ERASMUS UNIVERSITY ROTTERDAM
Erasmus School of Economics
Bachelor Thesis [Urban, Port and Transportation Economics]

The degree of housing speculation driven by prosperous economic signal: evidence from the Free Trade Zone establishment in China

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Date final version: 09/08/2022

Abstract

The real estate market is often a widely discussed topic. It has influence on not only the economy, but the wellbeing of the society. This thesis examined the effect of favourable economic signal: a free trade zone establishment on housing speculation in China. The result proves that there is a continuous increase in the price gap between the benefited cities and unaffected cities after the announcement. This suggests a high level of speculative involvement in the housing market as the speculators foresee the positive influence on the economy.

Keywords: housing market, speculation, free trade zone, economic growth

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1 Introduction

Housing has always been a controversial topic to discuss. On one hand, having new residential houses can accelerate the city's development and offer work opportunities for the locals, which can improve people's living conditions; on the other hand, it arrives with some potential social problems. For example, housing speculation that leads to unaffordable housing. People are buying a house for investment purposes, that allowing them to sell it later in time at a higher price. Depending on the momentum, house prices could soar to an unaffordable range for most of the residents, making the living condition of middle and lower class more difficult, and deteriorating the discrepancy between the rich and poor. This speculative demand for housing deviates from the original supply and demand equilibrium and such construction boom will bring no additional spill over effects to the economy as people are not moving in. When the bubble bursts, it will bring severe damage to the economy.

There are several factors that influence the speculative demand for housing, such as rising economic prosperity, ease of credit access and low mortgage rates (Nielsen, 2022). According to Acharya & Richardson (2009), the financial crisis of 2008 is largely contributed by the popping of housing bubble and unsustainable mortgage issuance practices in the US. The financial industry fell. This crisis had a knock-on effect on other countries which consequently led to a global recession. As a result, excess housing speculation implies a potential threat to the economy and lesson must be learned to prevent history repeating itself. While speculation driven by the ease of mortgage and credit issuance can be monitored by regulations, speculations based on economic prosperity cannot be balanced out by regulations easily. This is because a healthy economy is always growing, and no policymaker would scarify economic growth to curb housing speculation.

Economic prosperity can be built on many factors, international trade is one example. Schneider (2005) proves a positive relationship between foreign imports of high-technology goods and domestic innovation. He further demonstrates the stronger impact of foreign technology on per capita GDP growth than domestic ones. Based on the law of comparative advantage, countries can specialise in the production of certain products, and sell to each other. This partnership can achieve maximum efficiency, which more products can be produced at a cheaper price. If barriers to trade is eliminated, it would certainly be good news to the economy as firms can seek cheaper inputs from aboard and produce at a more competitive price. To eliminate trade barriers, a country can unilaterally establish a Free Trade Zone (FTZ), that allows foreign goods and services to enter and exit the specially designated areas freely without being subjected to customs regulations. It also serves for learning and re-export purposes. Within the FTZ territory, there are several benefits for businesses, such as ease of doing business, lower tax rates, and freedom of foreign exchange. Thus, an FTZ could stimulate economic growth in terms of trade and investment.

Interestingly, a substantial continuous appreciation in house prices is observed across many cities from 2016 onwards in China. At the same time, in September 2016, the Chinese government announced the establishment of a few FTZs across 7 provinces next year in 2017. As pointed out by Nielsen (2022), rising economic prosperity can lead to housing speculation, as speculators may foresee such policies positively influencing the economy, creating more employment and opportunities, thus pushing up the demand for luxuries and assets in the future. Therefore, there might be a link between the FTZ policy and housing speculation. This thesis will focus and research on the following research question: *"how does the free trade zone policy trigger housing speculation in the policy-affected cities?"* This study selects China as the object of study since it fits the purpose of this study: this wave of house price

appreciation could be a result of housing speculation on favourable economic conditions perspectives – Free Trade Zone policies announcement introduced by the government.

