), [Acemoglu et al. 2016](#), [Pierce and Schott 2016](#)). This paper extends this analysis to examine the effect that individuals can have across borders; while other work has examined the effect of immigrant inflows (e.g., [Card 2009](#), [Ottaviano and Peri 2012](#), [Foged and Peri 2016](#)), remittances (e.g., [Yang 2008](#), [Ambler et al. 2015](#)) or foreign aid (e.g., [Mueller 2021](#), [Dreher et al. 2021](#)), this paper specifically looks at the flow of personal money away from one's home country towards international consumption/assets.

This paper is also related to a behavioral finance literature on the theory of price formation and noise traders, which studies how the existence of irrational, misinformed, or capital constrained traders can lead to asset pricing puzzles such as prices deviating from fundamentals ([Shleifer and Vishny 1997](#), [Scheinkman and Xiong 2003](#)). This paper adds to the empirical evidence related to this theory that studies the effects of out-of-town buyers on house prices ([Chinco and Mayer 2014](#), [Bayer et al. 2015](#)), with findings in line with these studies by showing that wealthy Chinese buyers drive prices up when purchasing houses in the US.

Finally, this paper is related to literature discussing household finance, specifically focusing on international investment decisions and outcomes. The international finance literature discusses the gains to diversification by investing in assets uncorrelated with domestic risk (see [Coeurdacier and Rey 2013](#) for a discussion on diversification). One strand of this literature discusses the economic response to uncertainty, both in terms of economic and political risk. [Alfaro et al. \(2008\)](#) discuss the direction of capital flows in the context of the Lucas Paradox, suggesting that poor institutional quality is the main cause of capital movement from poor countries to rich ones. [Gourio et al. \(2016\)](#) show that uncertainty causes capital outflows, and construct a model in which economic or political risk shocks domestic assets, leading to capital flight. Few papers examine the impact on real estate, although some papers do discuss international determinants of real estate prices, finding

that especially between developed countries, house prices tend to comove ([Hirata et al. 2012](#)).

A key aspect that sets this paper apart is that we discuss these capital flows and financial at the individual/household level. Scholarship in the field of household finance has burgeoned over the past decade; however, behavior with respect to domestic investments is the focus of study (see [Agarwal et al. 2017](#) for a review of these papers). In addition, the household finance literature mostly examines households in developed countries; differences in availability and riskiness of domestic investment opportunities as well as differences in overall political and economic risk, may affect how households in developing countries react to uncertainty shocks. Those papers which do examine households in developing countries typically focus on expanding financial access to the poorest of the poor (see [Badarinza et al. 2018](#) for a review) rather than explore the financial decisions of those who are already financially included.

Whether households diversify portfolios and how they do so is poorly understood due to the lack of detailed or representative data.<sup>3</sup> On the other hand, a number of papers do address the household response to income uncertainty. Both [Chamon et al. \(2010\)](#) and [Choi et al. \(2014\)](#) calibrate structural models to show that the unusually high savings rate among households in China is a precautionary savings response to high income uncertainty over the past few decades. [Giavazzi and McMahon \(2008\)](#) use an uncertainty shock to Italian pensions to show a similar precautionary savings result. [Brown et al. \(2016\)](#) show that background risk leads to household portfolio reallocation such that there is a so-called “flight from risk”; i.e., that households divert money towards assets with less volatile returns.

Empirical work concerning international investment by households is scarce, unsurprising given that real estate purchase data does not typically provide detailed information on the buyer. The work mostly closely related to this paper is [Badarinza and Ramadorai \(2018\)](#), who examine the London housing market, demonstrating a reduced-form causal relationship between political and economic risk in a country and house price increases in neighborhoods with high concentration of immigrants from that country. Our paper improves on their work in two ways. Firstly, with our instrument we are able to leverage transactions-level data on home transactions in order to isolate variation in wealthy Chinese home purchases by wealthy Chinese people at a very granular

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<sup>3</sup>One exception in a developed country is [Calvet et al. \(2006\)](#), who are able to make use of detailed Swedish data to show that Swedish households diversify risk using mutual funds, with better diversification occurring with wealthier, more educated households.

level, which allows us to explicitly demonstrate that house purchases and overbidding by wealthy Chinese are the cause of home growth increase, as well as showing what wealthy Chinese do with their properties and how areas with wealthy Chinese purchases are affected. Secondly, because of the richness of the data that we use, we are able to expand the scope of study by making use of real estate data from across the United States rather than focusing on variation within a single city.

The rest of the paper is organized as follows: Section 2 provides some background information about home investment and the housing boom in China as well as some information about China's activity in the U.S. real estate market. Section 3 describes the identification strategy, econometric specification, and data sources. Section 4 presents the main empirical results concerning the impact of Chinese activity on house prices, while Sections 5 and 6 discuss the local impacts and the pull factors. Section 7 provides concluding remarks.

## 2 Background

### 2.1 Financial investment constraints in China

Despite China being the fastest growing and largest economy in the world by PPP, China's modern financial system is relatively young and underdeveloped compared to other East Asian and Western countries. While the financial system is moving towards liberalization, the state still plays a relatively large role in financial markets. Although the state's presence helps maintain stability by shielding failing state-owned enterprises from disaster, its presence also distorts incentives of these enterprises by reducing their burden of failure, which in turn encourages enterprises to pursue business plans that are less prudent and riskier than they might otherwise ([Allen et al., 2017](#)).

While China does have two stock markets, both among the top ten largest stock markets in the world, its stock markets are still underdeveloped in many ways. For one, the majority of listed firms are former state-owned enterprises. This owes in part from bureaucratic red tape that hinders other successful private enterprises from listing, which results in a lower level of quality among listed enterprises. Furthermore, there are strong limits on the extent to which shareholders have influence on management, especially for state-owned enterprises, because the government often determines the actions of firms rather than shareholders. As a result, shareholders have been shown to place less emphasis on actual firm value or long-run performance and instead focus on short-run

fluctuations in stock prices. In addition, the variety in financial products available to Chinese investors is relatively limited; for instance, index futures, short selling, and margin trading were only introduced in 2010 and have had slow take-up since then. Finally, participants of the stock market are primarily individual investors rather than more well-informed, well-endowed institutional investors that populate stock markets of other countries, partially due to activity restrictions that institutional investors such as insurance companies and pension funds face. The result is that China's stock market is driven primarily by speculation and not by fundamentals, as evidenced by the consistent comovement of stocks, as well as unusually high stock turnover rates ([Elliott and Yan, 2013](#)). It is suggested that poor investor protection and poor regulation contribute to the inefficiencies of the Chinese stock market.

Bond markets are also relatively underdeveloped, as there are few quality bond-rating agencies and auditing systems, and legal protections for creditors are scarce during defaults; thus, the level of investment in the bond markets is relatively low. In addition, the bank bond market (established in 1996) and corporate bond market (established in 2007) are segmented, each regulated by separate entities, reducing the efficiency of bond issuance. Prior to the Great Recession the corporate bond market was relatively small, although since then it has grown significantly<sup>4</sup>. Most bonds, however, are held by banks rather than individual investors.

One of the only available investment opportunities that has high returns in China is real estate. During the Cultural Revolution and up through the first decades of the "Reform and Opening Up" period, real estate was controlled and distributed entirely by the state through employers. Market liberalization reforms in 1998 alongside the development in individual mortgages and rising household income led to dramatic expansion in the private real estate market, with annual growth averaging 12.1 percent between 2003 and 2013. The fact that "traditional" investment opportunities such as stocks have poor returns and high volatility has positioned home ownership as one of the most reliable (and popular) forms of investment for the Chinese. These market forces align with traditional values that place high emphasis on home ownership; as is the case in many other countries, in China, owning a home is commonly regarded as a prerequisite for marriage, family-building, and a stable domestic life more generally ([Glaeser et al., 2017](#)). Thus, home buying and real estate

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<sup>4</sup>In 2007 corporate bonds made up only about nine percent of total issued bond value, not far from the 11 percent they made up in 1995. However, by 2011 corporate bonds had risen up to 27 percent of total bond value. ([Allen et al., 2017](#))

investment are generally held in high regards by Chinese people.

Housing supply in major Chinese cities has not been able to keep up with the extremely high levels of demand, resulting in high, potentially bubble-like real estate prices. One suggestion that the high prices may represent a growing bubble is that house prices have grown faster than income in many large cities; while per capita income in China in top-tier cities is much lower than that of U.S. counterparts, price per square foot is comparable between large metropolitan areas in the two nations. Further evidence of a bubble lies in the high per capita vacant owned land, estimated to be more than triple that of the US, suggesting that the demand for housing is not driven necessarily by desire to live in those houses, but instead by investment motives ([Glaeser et al., 2017](#)).

As a result of this bubble risk, the national government has attempted to control property speculation. In the spring of 2017 Beijing announced an increase in the required down payment for second houses to 60 percent, and 80 percent for third houses, which was then followed by similar announcements in second-tier cities ([Zheng, 2017](#)). In addition, the government is planning on implementing local property taxes in order to disincentivize speculative investment. Nevertheless, the real estate market maintains strong growth, reflecting strong Chinese demand for investment opportunities.

## 2.2 The wealthy in China

In 2008, about 1.6 million, or 1 percent of Chinese households were considered wealthy, as defined by earning over U.S. PPP \$100,000; moreover, in 2006, about 180,000 Chinese people were considered to be high net-worth individuals (HNWI), holding wealth of upwards from 10 million RMB (appx. 1.47 million USD). By 2017, this number had increased over ten-fold to 1.87 million people. While the majority of HNWI are enterprise owners, their share in HNWI has been falling as the number of "gold-collar" professionals has risen quickly over the past decade.<sup>5</sup> Wealthy Chinese are increasingly eager to diversify their wealth allocation by moving their money abroad. According to a recent survey ([Zeng and Ott 2017](#)), over 80 percent of Chinese HNWI sought to diversify their investments, and over half of HNWI were looking to do so abroad. Another survey ([Xu 2017](#)) found that 85 percent of them in China were concerned about the devaluation of the yuan, and over half were concerned

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<sup>5</sup>Gold collar professionals include executives, managers, engineers, accountants, and other well-paid professionals. In 2017, gold-collar professionals made up almost 30 percent of HNWI, up from just 12 percent in 2009. ([Zeng and Ott 2017](#))

with issues including the USD exchange rate, foreign exchange controls<sup>6</sup>, and the precariousness of domestic property bubbles.

As previously mentioned, property is the preferred investment for wealthy Chinese, as well as for middle and upper-middle class Chinese. With increasing government restrictions and increasingly prohibitive prices in China, as well as fears of a bubble, investors are turning abroad. While international stocks and bonds are also viable opportunities, real estate is considered more appealing because on top of investment returns, it provides investors with more access to opportunities abroad such as travel, medical care, or retirement, and is a tangible durable asset that can be passed down through generations that also has the potential to help their children study abroad ([Juwai 2017d](#)). Around a third of wealthy Chinese individuals surveyed in the 2018 Hurun Report (an annual survey of HNWI in China) said that they were considering moving abroad.<sup>7</sup>

According to reports ([Juwai 2017a](#)), almost 75% of Chinese buyers spent fewer than 6 months researching overseas properties prior to purchase in 2016, and almost 85% of Chinese buyers bought within a year of research. Although overseas investment was initially dominated by the ultra-wealthy, over time, middle and upper-middle class households have increasingly entered this overseas market.