This research is socially relevant as speculation in the housing market is common phenomena in every country and the example in China serves as a warning sign for other countries as the house price in China is at an extreme level. According to the data on Numbeo (2022), for instance, the house price to income ratio[1] in Shanghai is 50.96, compared to New York of 9.42. This number in Shanghai suggests that one must spend all their life to repay the mortgage. This variation in price between Shanghai and New York can be explained by speculation effect. Moreover, the current observations in the Chinese housing market expose its vulnerability to over-speculation, there are some worrying trends: massive debt default by the most prominent house construction company Evergrande last year in 2021 (Stevenson & Li, 2021); some house owners are protesting and threatening the banks to stop paying mortgages as the construction companies are unable to finish the housing projects in many cities recently due to illegal lending practices[2] (Gunia, 2022); and some rural small banks defaulted in Henan recently (Taplin, 2022). These events may not be interconnected, but it is a warning sign for society since house prices are tightly connected with GDP growth and people's wealth. Therefore, necessary research on housing speculation should be conducted. Furthermore, no study has been conducted on the impact of the Free Trade Zone policy on housing speculation in specific, this thesis could fill the gap and give a contribution to the current scientific literature. Some insight into the Chinese housing market is expected to be delivered by answering the research question. Relevant authoritative statistical data is collected from the Chinese National Bureau of Statistics (NBS) and municipal bureau of statistics of each city in this study. The result of this thesis shows that the speculation effect on benefited cities is a once off 6% appreciation compared to the price level of 2005 in the same year when the FTZ policy was announced.

The thesis will be divided into five parts. First, an extensive overview of the housing market will be provided, followed by a literature review section where arguments of scholars in this field will be discussed, and hypotheses will be drawn. Then, a methodology section regarding data collection and relevant mathematical models used will be explained in detail. An empirical analysis section will be given afterwards where the calculation is conducted, and results are obtained and analysed. Lastly, in the closing section, a conclusion will be drawn and recommendations to the policymakers and society will be provided.

[1] Numbeo defines the price to income ratio as an average 90m^2 house in the city, divide by the average annual income after tax, the ratio is expressed in years.

[2] In China, it is a common phenomenon people are paying the full amount either in cash or through a bank loan, to the developers before the houses are built.

2 Background to the housing market in China

2.1 Economic dependency on real estate development

Real estate has a considerable influence on the Chinese economy. Over the last few decades, China has become increasingly urbanised as people were migrating to cities from rural areas. Data from the National Bureau of Statistics of China (NBS) shows that from 2002 to 2021, there is a 3.21% annual average growth rate in the urban population whereas an average decline of 2.34% annually in the rural population (NBS, 2022). An influx of migrants and a growing population pressurised the housing market and pushed up the demand for housing in the cities. At the same time, the demand for housing created many job opportunities both within the industry and related ones, which consequently improved living standards and boosted the economy. According to Ren (2021), real estate and related value chains contribute to 17% of the Chinese GDP and act as a growth engine for the economy. Similarly, Cai Jing Shi Yi Ren (2021) states that the share of real estate to GDP is 20%. They also argue that real estate contributes 40% of government revenue and represents 60% of household assets. These rates are genuinely concerning as it creates a dependency of the real estate market on the Chinese economy.

Is there still any room for future growth in the real estate industry, or is it possible for the market to expand forever? In 2017, the Southwestern University of Finance and Economics China Family Finance Survey and Research Centre (CHFS) released a report, stating that there are 65 million empty residential houses in China and the rate of vacancy is as high as 21.4%. This rate is increasing each year (CLS, 2018). Moreover, given the demographic problem in China -- population decay, the future of the real estate market is highly uncertain. A study conducted by the Shanghai Academy of Social Science shows that the Chinese population is expected to shrink as early as 2022 and drop to less than half of what it is today by the end of the century (Peng, 2022). Soon, urbanisation and internal migration will reach its peak and the population size will start to shrink, given such a high vacancy rate already exists in the present, it suggests that there is already too much supply of houses than needed. Therefore, real estate-driven economic growth is unsustainable and will decline eventually.

2.2 Housing speculation

Given the potential oversupply of houses, the property price remains extremely high. In fact, housing prices rising faster than income is a common phenomenon across many cities in China. By comparing the NBS (2022) data of 35 major cities and provincial capitals in 2010 and 2018, most of the cities are getting more expensive to live in. The most extreme case is in Shenzhen, where the house price per square metre to an annual disposable income ratio has risen from 0.5868 in 2010 to 0.9634 in 2018. This means that to buy a 100m^2 house in Shenzhen, an average person must save all their net income for 58.68 years in 2010 and this number rose to 96.34 years in 2018. In real life, it will take much longer as a person has other necessary expenditures. This means buying a house is nearly impossible for an average person in Shenzhen. The following most expensive cities to buy a house in are Xiamen, Beijing and Shanghai which are going to take 66.18, 60.00 and 45.15 years respectively. The cheapest city on this list is Changsha, which is 17.45 years, still expensive. In contrast, the worst house price to household income ratio in the US is 9.8, 9.1 and 8.3 years in Los Angeles, San Jose, and San Francisco respectively, with the national average being 5.4 only (Delgado, 2021). Despite the figures for the US are measured in household income, even if the numbers

are adjusted -- multiplied by two to get a ratio for individuals, the comparison shows that the house prices in the US are still more affordable in contrast to the astonishing figures in China. It is exceedingly difficult for an average person to buy a house in China otherwise the person must acquire a loan and repay their mortgage for the rest of their life. Therefore, the housing market in China is unhealthy and unsustainable. There is a high degree of uncertainty on price stability and whether the bubble is going to burst at some point in the future.

One possible explanation for this dramatic house price appreciation is housing speculation. The reason for people to invest in the property market could be: 1) land is scarce, as city expands and population grows, there is a constraint on space development. Since private ownership of land in China is not possible, owning a private house is an alternative way of investing in land. 2) the Chinese stock market is not performing well in general, and it is too volatile, speculators may be hindered by the risks. 3) savings lose its purchasing power by sitting in the bank because of inflation, and house prices appreciation is larger than deposit rates.

Yang et al. (2017) showed there is a clear sign of housing speculation across examined cities in their study on China and the speculative behaviour influences each other in space. In China, due to custom, most of the new houses are sold unfurnished, with nothing but concrete surfaces. Due to its speculative nature, people buy houses for investment, but they do not live in those houses. As mentioned in the previous section, the study conducted by CHFS shows a vacancy rate is as high as 21.4%, and these empty houses are now becoming ghost towns, where no people live. This situation is more severe in second and third-tier cities. The vacancy rate of empty houses highlights the fundamental problem of housing speculation, inflating the demand which pushes up the price and undermines the affordability of those who actually demand a house for themselves and their family. Regarding the motives of the speculators, Chen and Wang (2021) identified two types of speculative traders, the fundamentalists who trade based on fundamental value and chartists who trade on momentum. They conclude that speculative demand is highly dependent on government policies on the housing market.

To tackle the problem of excessive speculation in the housing market, the Chinese government implemented the so-called limited house purchasing order in some major cities in 2010. Such policy requires residents to meet certain criteria to be eligible to buy a house, it aims to curb transaction from the demand side. This policy varies across cities, but it mainly allows only local households to buy a second home or non-local households who are working in the city and have been paying income tax for up to 5 years consecutively to be qualified of purchasing one housing unit (Xinhua, 2011). In theory, such strict restrictive house purchase policies should slow down the overheated market and bring the price down to a more reasonable level. Indeed, based on the research conducted by Cao et al. (2015) on 70 Chinese cities, a substantial decline in property price and transaction volume was observed when the policy was first introduced in 2010. In fact, since the policies were introduced, the supply side of housing construction has slowed down. According to the NBS data, in 2012, the areas of newly completed houses became relatively stagnant, with only an average growth rate of 1.10% in the following decade, compared to 11.65% in the previous decade. In some years such as 2015, 2017, 2018 and 2020, there was even a decline in the growth rate. These rates signal that the real estate development in China and housing supply may have reached a peak.

However, when evaluating the house prices again today after more than ten years, prices in cities like Shenzhen and Xiamen tripled over the decade, whereas people’s incomes were growing at a slower rate. People’s ability to buy a house has further deteriorated. Interestingly, after the research of Cao et al. in 2015, house price was raising much faster and the effectiveness of the restrictive policies is questionable in the long term.

2.3 Future perspectives

Only if the Chinese economy is performing well, all the stakeholders are fulfilling their obligations, (i.e., the developers are delivering the houses, home buyers are repaying the mortgages on time) and the price of housing does not drop significantly, the life cycle of the bubble may last longer. However, this is unsustainable. In the event of something going wrong with any interested party, it would have severe knock-on effects on the real estate market and may consequently cause the Chinese economy to collapse, because the real estate sector is tightly linked to many other industries and investments.