Recent media coverage on the proclivity of the Chinese to invest in overseas real estate markets ([Pacurar 2017; Poon 2017; Levin 2018](#)), as well as recent restrictions on overseas property purchases<sup>8</sup> suggests that China's level of investment is at least perceived to be significant. Although the United States is not the only country that Chinese home buyers target, it has many attributes that make it particularly amenable to Chinese nationals. For one, the United States boasts one of the largest overseas Chinese populations in the world, increasing the likelihood that investors will find Chinese communities as well as services that cater to the Chinese (e.g., restaurants, groceries, etc.). Another

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<sup>6</sup>Although Chinese nationals are limited in how much cash they can transfer out of the country (\$50,000 USD annually), there are a number of ways that Chinese investors circumvent these limitations. One method is to split up a large transfer into multiple parts using friends and family, with each portion of the money eventually being deposited into a single overseas bank account. Another tactic involves transfer of money Hong Kong, which, while technically part of China, maintains its own separate regulations that allow for larger overseas outflows ([Hepp 2017](#)). Finally, individual investors can invest via investment firms, which are not subject to the same restrictions ([Feng and Stevenson 2016](#)).

<sup>7</sup>It should be noted that purchasing a house in the United States is not a guarantee for gaining residency, nor does the United States require that you be a resident to purchase a house. An EB-5 visa can be acquired if one makes an investment of one million dollars that results in at least ten employment opportunities (the dollar amount is lowered to 500,000 if the area of investment is a low employment area or a neighborhood center), making this a potential route to permanent residency for the upper echelon of wealthy Chinese individuals who seek to emigrate from China.

<sup>8</sup>For example, as of April 2017, Ontario (Canada) levies a "Non-Resident Speculation Tax" amounting to 15 percent of the closing price of a property for foreign nationals. New Zealand imposed a similar tax in the fall of 2017.

is that the United States has some of the highest ranked and most famous universities in the world, which make purchasing a home in the U.S. appealing for parents who wish to send their children to school in America<sup>9</sup>, a popular option among affluent Chinese families. Indeed, Chang et al. (2016) show that foreign house price indices are negatively associated with China's GDP and that the association is larger in countries with superior rankings in higher education.

A 2017 survey by the U.S. National Association of Realtors showed that Chinese clients<sup>10</sup> accounted for 14 percent of international buyers, edging out buyers from neighboring Canada (12 percent) and Mexico (10 percent). However, around 40 percent of these Chinese buyers were non-residents. The most popular destination state for Chinese buyers was California (37 percent), followed by Texas (11 percent) and Florida (8 percent). In terms of cities, Los Angeles is the most popular, followed by Seattle, San Francisco, and New York City. 65 percent of Chinese buyers financed their purchases entirely with cash. For intended use, 42 percent responded that their house was intended to be either a vacation home or a residential investment, 39 percent said they intended it to be their primary residence, and 8 percent said the property would be used by a student.

### 3 Empirical Framework

#### 3.1 Data sources

In Table 1, we show summary statistics for the main variables in the analysis. Our main outcome variable, house price index growth, comes from data generated by the Federal Housing Finance Agency (Bogin et al. 2016). The house price index (HPI) is calculated using repeat-sale single-family home sale price data, at the tract level. The fact that the index is calculated using sale prices from repeat-sale houses and not new houses should alleviate concerns that an effect could be driven by differences in quality of new and old houses, or endogeneity coming from new houses being built to attract Chinese buyers. From this house price index data, we have a total of 485,349 observations. Because the index is calculated using repeat-sale price data, for localities in which there is low turnover, the index is not calculated, which is why there are fewer tracts in the data than there are

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<sup>9</sup>Owning a home in America means that a family (or at least, a member of the family) can live in America while the child goes to American high school, which can help ease the transition to college.

<sup>10</sup>This survey lumped in buyers from Hong Kong and Taiwan into "Chinese clients", although given the sheer population difference, the vast majority of their Chinese clients are likely to be from the Mainland. (National Association of Realtors 2017)

total tracts in the US. Thus, to avoid the possibility of the results being skewed by tracts with low turnover, we only include tracts for which we have observations for all years between 2005 and 2015, giving us a balanced panel with a total of 469,780 observations for 41,918 tracts.

The average year-to-year growth rate was 1.3%. In Figure 1, we display the growth rates across census tracts in 2006, showing that there is considerable variation in growth rates even within state. Figure 2 displays growth rates in 2012, showing that there is also considerable variation over time.

For our measure of Chinese house purchases, we utilize house-level real estate tax and deed data from CoreLogic, a real estate analytics company that aggregates county deed records, whose data is commonly used in the urban economics literature to study U.S. housing dynamics. While the deed data do not specify country of origin of buyers, they do give names of buyers, with which we utilize the following method to proxy for Chinese purchases: First we take the *Pinyin* romanized version of the 100 most common surnames as reported by the Chinese Ministry of Public Security in the 2007 household registration data; this allows us to identify buyers of Chinese descent. Then, in all regressions we use census demographic data to control for both American-born Chinese and Chinese immigrant home ownership levels at the PUMA level; this allows us to isolate identifying variation from foreign non-immigrant buyers. This way, the effect measured will be identified just off of activity by Chinese buyers who are not recorded by the census; i.e., Chinese buyers who do not live in the United States. On average, 0.9% of homes are owned by Chinese foreign buyers.

For covariates, we also control for demographic shifts using annual county population totals from census data, as well as local labor market characteristics (average annual wage, unemployment rate, manufacturing share of wages) from the Bureau of Labor Statistics, which are also aggregated at the county level.

### 3.2 Empirical motivation

The aim of this paper is to understand the buying behavior of Chinese investors in the U.S. real estate market and to quantify the consequences their behavior has on house prices and local residents. One could estimate the coefficient from a straightforward fixed-effects panel OLS regression of house price growth  $HomeGrowth_{it}$  in locality  $i$  in year  $t$  on a measure of Chinese purchase share  $CNShare_{it}$ :

$$HomeGrowth_{it} = \beta CNShare_{it} + \delta_i + \zeta_t + \varepsilon_{it} \quad (1)$$

Although  $\beta$  will capture the effect of Chinese buyers on local house prices, there is a measurement issue. The effect we wish to estimate is not simply the effect of Chinese home purchases, but specifically the effect of home purchases by Chinese investors. Hence, the effect from the investors may be washed out due to attenuation bias if Chinese investors' behavior differs from other Chinese buyers (including Chinese immigrants and Chinese-Americans).

In addition to measurement bias, a simple OLS regression will also pick up any selection effects that reflect Chinese investors' skill (or lack thereof) at selecting houses with high growth potential relative to native buyers. In addition, this regression will capture any spurious correlations, perhaps from Chinese investment timing coinciding with U.S. real estate growth periods but not actually having an effect on real estate growth or having anything to do with investors' ability to determine areas with high growth potential. Furthermore, Chinese purchases may be related to price growth through mechanisms other than aggressive bidding, such as by tightening the market, or by neighborhood effects of having Chinese purchaser neighbors ([Saiz 2003, 2007, Saiz and Wachter 2011, Accetturo et al. 2014](#)).

In order to understand the relationship between Chinese investor home purchases and U.S. home prices, it will be essential to deal with all these potential sources of endogeneity. To address these potential concerns, we construct an instrument for Chinese home purchases by exploiting exogenous variation that influences the timing of Chinese home purchases that is independent of U.S. home price dynamics. In particular, we use lagged Chinese GDP growth interacted with travel times from China to each tract to instrument for Chinese purchase share. The use of this interaction between one variable that gives exogenous time variation and another with spatial variation gives us an instrument that varies across time and space and allows us to include tract- and year- fixed effects to control for any tract- or year-specific potential confounders.

The motivation for the choice of lagged Chinese growth as our time variation is as follows. Wage income is typically highly cyclical for wealthy individuals relative to the average person ([Parker and Vissing-Jorgensen 2009; Parker and Vissing-Jorgensen 2010; Liebersohn 2016; Foellmi and Martínez 2017](#)). High-income individuals tend to be employed in large-scale firms, whose performance is closely tied to the state of the aggregate economy, and these wealthy individuals tend to be at the top of the employment hierarchy. Their pay is often tied to the performance of the firm through bonuses. In addition, a large portion of wealthy individuals in China are company executives, who

tend to invest in their own companies and receive dividends. A large empirical literature discusses the effects of income uncertainty, showing that a common reaction to an uncertainty shock among individuals/households is precautionary saving and a “flight from risk” (Giavazzi and McMahon 2008; Chamon et al. 2010; Choi et al. 2014; Brown et al. 2016) as predicted by theory. A number of papers (e.g., Alexopoulos and Cohen 2009, Bloom 2014, Jurado et al. 2015) find that common measures of economic uncertainty are counter-cyclical,<sup>11</sup> and others (e.g., Neve et al. 2018, Luechinger et al. 2010) show that there is a psychological component to the positive relationship between a country’s growth and individuals’ subjective well-being stemming from perceived economic uncertainty that extends beyond simple changes in consumption. The ICRG political risk index, an index used in the literature on economic and political risk (e.g., Erb et al. 1996, Glaeser et al. 2004, Badarinza and Ramadorai 2018), includes GDP growth as one of the factors, and the other factors in the index such as inflation rate and government budget share of GDP are typically procyclical. Given that wealthy Chinese people are increasingly interested in having options to live/travel abroad, and that there are few investment opportunities with stable returns in China, it makes sense that domestic income risk will drive wealthy Chinese individuals to move their money to countries like the United States where there are more investment opportunities with less risk. In particular, this income risk should push these individuals to invest in the perennially-favored asset of real estate.<sup>12</sup> Fears of economic instability are reported to be large drivers of Chinese households moving money abroad (Liu 2017).

Importantly for identification, lagged Chinese GDP growth should have no effect on local U.S. housing markets except through influencing Chinese investors’ home investment decisions. In Figure 3 we plot lagged Chinese GDP growth against U.S. GDP growth in 1995–2015 and show that there is no correlation between the two. Figures A.1 and A.2 repeat this exercise for 1995–2015 and excluding the Great Recession, respectively, with the same result. In Figure 4 we plot lagged Chinese growth against the number of U.S. visas issued to Chinese citizens from 2002 to 2018, and find no strong relationship, suggesting that Chinese immigration timing does not seem to be immediately

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<sup>11</sup>There is no standard measure of uncertainty, but some frequently used include volatility in the stock market, bond markets, exchange rate, GDP growth, and usage frequency of the word “uncertainty” in newspapers.

<sup>12</sup>This also has parallels to literature on migration (e.g., Ortega and Peri 2009); there, because migrants’ income is primarily driven by labor, differences in the return to labor drive migration abroad, whereas here, as returns to investments make up a larger proportion of income for wealthy people, differences in the return to investment drives the movement of money abroad.

related to Chinese growth. Figure 5 shows that there is no relationship between lagged U.S. GDP growth and U.S. business visas issued to Chinese citizens.

While Chinese investors are likely to be swayed by domestic growth, domestic growth is unlikely to play a significant role in the migration timing decision for Chinese immigrants or the house purchase decisions of Chinese-Americans (and Americans in general), and so the use of domestic growth should alleviate concerns about measurement error bias. In addition, because the instrument is not based on internal aspects of the housing market, this should also rule out issues related to reverse causality where growth or potential growth in the housing market would be pulling in Chinese investment. Although there is no reason to expect any direct effect from Chinese growth on the housing market except through Chinese investment, the possibility remains that Chinese growth may have indirect effects on the U.S. economy that could trickle into the housing market and violate the exclusion restriction. We further address such concerns in Section 4.3.

While we could instrument for Chinese home purchases just with Chinese growth, we would be unable to include year-fixed effects to control for any confounding time-varying real estate market characteristics, such as increases in the housing supply or the Great Recession, because our instrument would not have any spatial variation, and so we interact it with approximated travel times between China and U.S. census tracts. Because the U.S. does not have an “open skies” policy with China, the number of routes between the two countries is strictly limited, and in fact in 2005 there were only 5 airports that flew direct to China.<sup>13</sup> These destinations are thus much more convenient for investors ([Juwai 2017b](#), [Juwai 2017c](#)), who often take the opportunity to search for real estate while on holiday abroad ([Juwai 2015](#)). In addition, investors are more likely to know about large metropolitan areas, which are more likely to have these direct routes. Finally, airlines deliberately advertise their direct international routes, making these destinations more salient to travelers. Given that many investors do not purchase homes with (immediate) residential intentions, spatial preferences are more likely to be determined by salience and convenience. Indeed, [Campante and Yanagizawa-Drott \(2017\)](#) show that flight networks cause an increase in business linkages across countries.