Since strict covid measures and hard lockdown across the country from 2020, people were unable to leave their houses, causing a systematic breakdown in the economy, people cannot engage in the production front, and companies are facing unprecedented challenges. There are some worrying signals on the housing market starting from last year in 2021 when the biggest housing developer Evergrande defaulted on its debts. It should be noticeable that the housing developers rely on prepayment from the buyers before the project is finished. They simply repeat the cycle of borrowing more money from the banks, investing in new projects and preselling. Therefore, the debts are getting higher and higher. The government knows this problem, which is why the government earlier in the prior year, announced three red lines stating that developers must not have a debt to assets ratio over 70% excluding prepayments from buyers; net debt ratio over 100%; quick ratio over 1 (Xinhua Net, 2020).

In fact, government intervention added volatility to the housing market and these hard measures put pressures on developers and it passed down to the buyers eventually. Recently, developers across more than 10 provinces are unable to finish the housing projects, leading to house owners stopping to repay their mortgages to the banks (Gunia, 2022). While this incident may still be manageable, it exposes the vulnerability of the real estate sector in China. It creates distrust among the buyers. Once the price started to fall, the damage to the economy is unpredictable as it affects developers' profitability and government revenues, unemployment will rise, and households' net wealth will depreciate substantially.

3 Literature review

A Free Trade Zone is defined as a unilateral specially designated area that allows foreign goods to enter and exit the country freely without being subject to customs duties. Within the FTZ territory, there are several benefits for businesses, such as ease of doing business, lower tax rates, and freedom of foreign exchange. It also serves for learning and re-export purposes and consequently stimulating economic growth. In September 2016, the Chinese central government announced that seven additional Free Trade Zones (FTZ) will be set up in Liaoning, Zhejiang, Henan, Hubei, Chongqing, Sichuan, and Shaanxi, across seven provinces in the next year (Sina News, 2016). These zones spread around different geographic locations in China, including the coastal regions and further inland. As promised, in April 2017, this policy was fully implemented. This was a major positive economic signal released by the government.

House price is determined by various factors and there is no study that has been carried out on the influence of free trade policy on housing speculation in specific. However, Sutton (2002) proved favourable economic condition has a positive effect on the change in house prices. According to the study led by Huang et al. (2017), they proved there is a substantial benefit to the Shanghai economy because of the first Pilot Free Trade Zone establishment in September 2013. They have conducted a counterfactual analysis that what would have happened to the Shanghai GDP if the FTZ policy was not implemented. The results highlight the increasing importance of FTZ on the Chinese economy. The effects of FTZ in Shanghai cause an increasing difference in the GDP in percentage terms. Therefore, they claim that the economic reform and opening are successful. The policy does not only facilitate trade, but also other areas including institutional innovation, service industry openness, financial deregulation, and political guarantee. Their findings are congruent with Fan et al. (2022) that despite the effects of FTZ on economic outcome varies depending on the city, an FTZ establishment has a positive effect on production and development in the port areas. Similarly, Schneider (2005) conducted a panel data of study on developed and developing countries and proved that high-technology imports can stimulate domestic innovations in both developed and developing countries; foreign technology also has a stronger impact on GDP per capita growth than domestic ones. Schneider's paper highlights the importance of imports and international trade in general. Likewise, Volovik (2016) also argues that the FTZ agreement between the Eurasian Economic Union and Vietnam in 2016 will significantly increase their trade turnover. In relation to the research topic, this thesis is testing the effect of FTZ on the cities of the third batch establishment. To calculate the economic effects, the impact on traded volume after the policy needs to be examined first. Therefore, the first hypothesis in this thesis is that: *the establishment of Free Trade Zones leads to more volume traded in the benefited cities".* If it turns out that the trade volume does not increase in these benefited cities, it will be hard to explain the trade-driven economic growth and consequently leading to housing speculation because of the positive trade patterns.