That the gateways between China and the U.S. are limited is not only going to make areas near

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<sup>13</sup>These airports were Los Angeles (LAX), San Francisco (SFO), Chicago O’Hare (ORD), Newark (EWR), and New York John F. Kennedy (JFK).

direct-flight airports attractive to Chinese buyers, but also areas well-connected by plane to China via those direct-flight airports. To make use of this additional variation, the way we construct travel time is as follows:

1. Because direct flights tend to depart from either Beijing or Shanghai, we calculate the flight distance<sup>14</sup> between both Beijing and Shanghai to each of the cities with a direct flight, calculate the approximate flight time<sup>15</sup>, and average the Beijing and Shanghai flight times to get a “China” flight time to each airport with a direct flight (henceforth, hub airport).
2. we then calculate the flight distance between each hub airport to the nearest medium airport in the US,<sup>16</sup> and calculate the approximate flight time for each pair.
3. we calculate the straight-line ground distance between each medium airport and the nearest census tract, and convert this to driving time by assuming an average drive speed of 60 mph.
4. For each tract, we calculate two times:
  - a. China flight time to nearest hub + 1 hour layover + hub to nearest medium airport flight time + drive time<sup>17</sup>
  - b. China flight time to nearest hub + drive time
5. we then take the minimum of 4a and 4b to take into account the fact that some airports are so close to the hub airports that it is not worth flying to them (e.g., San Francisco to Oakland)

To mitigate a potential reverse causality concern that U.S. air routes might be influenced by real estate growth (e.g., a route opens between a house price growth hot spot in an effort to capitalize on Chinese investors), we keep travel time fixed at the base year level rather than use a contemporaneous measure. We display these distances in Figure 6. The instrument that we then construct is the interaction between lagged Chinese growth and base-year travel time. An advantage

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<sup>14</sup>For all flight distance calculations we use the haversine, or great-circle, distance formula.

<sup>15</sup>For these calculations we use the flight calculator <https://www.airmilescalculator.com/>, which uses a commonly used flight time approximation of flight time  $F$  (minutes) as  $F = 30 + 0.1136D$ , where  $D$  is the flight distance in miles. The coefficient 0.1136 corresponds to the average flight speed of 528.116 mph, or 850 kph.

<sup>16</sup>We use the FAA definition of a medium airport, which must carry at least 0.25% of total annual passenger boardings.

<sup>17</sup>Using 1 hour as the layover time is an assumption based on the frequency and availability of domestic flights within the US; the results are robust to adjusting the layover time. Tables can be made available upon request.

of using this interaction in combination with individual- and year-fixed effects is that any potential exclusion restriction violation would have to be related to both factors; for example, while we might expect travel time to China to be related to travel time to other countries, there is little reason to expect that the timing of home purchases in the U.S. by people from other countries should vary with domestic growth in China, and so any potential confounding factor like this will be differenced out by fixed effects.

There are some possible concerns about our choice of instrument. One is that although we might wish to include state-by-year fixed effects to flexibly control for state-specific trends, given that most states have only one medium airport, including state-by-year fixed effects would eliminate a great deal of inter-state identifying variation; for the vast majority of states, the spatial variation would consist solely of the distance to the largest city, and the variation in flight time costs would be absorbed entirely by the fixed effects. We instead include census region-by-year fixed effects, which still allow for differential trends across regions (e.g., increasing preference for houses on the West Coast) without differencing out important flight time variation. The second concern of the instrument lies not in the validity but with data limitations; the time frame that we have data for is only for an eleven-year period, in which Chinese GDP growth only reverses direction three times. This could raise concern that Chinese GDP growth is spuriously correlated with house price growth or some other third variable that is related to house price growth. Along with the other robustness checks we address these spurious correlation concerns in Section 4.3.

### 3.3 Econometric specification

As mentioned previously, we instrument for Chinese home purchases using lagged Chinese GDP growth interacted with U.S. base year travel time from China. Conceptually, using this interaction variable as an instrument follows the same intuition as a difference-in-difference estimation, where house prices in high Chinese purchase propensity areas are compared in years with high and low Chinese demand, with a reference group of low Chinese purchase propensity areas. We run the following simplified reduced-form regression to verify that the data reflect the intuition of the

instrument:

$$CNShare_{it} = \beta_1(D_{t-1} \times CN_i) + \beta_2 D_{t-1} + \beta_3 CN_i + \mathbf{X}_{it}\Gamma + \varepsilon_{it} \quad (2)$$

where  $CNShare_{it}$  is the share of purchases in census tract  $i$  within census region  $r$  in year  $t$  that are Chinese,  $D_{t-1}$  is lagged Chinese GDP growth,  $CN_i$  is travel time,  $\mathbf{X}_{it}$  is a vector of the relevant covariates, and  $\varepsilon_{it}$  is the error term. The logic of the instrument suggests that we should expect both  $\beta_2$  and  $\beta_3$  to be negative while  $\beta_1$  should be positive. As a concrete example of how to think about this, we might expect that following a year of decreased growth in China, Chinese investors are keen to move their money abroad and purchase houses in the US, and also prefer for simplicity to stay close to direct-connection cities like Chicago, and so decide to invest either in Chicago itself or a relatively close city such as Milwaukee. On the other hand, after a boom year they might be calmer and have more patience, and both are less pressed to purchase immediately and are willing to look further to, say, Nashville or Tulsa. So, while we expect Chinese purchase share to be negatively related to both lagged growth ( $\beta_2 < 0$ ) and travel time ( $\beta_3 < 0$ ), a decrease in growth will increase Chinese purchase share more for somewhere with shorter travel time versus somewhere with longer travel time (or equivalently, an increase in growth will increase Chinese purchase share more for somewhere with longer travel times relative to short-travel areas), and so we expect  $\beta_1 > 0$ .<sup>18</sup>

As Table 2 shows, we find that this is indeed the case;  $t - 1$  Chinese GDP growth and distance to direct-flight airport each negatively and significantly predict Chinese home purchases, while their interaction positively and significantly predicts Chinese home purchases.

Moving on to the main regression, the identification strategy can be represented in a two-stage regression:

$$CNShare_{irt} = \pi(D_{t-1} \times CN_{ir}) + \mathbf{X}_{irt}\Theta + \eta_{ir} + \xi_{rt} + \nu_{irt} \quad (3)$$

$$HomeGrowth_{irt} = \beta(D_{t-1} \times CN_{ir}) + \mathbf{X}_{irt}\Gamma + \delta_{ir} + \zeta_{rt} + \varepsilon_{irt} \quad (4)$$

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<sup>18</sup>Another way to see this is that Chinese share is more sensitive to Chinese growth for places with short travel time, and less sensitive for places with long travel time. For somewhere like Chicago, an increase in growth should elicit a large drop in Chinese purchases, while for somewhere like, say, Fargo, an increase in Chinese growth should produce a smaller drop in Chinese purchases. This means that the drop in purchases is less negative (or increasing) as travel time increases, and so we expect  $\beta_1 > 0$ .

where (3) is the first stage and (4) is the reduced form.

$HomeGrowth_{irt}$  is home price growth in census tract  $i$  within census region  $r$  in year  $t$ ;  $CNShare_{irt}$  is the proportion of Chinese house purchases in tract  $i$  within region  $r$  in year  $t$ ;  $D_{t-1}$  is a lagged temporal demand shock in year  $t$  (GDP growth);  $CN_{ir}$  is a variable with spatial variation in the propensity of Chinese people to purchase houses in tract  $i$ , state  $s$  (2005 travel time from China);  $\mathbf{X}_{irt}$  is a vector of covariates that vary across space and time, such as demographic characteristics and local labor market characteristics;  $\delta_{ir}$  and  $\eta_{ir}$  are tract dummies;  $\zeta_{rt}$  and  $\xi_{rt}$  are region-by-year dummies;  $\varepsilon_{irt}$  and  $\nu_{irt}$  are error terms. Both the  $D_{t-1}$  and  $CN_{ir}$  difference-in-difference terms from the previous regression are absorbed by the region-by-year and tract dummies, respectively, in both regressions, and thus do not need to be included.

## 4 Results

### 4.1 Main results

We first run a “naive” panel OLS regression of home price growth on Chinese home purchases:

$$HomeGrowth_{icrt} = \beta CNShare_{icrt} + \mathbf{X}_{icrt}\Gamma + \delta_{icr} + \zeta_t + \varepsilon_{icrt} \quad (5)$$

$P_{irt}$  is average home price in census tract  $i$  within census region  $r$  in year  $t$ ;  $H_{irt}$  is the percentage of Chinese house purchases in tract  $i$  within region  $r$  in year  $t$ ;  $\mathbf{X}_{irt}$  is a vector of controls;  $\delta_{icr}$  is a tract dummy;  $\zeta_t$  is a year dummy;  $\varepsilon_{icrt}$  is the error term.

We show in Table 3, panel A, column 1 that there is a positive and significant association between Chinese house purchases and home price growth. However, as discussed earlier, it is possible that some omitted variable is driving both Chinese house purchases and price growth. For example, people might move to an area because of increased jobs in an area from some productivity increase, which could drive up demand, increasing prices. Concurrently, this economic boom makes this area more salient to Chinese investors, who eye this area as having high growth potential. Thus, in column 2, we control for population, average wage, and unemployment rate at the county level, and show that the result is qualitatively similar.

However, even controlling for these potentially confounding factors, we still cannot say whether

this relationship exists because Chinese people have some causal effect on the housing market or if Chinese people are skilled in selecting houses in areas with high growth potential. This is especially so if we think that the key role of these house purchases is for investment returns. In addition, although we have controlled for local demographic changes and local labor market conditions, which might predict real estate growth, we cannot account for the possibility that there still exist other unobserved factors that affect Chinese investors' house purchase decisions and local house price growth.

Thus, we instrument for Chinese home purchases by interacting lagged Chinese growth and base year travel time from China. Neither Chinese growth nor a fixed travel time should inform Chinese investors of where places with high growth potential are in a given year; our identifying variation should be orthogonal to contemporaneous local real estate market conditions, and so the coefficient we get should only reflect the effects of demand-side shocks from the Chinese side. In Table 4, column 1, we run a first-stage regression (i.e., equation (3)) of Chinese home purchases on our instrument, and find that our instrument does indeed predict Chinese home purchases. The coefficient is positive, suggesting that low Chinese growth induces more Chinese investment in areas with shorter travel times, exactly as expected. In Table 3, panel C, column 1, we show the results from the two-stage least squares regression. As in the OLS regression, we find a positive and significant effect of Chinese home purchases on U.S. home price growth: a one percentage point increase in the proportion of Chinese home purchases results in a 10 percentage points increase in home price growth. Interestingly, we find that the magnitude of the coefficient is higher than in the OLS regression; this would be consistent with Chinese investors being *bad* at selecting houses for potential growth (e.g., that those houses would counterfactually have not grown, but the Chinese activity canceled this out). This is in line with previous research on out-of-town buyers that finds that out-of-town buyers tend to be speculative and misinformed (e.g., [Chinco and Mayer 2014](#)).

At first glance, the magnitude of the coefficient seems unusually high. However, two things should be taken into account in interpreting this magnitude: Firstly, because the variance in tract-level house price growth is extremely high, in standard deviations, this only says that a standard deviation increase in the proportion of Chinese home purchases results in about a standard deviation increase in price growth (the average absolute year-to-year change in Chinese purchase share is 0.64 percentage points) Secondly, the measure of Chinese home purchases includes not

only Chinese people from China but also people in the U.S. with Chinese names, meaning that the number of Chinese home purchases is much higher than that of home purchases by Chinese investors. Although the deed data do not show how many home buyers are from China, we do a back-of-the-envelope calculation to get at an upper bound: In 2017, there were estimated to be 1.87 million HNWI in China, and for many years the number of HNWI in China has been steadily increasing. Among a sample of HNWI that year, 30 percent reported holding overseas property. Assuming all of that property were in the United States, that would be equivalent to 560,000 houses. In the deed data, approximately 6 million homes were purchased by individuals with Chinese last names in 2015, meaning that at most, 10 percent of homes included in "Chinese home purchases" were actually purchased by a Chinese investor, and so the realized effect of Chinese investors is likely an order of magnitude smaller than the coefficient.

Another point to note is that the difference in the magnitudes of the OLS and instrumented coefficients reflects that the identifying variation in the instrumented case comes from Chinese investors, and specifically, Chinese investors who are spurred by domestic uncertainty. Because the independent variable is purchases by people with Chinese names, there is going to be variation coming from wealthy Chinese households, whose purchase decisions are most likely to be influenced by Chinese growth and travel times, but also other Chinese households (e.g., ordinary Chinese immigrants or Chinese-Americans), whose purchase decisions are unlikely to be related to Chinese growth and travel times. Thus, it makes sense that the OLS coefficient is attenuated since it averages across both the wealthy and non-wealthy purchases, and we expect non-wealthy purchases to have negligible effects relative to wealthy ones, especially if we believe that wealthy Chinese households have high propensity to overbid. In contrast, because the IV coefficient is identified off of variation in wealthy purchases, it should be larger than the OLS coefficient, and reflects the variation that we are interested in in the first place.

A potential concern with this instrument is the exclusion restriction. One could imagine that Chinese growth could be somehow indirectly linked to local housing markets in the US. For example, Chinese growth could have an indirect effect on local U.S. housing markets, perhaps by affecting wages in areas that either trade more with China or compete more with Chinese exports, which could draw people into those areas or just increase people's willingness to pay for houses; this, in turn, could affect house price growth. Thus in column 3 we also control for share of employment in

the manufacturing sector, and find qualitatively similar results; in fact, we find that the coefficient is larger with controls than without.

Figures A.3 to A.10 illustrate the reduced form result. Consistent with the logic of our approach that domestic uncertainty in China should affect house prices in the U.S. for places with short travel times but not long travel times, we find the largest and statistically significant relationship between lagged Chinese GDP growth and house price index growth for U.S. tracts with travel time below the 10th percentile, and no such relationship for tracts with travel time above the 50th percentile.

## 4.2 Mechanisms

Although our instrument allows us to attribute a causal effect to Chinese investment on U.S. house price growth, this alone does not give an explanation for why we see these outcomes. Although mechanically the housing market is affected by Chinese investors simply through the increase in demand for U.S. houses, whose supply is generally inelastic, we might expect there to be additional reasons for why house prices get pushed up by Chinese home purchases. Anecdotally, one of the key channels through which Chinese purchases affect price growth is aggressive offers that result in higher sales prices than if there were no Chinese purchases. Although the discrepancy between the OLS and IV results are consistent with that explanation, there could be other explanations that would produce such a discrepancy.

In Table 5, we interact purchases with average wage. Column 2 shows that the effect of Chinese home purchases is decreasing in the average county wage. That the effect of purchases is smaller in wealthier neighborhoods is consistent with Chinese households bidding high if we consider the fact that most home purchases in the US, particularly for those lower on the wealth distribution, are financed through borrowing; for a wealthier household, the cost of housing as a proportion of their total income is going to be much lower than that of a poorer household, and so a wealthier household would have more resources available and/or be more willing to counter high bids from Chinese purchasers, making outbidding a less appealing strategy to the Chinese. On the other hand, a middle-class household may, out of a precautionary motive, be less willing to put up extra cash when they are already relatively liquidity-constrained. Conceivably then, a Chinese buyer would be more likely to be guaranteed a house by raising their bid in less wealthy neighborhoods, and may then use overbidding as a strategy to reduce search time.

Of course, it is also possible that in wealthier neighborhoods there are still aggressive competing bids, but if native home buyers are aggressive as well, the likelihood of the aggressive bidding leading to a Chinese purchase is lower. If it is the case that Chinese buyers focus on specific neighborhoods, then the coefficient we observe reflects both the effect of the successful purchase of a Chinese buyer as well as the effects of any failed purchases, both of which should be positive. This would suggest that we should expect to observe a *larger* effect in wealthy neighborhoods; however, we observe the opposite, thus suggesting that in wealthy neighborhoods there is less aggressive bidding overall.

Another possibility that could be consistent with Chinese purchases causing changes in home prices is that Chinese purchases have a neighbor effect (à la [Saiz 2003](#), e.g.). However, because we have controlled for in-migration by including population as a covariate in the regression, our identifying variation should only come from investors who do not reside in their homes, for whom there should not be any neighbor effect. In addition, the literature on neighbor effects typically finds that an influx of foreign neighbors causes a downward trend in house prices, meaning that the estimated effect would actually an underestimate of pure up-bidding if it were the case that there were any neighbor effects.

On the supply side, one might think that Chinese interest could spur developers to construct more expensive homes to attract more Chinese investors. We argue though that this seems unlikely. As mentioned earlier, housing supply is relatively inelastic; in the U.S. it typically takes at least six months to construct a house, not including the time it takes for demolition or permit acquisition, meaning that most of any supply-side response would at the earliest occur in the year following an increase in purchases rather than the same year. In addition, because the house price index is calculated from resale value of existing homes and not sales on new homes, the only way this channel could have an effect on HPI is through spillover effects from the new houses' value added to the neighborhood and not directly through the new houses themselves.

### 4.3 Robustness checks

Although we have shown that wealthy Chinese activity causes an increase in home price growth, there still may remain concerns that other factors could explain the observed results. We address a number of these concerns in this section. Further robustness checks are reported in the appendix.

### 4.3.1 Alternate instruments

One potential concern with the results is that estimating coefficients using travel times may be skewed because the travel time factors linearly into the regression. For example, one might think that the difference in effect for a tract 12 hours away versus 13 hours away may be different from a tract 16 hours away versus 17. In Table A.1, we address this by rerunning our two-stage least squares regression with different variations of the instrument. In column 2, we include a squared term into the instrument and get similar results. In column 3, we use log travel time instead of travel time and also find little change.

In columns 4 and 5 we use two alternative instruments to check the robustness to the exact variables we use, lag Chinese growth and travel time. In column 3 instead of using travel time we use distance to the nearest airport with a direct flight to China. This addresses concerns that there may be differing effects closer to the West Coast perhaps related to shipping, which may be confounded with the shorter travel times to China. We still find a positive and significant effect, although its magnitude drops somewhat. In column 5, instead of Chinese growth we use the number of business visas issued by the U.S. to Chinese people, to address concerns that the linkage between growth and purchases may seem tenuous; there is a clearer link between wealthy Chinese people acquiring U.S. business visas and wealthy Chinese people purchasing houses in the US. We find that the results are nearly identical to using lagged Chinese growth.

### 4.3.2 Potential confounders

In this section we run a series of robustness checks for potential confounding variables and alternative explanations for the effect that we observe.

One explanation for the observed effect is that fluctuations in Chinese growth have other indirect effects. In particular, it could be that Chinese growth fluctuations affect its trade directly with the US, or indirectly through U.S. trading partners such as Japan or Canada, which then has a ripple effect onto the US. It could be that based on spatial differences in trade competition, some regions experience some sort of trade shock, which then filters into house prices. This line of inquiry seems tenuous given that we have already included local labor market controls, but for extra robustness in Table A.2 we control for lag growth in the U.S. and its top three trading partners, Japan, Canada,

and Mexico, interacted with the direct airport distance. In all cases we still find a positive, significant coefficient for Chinese home purchases, with the magnitudes actually being higher. This is not altogether surprising; we run correlations between Chinese growth and growth of the U.S. and its top trading partners for the period from 2005 to 2015, and find that while growth in the U.S. and its major trading partners are all positively correlated with each other, none of them are correlated with Chinese growth (table on request).

Although not threatening the internal validity of the results, another potential concern is that the effect is mostly identified off of outlier cities. One possible concern is that the effect comes from the fact that the cities that the direct airports are in are somehow special, perhaps because these areas are economic powerhouses or have high population density. To account for this possibility, in Table A.3, we rerun the regressions including an indicator for being in a 5, 10, 25, and 40 mile radius of these airports interacted with year fixed effects in the controls, shown in columns 1. In all cases, we find the coefficient to be roughly similar to before (if not bigger), suggesting that the cities with direct airports are not driving the effect. Another possible concern is that the effect is driven by the fact that this period includes the Great Recession; we include an interaction between the recession and state fixed effects in column 5, and still find a positive and significant effect, although the effect size does drop somewhat. This implies that while the effect is larger in the recession years, the effect is not confined to the recession years and is a general effect.

In Table A.4, we test a number of other potential confounding factors related to industry share. One potential spurious correlation is if Chinese growth connects to U.S. localities through manufacturing exports; if localities compete directly with Chinese exports (e.g., Autor et al. 2013), then a growth shock could have an indirect effect on house prices through manufacturing. In column 1 we include share of wages in manufacturing at the county level as a control, and find no change in the results. Another potential confounding factor is if the increase in house prices actually comes from the rise of the tech industry; tech is concentrated in large cities, particularly on the west coast, and so if the overall trend of tech is spuriously correlated with Chinese growth, we would attribute the effect of tech on house prices to Chinese purchases. In columns 2 and 3 we include the share of wages to the information sector and telecommunication sector, respectively, and in both cases find little change.

## 5 Investor behavior and local impacts

Given that we find that Chinese purchases raise house prices, the next logical question is who in the United States is affected by these purchases and how so. Unlike in the cases of immigration or trade, where changes in labor supply and/or productivity are the main means by which locals are affected by foreigners (e.g., [Butcher and Card 1991](#), [Card 2009](#), [Ottaviano and Peri 2012](#), [Foged and Peri 2016](#), [Sequeira et al. 2020](#)), when we look at the effect of foreign home investors, we expect locals to be affected through the housing market. Although the data tell us that there are Chinese investors buying houses in the US, and anecdotal evidence suggests that these buyers are inclined to leave their houses vacant, there is little else that we can glean directly from the data in terms of what these investors are doing with the homes simply because there is no systematically collected data about what these investors do. Fortunately though, there are essentially only a few things that investors can do with their houses (move into the house, rent out the house, and leave the house vacant), making it possible to draw some basic conclusions about their activities by looking at a number of proxy outcomes.

To try to get at more definitive results concerning the behavior of investors, we look at the effect that Chinese investors have on rental prices. We should expect the effect on rental prices to depend on the propensity of investors to rent out their homes relative to their counterfactual local buyers. If it is the case that investors rent out their homes more, then we might expect lower rental prices due to an increase in the supply of rentals.<sup>19</sup> At the other side, if investors are overly prone to leaving their homes vacant, then like home buyers, renters may also be negatively impacted by an influx of foreign investors by decreasing the stock of rental homes. In Table 6 we look at the effect that Chinese purchases have on the average county rents. We find in Column 1 that for a 1pp increase in Chinese purchases, studio apartment rents statistically significantly decrease by \$176.10<sup>20</sup>. For one-bedroom rentals, there is a small, marginally significant negative effect in the reduced form regression, but the instrumented coefficient is insignificant, and much smaller in magnitude compared with studios. For all other rentals, there is no statistical effect on rental prices. It would make sense that Chinese investors would be very unlikely to ever move to the U.S.

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<sup>19</sup> Although given that home ownership is considered to be one of the most common ways to build wealth, if lower rental prices discourage people from buying houses, this may still end up hurting renters in the longer run.

<sup>20</sup> Again, since the actual year-to-year variation in Chinese purchase share is quite low, the average resulting price change is an order of magnitude smaller.

to live in a studio apartment, so it would make the most sense for them to rent out their studio apartments, versus a property with bedrooms, which they could have as a vacation home that they would eventually move into. Given that there is a modest decrease in rental prices, it makes sense that in Columns 2 and 3 of Table 7 that we do not see an increase in the number of homeless people. That we observe no positive price effects for any type of rental with bedrooms could mean that Chinese buyers rent out their non-studio properties at the same rate as their local counterparts, or that Chinese buyers do not purchase properties that typically enter the rental market.