Moreover, the influence of international trade on house prices is supported by Richardson et al. (1974). Richardson et al. developed a regression model on location choice and tested the urban house prices in Scotland and claim that housing characteristics, general spatial variables, accessibility, and environmental quality determine the house prices in the urban areas. In terms of accessibility, imports improve the variety of products, a free trade policy aims at eliminating the barriers to import, which would increase the accessibility to more goods and services, and thus contribute to a higher house price. Similarly, Leung (2001) established a link between international trade and housing prices and built a simple dynamic general-

equilibrium model to connect the two. In his model, he argues that the housing prices and the price of non-tradable goods relative to tradeable goods, tend to increase over time in small open economies. He claims that a change in the tariff rate affects the tax factor which will influence the marginal product of adopting an additional intermediate good and consequently leads to a change in the economic growth rate. Once economic growth is observed, growth in the housing market and house prices will follow. He argues that the housing market is less sensitive to the tariff policies than the goods production sector because a change in the tariff rates only affects capital inputs since land is given, i.e., the elasticity of growth of the housing market and housing prices is smaller than the economic growth rate that is driven by lowering tariff rates. Hence the house prices tend to grow at a slower rate than economic growth. Like Leung, Xu and Tang (2014) studied the determinants of house prices in the UK for the period 1971 to 2012 and argue that construction cost, credit, GDP, interest rate and unemployment rate have a positive impact on house prices. On the contrary, Borowiecki (2009) found that in the Swiss housing market, GDP has only minor impacts on the determinants of housing prices in the short run, suggesting that the house price growth should not exceed GDP growth at the same period.

In these papers, there is no mention about speculation, so it can be assumed that their models do not take speculation into account. If their arguments are still valid today and can be applied to the case in China in this study, a clear speculation sign can be explained if the housing prices are more sensitive and growing faster than economic growth in the same period. This thesis will deepen the investigation, in relation to housing speculation on the Free Trade Zone policy announcement in China. Therefore, it leads to the second hypothesis of this thesis: *housing prices tend to grow faster than the economic growth rate in the same period in the cities with a Free Trade Zone*. If this phenomenon is observed, it could be attributed to housing speculation.

In relation speculation in specific, Levin and Wright (1997) studied the housing market in London and the UK and found that the house prices are autocorrelated with the historic price, suggesting this phenomenon is caused by speculation. Even though the motive of the home buyers is not necessarily to speculate as there are transaction costs, but they may take a speculative position regarding the timing of the purchase and sale contract. Buyers may adjust their decision based on the current economic environment and future projection. Wang and Zhang (2014) investigated the changes in the fundamental factors of demand and supply of houses in China and argue that the house price should follow local economic performance. In their model, the house prices in the coastal cities that are significantly deviated from the predicted number and much larger. In their paper, they suggest there is an investment demand for housing and residents in the coastal regions are in general richer than residents inland, which drives up the prices of housing. Therefore, housing speculation could be the reason why annual housing price appreciation in coastal cities is as high as 15 – 20 per cent while inland cities only have 2 – 5 per cent. Wang and Zhang's findings are congruent with what Leung (2001) and Borowiecki (2009) suggests, the growth in house prices should be smaller than and should not exceed the economic growth rate when there is no speculation.

On the other hand, Chen and Wang (2021) explicitly categorised house prices into two components: macroeconomic variables and speculation factors. They identified two types of traders, the fundamentalists who trade based on fundamental value and chartist traders who trade based on momentum. The former demand is derived from personal disposable income while the latter one is derived from expected returns. They also highlight the role of the banking sector that boosting the housing market in China, and it is the main source of speculative behaviour. In comparison, unlike the housing market China, which is beyond the affordable

range, the rapid house price appreciation in Malaysia is not caused by speculation in the housing market, even though a house is also regarded as a financial asset and people also invest in the housing market, the appreciation can be offset by the raising income (Wong et al., 2019). Likewise macroeconomic conditions explained most of the variation of house prices in Chile and there is a low margin of speculative behaviour (Idrovo-Aguirre et al., 2021). These two examples are an indication of what a healthy housing market. This also highlights the housing market in China is problematic.

Nonetheless, macroeconomic variables and speculation should be interconnected. If economic prosperity pushes up input prices, i.e., inflation, people will demand a higher wage, so their disposable income will increase. Then, people will increase their consumption and thus leading to higher demand. Higher demand will push up the price. If people foresee a price appreciation in the future, they may demand more in the present which allows them to make temporal arbitrage profits. Hence, the third hypothesis in this thesis will test the effects of external economic shocks on housing speculation: *housing speculation is observed in the benefited cities by the Free Trade Zone establishments*. An FTZ allows foreign goods and services to enter the country border in some designated areas without being subject to customs tariffs. This is essential for international businesses that demand foreign components and re-export. It will create employment and contribute to economic growth. Housing speculations could explain the variation in price as people may believe that the economic environment in the benefited cities will be improved due to the establishment of Free Trade Zones.