Since there is no way to directly infer whether someone moves into a given house, we examine two outcomes that proxy for moving in: car registrations and electricity consumption. If we believe that the counterfactual people who would have bought the houses instead of the Chinese investors would already have cars, then we would expect there to be no change in car registrations if the investors were moving in or renting out their houses, and a decrease if they were leaving the houses vacant. Similarly with electricity consumption, if Chinese investors move in or rent out their houses at an equal or greater rate to locals, then we should expect no change in electricity usage, whereas if they leave the houses vacant at a greater rate, we should expect a decrease in usage. In both cases, we observe a negative effect (Table 8, columns 2 and 3), but in both cases they are also statistically insignificant, suggesting that Chinese investors do not leave their houses vacant at a higher rate. This may suggest that the counterfactual buyers for the houses that Chinese buyers purchase also have high rates of vacancy or renting. Although there may be power issues since the data for these outcomes is only measured at the state level, running the state-level house price index growth does produce a statistically significant coefficient. However, it should also be noted though that the *F*-statistic for these regressions are below the weak instrument threshold, so this should be taken into account when interpreting the results.

If local homeowners are competing with foreign buyers, then we expect home ownership rates among locals to be negatively impacted since the supply of homes is relatively inelastic, and so an increase in foreign buyers is equivalent to a decrease in the stock of available homes, especially so if foreign buyers buy aggressively. This is further augmented if a significant proportion of competing buyers are would-be first time home buyers and/or if the decrease in rental prices from an influx of Chinese rentals encourages would-be home buyers to continue to rent. However, regardless of what Chinese buyers do with their houses, we expect local home ownership rates to drop simply because

there are fewer houses and higher prices, and so we cannot use the effect on local home ownership rates to say anything more about the behavior of Chinese buyers.

A third group that may be affected by foreign home investors is local governments, via tax revenues. Especially if foreign up-bids have positive spillover effects on the prices of local contemporaneous home purchases (e.g., the “comps” effect), local governments may see benefits to their property tax revenue from attracting wealthy foreign buyers. In Table 9 Column 1 we show that an increase in Chinese purchase share results in a significant increase in property tax accrued by county governments. However, in Column 2 we show that there is no effect with sales tax revenues, showing that while the increase in house prices does in fact result in more property taxes collected, the price effect is not simply coming from locals becoming wealthier.

From these outcomes, we can use a simple accounting exercise to try to summarize what we can conclude about the likelihood for Chinese buyers to move into ( $m$ ), rent out ( $r$ ), and leave vacant ( $v$ ) the houses they buy, relative to the counterfactual buyer (for example, if 34 percent of Chinese investors and 30 percent of local home buyers rent out their homes, then  $r = 0.04$ ). Since the only things a homeowner can do with their house are to move in, rent out, or leave vacant,  $m + r + v = 0$ . If  $m + r > 0$  (or equivalently,  $v < 0$ ), then there should be an increase in the overall rate of home occupancy, and so we should expect the consumption of utilities and cars to increase. Instead, we see a weak decrease, so it must be that  $m + r \leq 0$ , and so  $v \geq 0$ . Because we see a decrease in rental prices for studios and some evidence of a decrease for 1-bedrooms, that implies that there is an increase in rental supply, or that  $r > 0$ , so  $m < 0$ . Thus, the data suggest that Chinese buyers are less likely to move into their houses, but more likely to either rent out their houses or leave them vacant.

We find that in contrast with property taxes, the increase in sales tax revenues is small and insignificant, consistent with  $m + r \geq 0$  if we think that occupancy rate and sales tax revenues go hand in hand, and so we conclude that  $m + r = 0$  and hence,  $v = 0$ . Although there is no data available generally for the vacancy rate for counties or tracts, the U.S. Housing Census does provide data on the owned-home vacancy rates for the 75 largest MSAs in the United States. Using this sample, we find in Table 10 Column 2 that Chinese purchase share has a small, positive, but statistically insignificant effect on the owned-home vacancy rate, also consistent with  $v = 0$ .

Of course, this simplified breakdown does not capture how actions may differ across types of

rentals, account for consumption patterns for locals possibly being different from Chinese buyers, or any potential general equilibrium effects such as inducing a decrease in in-migration, changes in utilities or car consumption as a result of changes in the rental/purchase prices of houses, the effect that the rental rate of Chinese buyers has on the rental rate of locals, etc. It also only tells us the *relative* rates, and does not tell us about how likely locals are to pursue these activities. For example, if the counterfactual buyer is also an investor (e.g., an out-of-town buyer or second home buyer), then even if  $v = 0$ , it still may be the case that there is a high vacancy rate among Chinese buyers.

## 6 Pull factors

Local governments may care greatly about what aspects of an area (however loosely defined) are most appealing for foreign investors. If they wish to increase their tax revenues, they may wish to expand those appealing pull factors, whereas if they want to protect their constituents from the negative effects of foreign investment they might wish to curb those factors and/or impose extra burdens on foreign buyers. Key to that decision-making process is knowing which pull factors are most attractive and which negative aspects are worth overlooking to those buyers.

For local governments, there may be a trade-off between increasing public funds by increasing property tax rates and attracting wealthy people by decreasing property taxes, particularly with wealthy foreign buyers, who, like other out-of-town buyers, have much more flexibility when it comes to where to buy a house relative to locals. However, it seems that this may be a false trade-off; in Table 11 column 1 we regress Chinese share on the instrument interacted with the county-average property tax find that the effect is actually increasing in the county-average property tax rate. It seems implausible that people look for houses *because* they have high property taxes; rather, this suggests that people buy houses *in spite* of the property taxes. Given that there is a weak negative correlation between travel time and property tax rate, it may just be that Chinese buyers pay little attention to the property tax when purchasing, and the increased likelihood of purchasing in high property tax areas is just because they are also more likely to have shorter travel times.

Like property tax, income taxes are another lever that local governments have at their disposal to pull in or push out people. In Column 2 we interact the instrument with the maximum total

income tax rate in a state, and find that like with the property tax rate, buyers are actually more likely to purchase in states with high income tax, not less. Since Chinese buyers are less inclined to move to the houses they buy, we should not expect income taxes to act as a purchasing deterrent, especially if we do not even see property taxes as a deterrent, which is indeed we see.

Chinese home buyers who are interested in raising families in the U.S. should be paying attention to the quality of schools in a neighborhood. While local governments may not have quite as much control over the quality of schools in the same way that they do tax rates, they still determine aspects such as school funding. We look at the average pass rate of Common Core math and RLA (English) exams.<sup>21</sup> Regressing Chinese purchase share on the instrument and an interaction between the instrument and pass rates in columns 3 and 4, we find that neither math nor RLA pass rates differentially predict purchase rates, suggesting that grade school quality is not a major factor in the decision-making of Chinese buyers. If it is the case that Chinese buyers make purchases primarily for investment purposes rather than for moving in, then it would make sense for school factors to be unimportant.

Overall, there does not seem to be any evidence that Chinese home investors are put off by what we would normally think to be off-putting, and not attracted by any aspects that we would normally think to be attractive to local home buyers. This suggests that other than legislation that either explicitly encourages or discourages foreign property investment (or perhaps somehow negotiating a sky route to a nearby airport), local governments have little to no sway over the decision-making process of foreign property investors.

## 7 Conclusion

As wealthy Chinese households continue to lack domestic investment options that are readily available and have stable returns, we should expect their exploration into foreign investment to continue to grow. Focusing on one of the most popular investment assets among wealthy Chinese, American real estate, we show that home purchases by Chinese nationals are positively correlated

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<sup>21</sup>Because the fineness of the pass rate depends on the number of students (e.g., a small school district may only report a range of 80-90 percent of students passing, while a larger one may report a more specific range of 85-90 percent), we construct a score for each district, where a 0 means at least 0 but less than 10 percent of students pass, a 1 means at least 10 but less than 20 percent pass, etc. We then average scores in a county, ignoring school districts that cross county lines (4023 out of 13569 school districts are not confined to a single county).

with local U.S. home price growth. Instrumenting for Chinese home purchases using lagged Chinese GDP growth interacted with travel time from China, we demonstrate that Chinese home purchases have a positive and significant causal impact on local U.S. housing prices. Moreover, this increase in U.S. housing prices is driven by above-average house bids, consistent with observations that Chinese investors tend to bid aggressively for houses. Using a number of proxy outcomes, we also provide results suggesting that while Chinese investors are not necessarily leaving their houses vacant at a higher rate than their competitors, they are more likely to rent out their houses and less likely to move in, which results in a benefit for renters relative to home purchasers.

That foreign buyers have a real effect on local housing markets suggests that the protective policies that some local governments have been implementing to curb foreign real estate buyers may in fact be based on a substantive problem rather than anecdotally-based fear. Especially given the recent debate surrounding the lack of affordable housing in the US, the fact that forces external to localities may be worsening the housing unaffordability crisis could stoke concern about foreign buyers having a significant impact on the welfare of natives. Local governments will also face a dilemma of how to balance the benefits of increased revenues with the difficulties constituents face in transitioning from renting to owning, as wealthy buyers crowd out locals, drive up prices, and also make renting relatively more appealing through lower rental prices.

However, despite the rise in prices due to foreign buyers, their current level of activity is not enough to price out large swaths of local home buyers. As the number of wealthy individuals in China and other developing countries continues to climb up though, they may increasingly seek out these international options and move their money away from home, and so increasingly both domestic investment and foreign home buyers will be negatively affected by this movement of money. Further development and sophistication of domestic financial asset markets will be instrumental to disincentivize wealth from leaking out the country, and future research should explore push factors in more detail.

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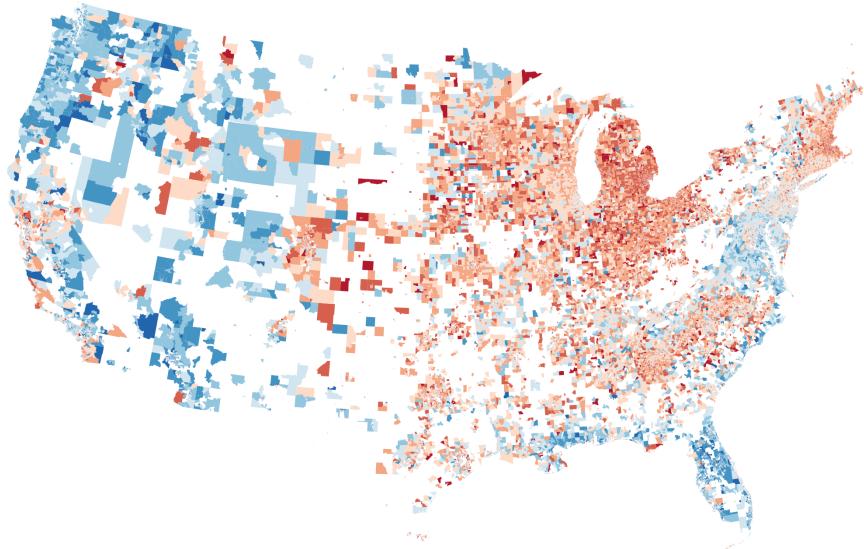
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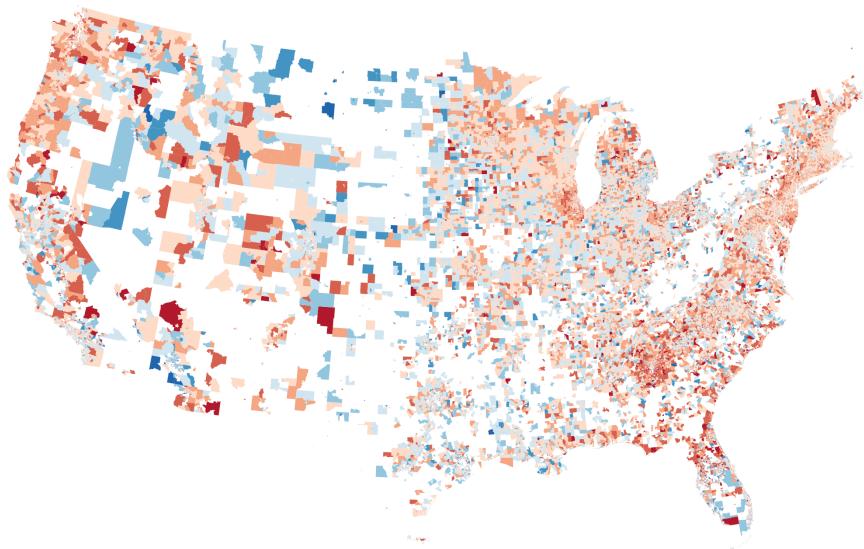
# FIGURES AND TABLES

Figure 1: House price index growth, 2006



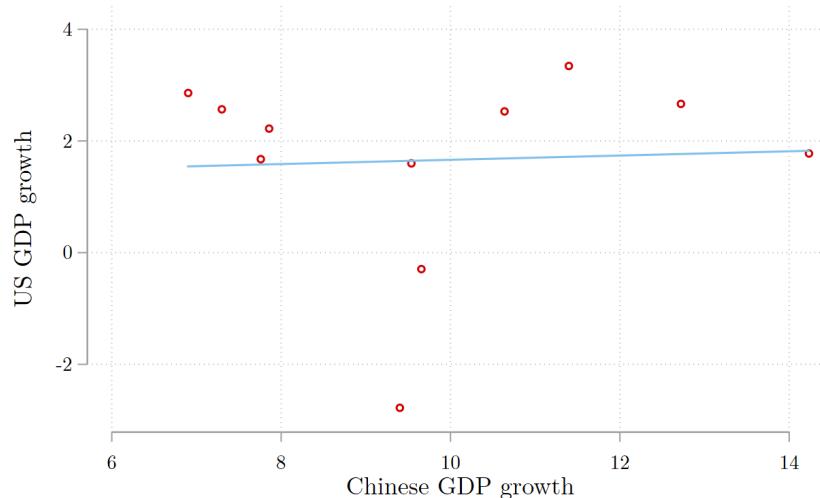
Note: Darker shades indicate larger magnitudes. Red tracts have negative growth while blue tracts have positive growth.

Figure 2: House price index growth, 2012



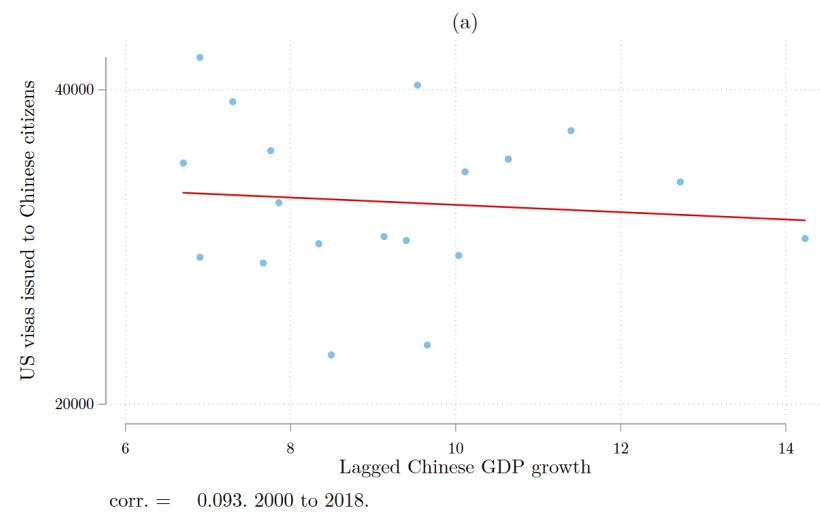
Note: Darker shades indicate larger magnitudes. Red tracts have negative growth while blue tracts have positive growth.

Figure 3: Chinese & U.S. growth, 2005–2015



corr. = 0.051. 2005 to 2015.

Figure 4: Chinese Growth and General Visas



corr. = 0.093. 2000 to 2018.

Sources: US Department of State, World Bank

Figure 5: US Growth and Business Visas

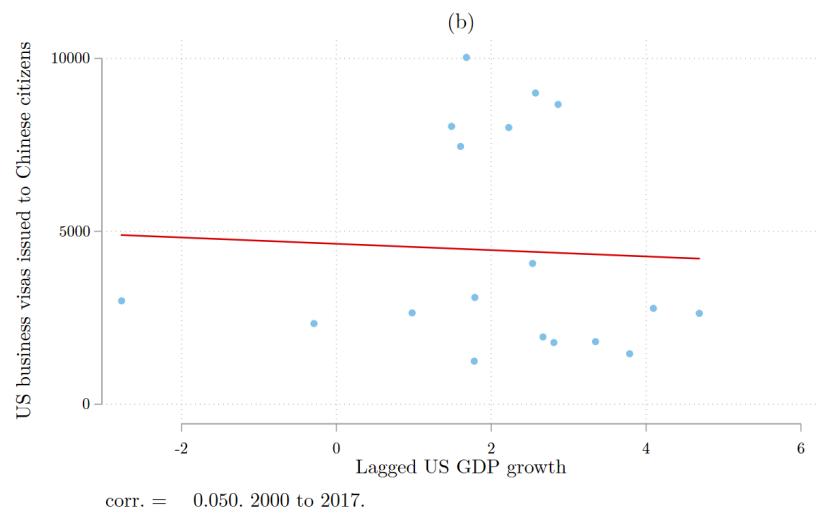
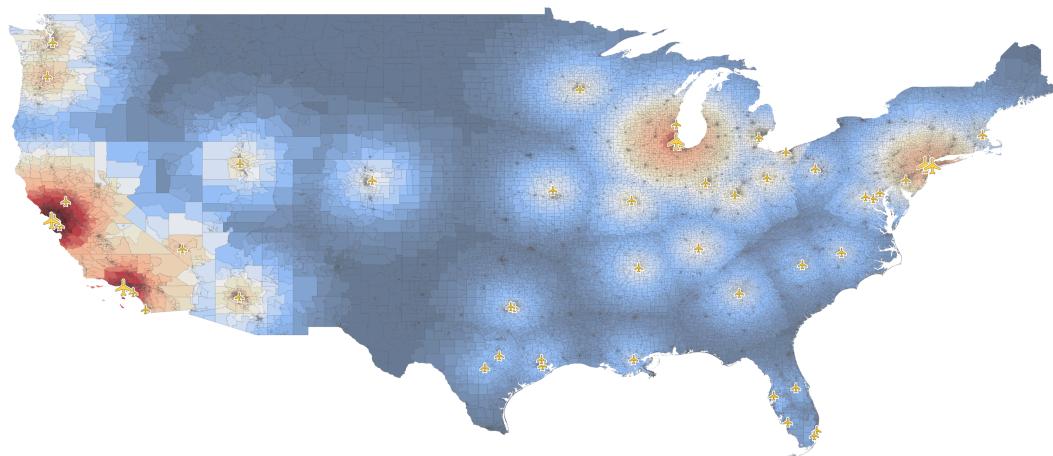


Figure 6: Travel time from China, 2005



Note: Red shades indicate shorter times and blue shades indicate longer times

Table 1: Summary statistics

	Mean	Standard deviation
House price index growth (%) (tract)	1.286	9.469
Chinese home purchase share (%) (tract)	0.913	2.59
Annual wage (\$1.000) (county)	43.87	11.09
Unemployment rate (%) (county)	6.801	2.626
Manufacturing share (%) (county)	10.56	6.925
Population (100.000) (county)	10.08	18.89

The sample includes 2005-2015. The data and sources are described in Section 3.1.

Table 2: "Difference-in-difference" instrument validation

Dependent variable: Chinese home purchase share	
Lag Chinese growth x travel time	0.0369*** (0.000911)
Lag Chinese growth	-0.697*** (0.0161)
Travel time (hrs.)	-0.0125*** (0.000254)
Number of observations	469780

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01. Standard errors in parentheses, clustered at the census tract level. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100.

Table 3: Effect of Chinese home purchase share on home price growth, 2SLS

	Dependent variable: HPI growth		
	(1)	(2)	(3)
<i>Panel A: OLS</i>			
Chinese home purchase share	0.088*** (0.008)	0.076*** (0.008)	0.076*** (0.008)
<i>Panel B: Reduced form</i>			
Lag Chinese growth x travel time	0.323*** (0.004)	0.315*** (0.005)	0.315*** (0.005)
<i>Panel C: Two-stage least squares</i>			
Chinese home purchase share	10.34*** (0.320)	17.41*** (0.889)	17.40*** (0.889)
Local labor market covariates		✓	✓
Manufacturing share			✓
Tract & year FEs	✓	✓	✓
Region-by-year FEs	✓	✓	✓
Kliebergen-Paap <i>F</i> -statistic	1130.8	401.1	400.8
Number of observations	469780	469780	469780

\*  $p < .1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors in parentheses, clustered at the census tract level. Each cell represents a coefficient from a separate regression. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100. Local labor market covariates include population, employment rate and average annual wage, at the county level.

Table 4: Effect of  $t - 1$  Chinese GDP growth interacted with distance to direct-flight airport on Chinese home purchase share, OLS (First stage)

	Dependent variable: Chinese home purchase share		
	(1)	(2)	(3)
Lag growth x travel time	0.031*** (0.001)	0.018*** (0.001)	0.018*** (0.001)
Local labor market covariates		✓	✓
Manufacturing share			✓
Tract & year FEs	✓	✓	✓
Region-by-year FEs	✓	✓	✓
Number of observations	469780	469780	469780

\* p < .1, \*\* p < 0.05, \*\*\* p < 0.01. Standard errors in parentheses, clustered at the census tract level. Each cell represents a coefficient from a separate regression. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100. Local labor market covariates include population, employment rate and average annual wage, at the county level.

Table 5: Heterogeneous treatment effect of Chinese home purchase share interacted with average county wage on home price growth, 2SLS (instrument:  $t - 1$  Chinese GDP growth interacted with travel time and wage)

	Dependent variable: HPI growth	
	(1)	(2)
Chinese home purchase share	17.40*** (0.889)	24.20*** (1.256)
Chinese share x average wage (10000s)		-1.649*** (0.111)
Local labor market covariates	✓	✓
Manufacturing share	✓	✓
Tract & year FEs	✓	✓
Region-by-year FEs	✓	✓
Kleibergen-Paap $F$ -statistic	400.8	111.5
Number of observations	469780	469780

\*  $p < .1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors in parentheses, clustered at the census tract level. Each cell represents a coefficient from a separate regression. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100. Local labor market covariates include population, employment rate and average annual wage, at the county level.

Table 6: Effect of Chinese home purchase share on rental prices

	Avg. rent - 0bd	Avg. rent - 1bd	Avg. rent - 2bd	Avg. rent - 3bd	Avg. rent - 4bd
	(1)	(2)	(3)	(4)	(5)
<i>Panel A. OLS</i>					
Chinese sale pct.	1.192* (0.667)	1.555** (0.660)	2.006** (0.828)	2.532** (1.114)	3.628*** (1.379)
<i>Panel B. Reduced form</i>					
Lag growth x travel time	-0.634*** (0.158)	-0.270* (0.160)	-0.236 (0.244)	-0.0906 (0.368)	-0.00833 (0.481)
<i>Panel C. 2SLS</i>					
Chinese sale pct.	-176.1*** (61.54)	-51.65 (52.61)	-38.94 (77.99)	13.02 (117.8)	44.32 (155.1)
County and year FEs?	Yes	Yes	Yes	Yes	Yes
Region-by-year FEs?	Yes	Yes	Yes	Yes	Yes
Kliebergen-Paap F-statistic	14.28	14.28	14.28	14.28	14.28
Number of observations	24479	24479	24479	24479	24479

\* p < .1, \*\* p < 0.05, \*\*\* p < 0.01. Standard errors in parentheses, clustered at the county level. Each cell represents a coefficient from a separate regression. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100. All regressions include county population, employment rate, and average annual wage as covariates.

Table 7: Effect of Chinese home purchase share on home price growth and homelessness

	Dependent variable		
	HPI growth	Overall homeless	Unsheltered homeless
	(1)	(2)	(3)
<i>Panel A: OLS</i>			
Chinese home purchase share	0.0773 (0.170)	37.90 (157.8)	-107.2 (79.88)
<i>Panel B: Reduced form</i>			
Lag Chinese growth x travel time	0.295** (0.117)	25.83 (25.46)	3.991 (15.28)
<i>Panel C: Two-stage least squares</i>			
Chinese home purchase share	7.704** (3.129)	801.7 (767.8)	122.1 (470.2)
CoC & year FEs	Yes	Yes	Yes
Kliebergen-Paap <i>F</i> -statistic	10.66	9.873	10.07
Number of observations	4188	3376	3335

\* p < .1, \*\* p < 0.05, \*\*\* p < 0.01. Standard errors in parentheses, clustered at the continuum-of-care level. Each cell represents a coefficient from a separate regression. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100.

Table 8: Effect of Chinese home purchase share on proxy outcomes

	Megawatt-hours	Car registrations
	(1)	(2)
<i>Panel A. OLS</i>		
Chinese sale pct.	13.31 (12.83)	-5.099 (3.187)
<i>Panel B. Reduced form</i>		
Lag growth x travel time	-1.041 (1.105)	-0.140 (0.164)
<i>Panel C. 2SLS</i>		
Chinese sale pct.	-54.80 (60.54)	-7.168 (7.484)
Local labor market covariates	Yes	Yes
Manufacturing share	Yes	Yes
State and year FEs?	Yes	Yes
Region-by-year FEs?	Yes	Yes
Kliebergen-Paap F-statistic	6.864	6.864
Observations	520	520

\* p < .1, \*\* p < 0.05, \*\*\* p < 0.01. Standard errors in parentheses, clustered at the state level. Each cell represents a coefficient from a separate regression. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100. Local labor market covariates include employment rate and average annual wage, at the state level.

Table 9: Effect of Chinese home purchase share on tax revenues

	Property tax rev.	Sales tax rev.
	(1)	(2)
<i>Panel A. OLS</i>		
Chinese sale pct.	2.391** (1.099)	0.380* (0.203)
<i>Panel B. Reduced form</i>		
Lag growth x travel time	0.574*** (0.129)	0.063** (0.027)
<i>Panel C. 2SLS</i>		
Chinese sale pct.	89.15*** (18.97)	1.041 (2.413)
Local labor market covariates	Yes	Yes
Manufacturing share	Yes	Yes
County and year FEs?	Yes	Yes
Region-by-year FEs?	Yes	Yes
Kliebergen-Paap F-statistic	16.60	16.60
Number of observations	19089	19089

\* p < .1, \*\* p < 0.05, \*\*\* p < 0.01. Standard errors in parentheses, clustered at the county level. Tax revenues are in 10000s of dollars. Local labor market covariates include population, employment rate and average annual wage.

Table 10: Effect of Chinese home purchase share on home price growth and home vacancy rates

	Dependent variable	
	HPI growth (1)	Owned-home vacancy rate (2)
<i>Panel A: OLS</i>		
Chinese home purchase share	-0.585* (0.295)	-0.039 (0.058)
<i>Panel B: Reduced form</i>		
Lag Chinese growth x travel time	0.564*** (0.093)	0.000 (0.013)
<i>Panel C: Two-stage least squares</i>		
Chinese home purchase share	15.87*** (3.132)	0.012 (0.278)
MSA & year FEs	✓	✓
Kliebergen-Paap <i>F</i> -statistic	37.84	37.84
Number of observations	722	722

\* p < .1, \*\* p < 0.05, \*\*\* p < 0.01. Standard errors in parentheses, clustered at the MSA level. Each cell represents a coefficient from a separate regression. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100.

Table 11: Differential Chinese purchase rates

	Dependent variable: Chinese sales percentage			
	(1)	(2)	(3)	(4)
Instrument	0.000406*** (0.0000212)	0.000383*** (0.0000212)	0.000379*** (0.0000194)	0.000340*** (0.0000413)
Instrument x Property tax rate	0.00000179*** (0.000000657)			
Instrument x Income tax rate		0.00000263*** (0.00000100)		
Instrument x Math			-0.00000169 (0.00000178)	
Instrument x RLA				0.00000209 (0.00000165)
Tract & year FEs?	Yes	Yes	Yes	Yes
Region-by-year FEs?	Yes	Yes	Yes	Yes
Number of observations	450006	450006	462972	468827

\* p < .1, \*\* p < 0.05, \*\*\* p < 0.01. Standard errors in parentheses, clustered at the tract level. Each column represents a coefficient from a separate regression. The instrument is lagged Chinese growth interacted with travel time. Math and RLA are the average county Common Core math and English exam pass rate, respectively. Property tax is the average property tax rate from the 2010-2014 ACS. Income tax rate is the maximum state income tax rate.

# APPENDIX (NOT FOR PUBLICATION)

## A Appendix Figures and Tables

Figure A.1: Chinese & U.S. growth, 1995–2015

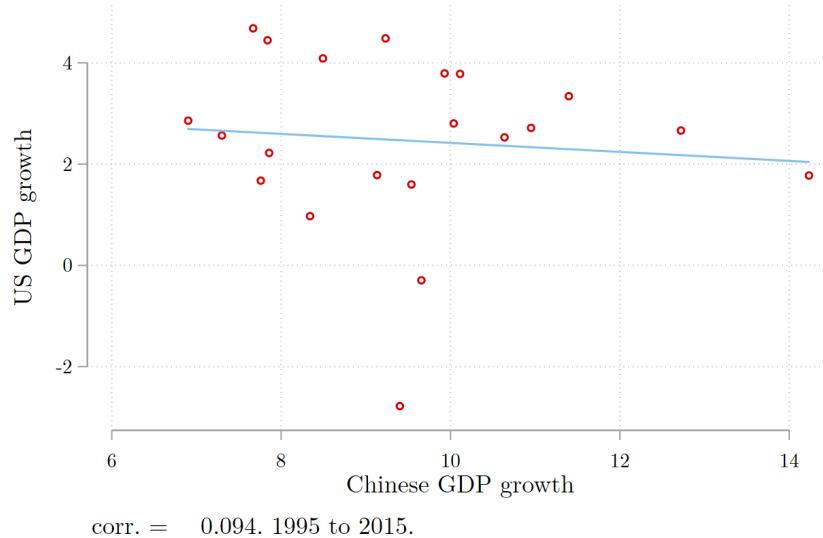


Figure A.2: Chinese & U.S. growth, 2005–2015, Excluding Recession

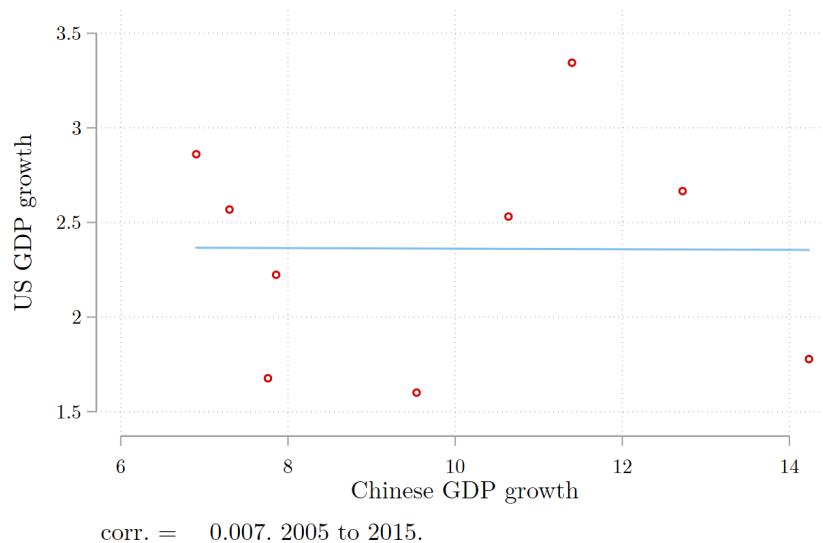


Figure A.3: Areas With Travel Time Below 10th Percentile

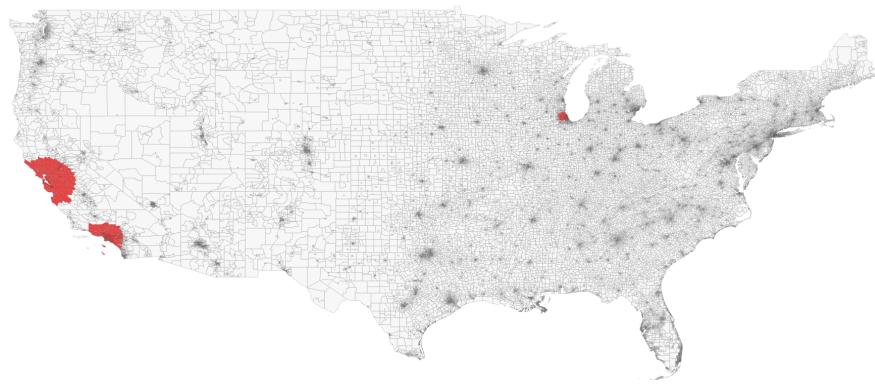


Figure A.4: HPI Growth and Chinese GDP Growth, Travel Time Below 10th Percentile

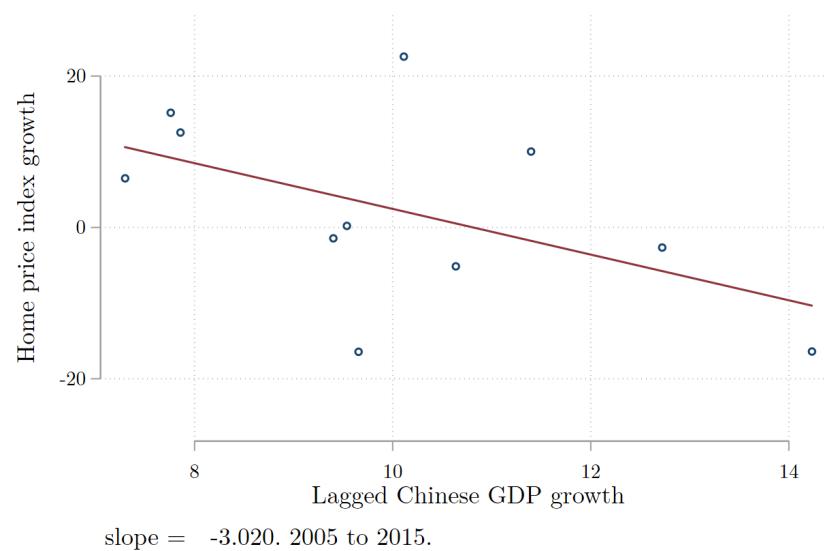


Figure A.5: Areas With Travel Time Between 20th and 30th Percentile

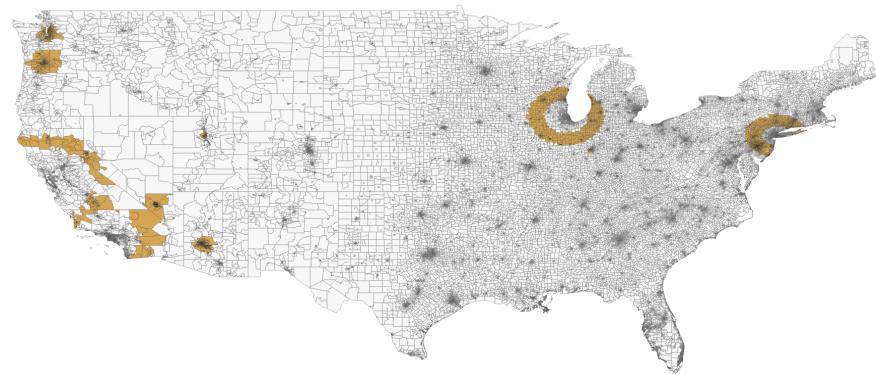


Figure A.6: HPI Growth and Chinese GDP Growth, Travel Time Between 20th and 30th Percentile

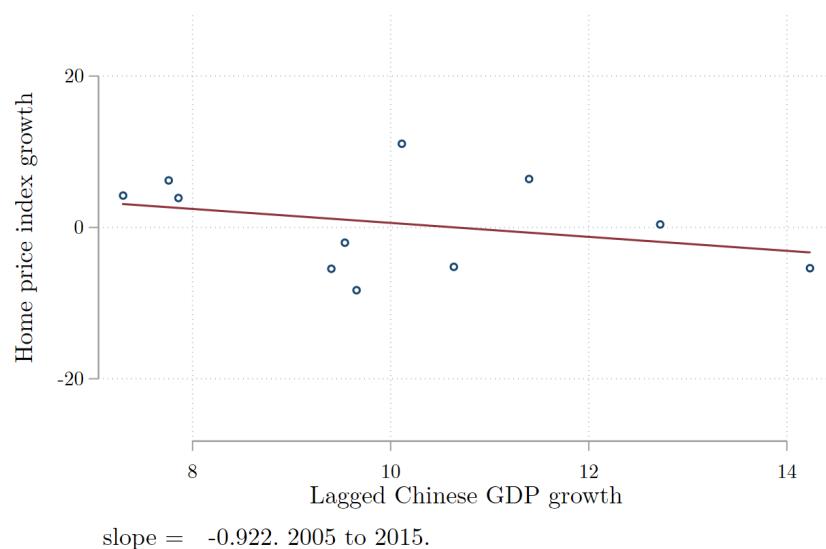


Figure A.7: Areas With Travel Time Between 40th and 50th Percentile

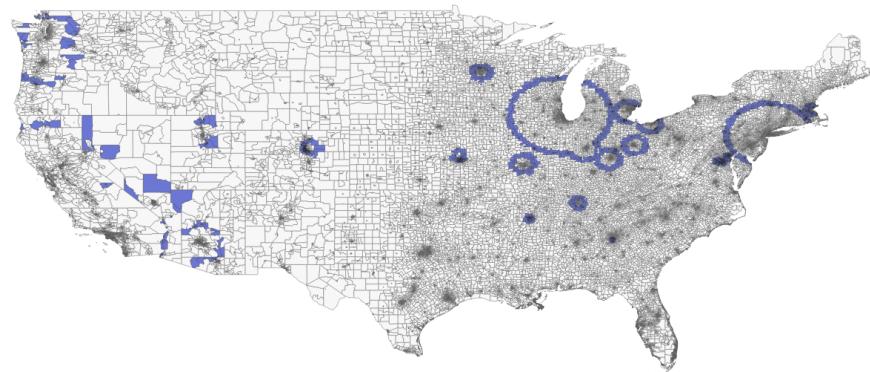


Figure A.8: HPI Growth and Chinese GDP Growth, Travel Time Between 40th and 50th Percentile

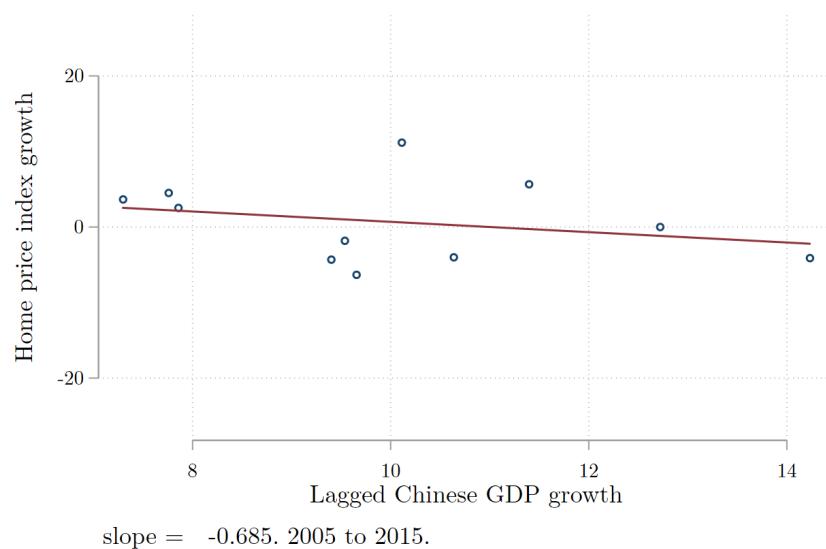


Figure A.9: Areas With Travel Time Between 60th and 70th Percentile

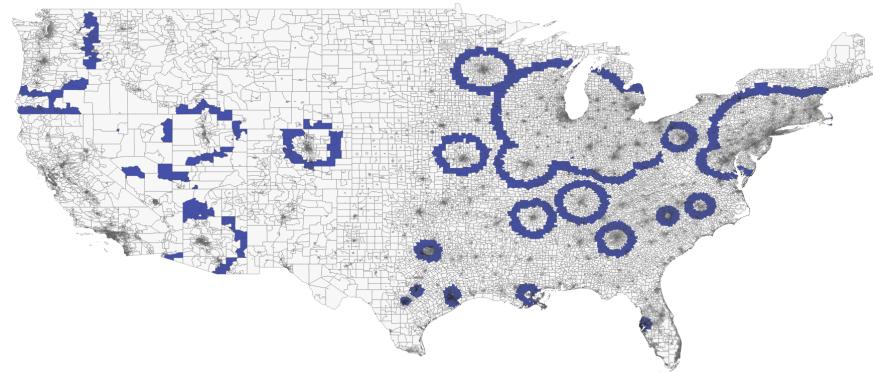


Figure A.10: HPI Growth and Chinese GDP Growth, Travel Time Between 60th and 70th Percentile

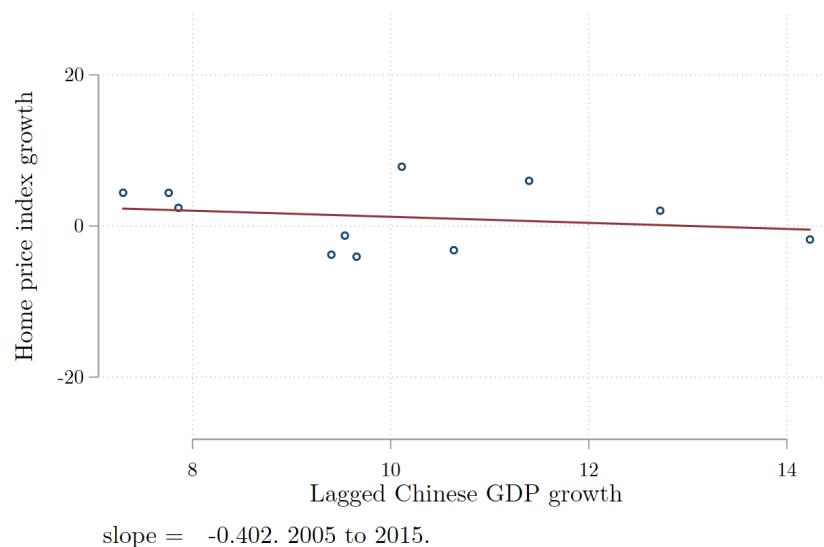


Table A.1: Effect of Chinese home purchase share on home price growth, 2SLS: Instrument robustness checks)

	Dependent variable: HPI growth			
	(1)	(2)	(3)	(4)
Chinese home purchase share	17.40*** (0.889)	15.17*** (0.841)	17.04*** (0.872)	16.59*** (0.960)
Instrument:				
Lag growth X travel time	✓			
Lag growth X travel time & lag growth X squared travel time		✓		
Lag growth X log travel time			✓	
Chinese business visas X travel time				✓
Local labor market covariates	✓	✓	✓	✓
Manufacturing share	✓	✓	✓	✓
Tract & year FEs	✓	✓	✓	✓
Region-by-year FEs	✓	✓	✓	✓
Kleibergen-Paap $F$ -statistic	400.8	200.7	397.5	318.2
Number of observations	469780	469780	469780	469780

\* p < .1, \*\* p < 0.05, \*\*\* p < 0.01. Standard errors in parentheses, clustered at the census tract level. Each cell represents a coefficient from a separate regression. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100. Local labor market covariates include population, employment rate and average annual wage, at the county level.

Table A.2: Effect of Chinese home purchase share on home price growth, including U.S. trading partner covariates, 2SLS (instrument:  $t - 1$  Chinese GDP growth interacted with travel time)

	Dependent variable: HPI growth			
	(1)	(2)	(3)	(4)
Net Chinese home purchases	19.27*** (1.070)	19.08*** (1.042)	18.56*** (1.007)	18.93*** (1.039)
Lag USA growth x state FE	✓			
Lag JPN growth x state FE		✓		
Lag CAN growth x state FE			✓	
Lag MEX growth x state FE				✓
Local labor market covariates	✓	✓	✓	✓
Manufacturing share	✓	✓	✓	✓
Tract & year FE	✓	✓	✓	✓
Region-by-year FE	✓	✓	✓	✓
Kliebergen-Paap $F$ -statistic	338.4	350.8	355.2	347.8
Number of observations	469780	469780	469780	469780

\*  $p < .1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors in parentheses, clustered at the census tract level. Each cell represents a coefficient from a separate regression. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100. Local labor market covariates include population, employment rate and average annual wage, at the county level.

Table A.3: Effect of Chinese home purchase share on home price growth, 2SLS (instrument:  $t - 1$  Chinese GDP growth interacted with travel time): Outlier robustness

	Dependent variable: HPI growth				
	(1)	(2)	(3)	(4)	(5)
Net Chinese home purchases	17.31*** (0.879)	18.20*** (0.944)	18.92*** (0.992)	22.96*** (1.577)	13.24*** (0.649)
5 mile radius x year FE	✓				
10 mile radius x FE		✓			
25 mile radius x FE			✓		
40 mile radius x FE				✓	
Recession x state FE					✓
Local labor market covariates	✓	✓	✓	✓	✓
Manufacturing share	✓	✓	✓	✓	✓
Tract & year FEs	✓	✓	✓	✓	✓
Region-by-year FEs	✓	✓	✓	✓	✓
Kliebergen-Paap $F$ -statistic	405.2	387.1	381.5	218.1	442.2
Number of observations	469780	469780	469780	469780	469780

\*  $p < .1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors in parentheses, clustered at the census tract level. Each cell represents a coefficient from a separate regression. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100. Local labor market covariates include population, employment rate and average annual wage, at the county level.

Table A.4: Effect of Chinese home purchase share on home price growth, 2SLS (instrument:  $t - 1$  Chinese GDP growth interacted with travel time): Industry wage share robustness

	Dependent variable: HPI growth		
	(1)	(2)	(3)
Net Chinese home purchases	17.40*** (0.889)	17.41*** (0.887)	17.61*** (0.908)
Information share of wages		✓	
Telecommunication share of wages			✓
Local labor market covariates	✓	✓	✓
Manufacturing share	✓	✓	✓
Tract & year FEs	✓	✓	✓
Region-by-year FEs	✓	✓	✓
Kliebergen-Paap $F$ -statistic	400.8	401.6	392.0
Number of observations	469780	469780	469780

\*  $p < .1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors in parentheses, clustered at the census tract level. Each cell represents a coefficient from a separate regression. Chinese home purchase share is equal to the number of homes whose purchaser has a Chinese last name divided by total purchases times 100. Local labor market covariates include population, employment rate and average annual wage, at the county level.