4 Methodology

4.1 Data collection

In order to obtain authoritative data, relevant data is extracted from the National Bureau of Statistics of China (NBS) and the annual reports of each municipality from the municipal statistics bureau of the sample. These data sources are regarded as reliable as the government has the best access to data and therefore the data should be accurate and representative.

The house price data is from the NBS. The dataset consists of a monthly house price index across 70 large and medium-sized cities, compared with last month. The sample size of cities in this study is subject to the data available from the NBS. The studied period ranged from 2005 to 2019. When making this research, there are a few adjustments to the dataset. First, the monthly non-accumulative index will be recalculated and converted into an accumulative annual index with the 2005 number normalised to 1. Second, since this study is based on the third batch of Pilot Free Trade Zone establishment in 2017, cities which have FTZ established prior to the announcement are excluded from this study. These cities include Shanghai, Guangzhou, Xiamen etc. which were the first batch and second batch benefited cities in 2013 and 2015. Furthermore, cities that would become FTZ benefited cities between 2017 and 2019 are also excluded as they are no longer qualified to be control cities in this study. These cities include Qingdao, Shijiazhuang, and Nanjing. Therefore, after the selection process, the sample size is sieved down to 50 cities with 40 control cities and 10 treatment cities.

Table 4.1 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Treatment					
Price	150	1.422	.306	1.000	2.585
GDP per capita	150	57948.64	32432.67	6754	145545
Trade	150	145.18	158.61	.52	586.32
Control					
Price	600	1.411	.314	.990	2.863
GDP per capita	600	48673.71	32194.66	4600	180000
Trade	600	137.37	382.54	.34	2866.35

Note: period of observation is from 2005 to 2019. House price is expressed as an index relative to the price level of 2005, which is normalised to 1. GDP per capita is expressed in CNY. Trade is expressed in billion CNY.

Relevant attributes of cities are collected from the annual reports of each city's statistics bureau and the summary statistics is shown on Table 4.1. Since this study is on the influence of FTZ on house prices, trade volume expressed in Yuan will also be collected. It is noticeable that trade volume was measured in USD rather than CNY in some municipalities before a certain date or some cities just use USD throughout the period. To convert the number into CNY to make the number consistent, the average exchange rate of that year will be used. Another important indicator that will be used is the annual GDP of the city. To make the statistics comparable across cities, the GDP figure will be adjusted according to the population

size, namely GDP per capita. It is important to know that the GDP per capita figure is unavailable in some municipal annual reports. To calculate this figure, annual gross GDP will be obtained and divided by the municipal population of that year. The calculation method of GDP per capita varies depending on the city, some are based on household registered population, and some are based on permanent population. The difference is that people can be registered in one place and live in another. For this study, these differences will be ignored and assumed to be the same since they are only causing minor variations in the GDP per capita figure.

4.2 Trade volume and growth

The first hypothesis is to test whether the trade volume has increased in the cities where the Free Trade Zone is established. The aim is to establish a relationship between free trade and economic growth. The sum of the total trade statistics of the 10 treatment cities will be collected. Since the policy will come into effect in 2017. To analyse this, a Chow Break test will be performed. This test was proposed by econometrician Chow (1960), this test is used in time series to find whether there is a structural break at a given period, which is suitable for this study. While comparing trade volume with GDP would be an alternative method, it is important to know that there are different factors driving GDP growth. In another word, the share of trade to GDP may vary each year. By testing annual trade patterns directly, an increasing value of trade requires more investment and will create more employment, hence it can be assumed that it will stimulate economic growth. In addition to the data until 2019, two extra years of observation on trade is available on the original source. To measure the trade effect more accurately, these additional years of data will be included in this break test.

There are a few steps to do the Chow break test. First, in the pre-break equation, or the restricted model (1), $Trade_t$ is the dependent variable, trade volume at time *t*, expressed in billion yuan; $Year_t$ is the independent variable, time, expressed in years; all the betas are a numeric coefficient: beta zero is the intercept and beta one is the slop, and the epsilon is a random error. Since the study period is from 2005 to 2021, 2005 can be normalised to year 1. The formula can be written as follows:

$$(1)\ Trade_t = \beta_0 + \beta_1 * Year_t + \varepsilon$$

The difference between the post break equation (2) and the pre-break equation (1) is that the letter gamma being added to the coefficients, beta. The intuition is that if there is no break, the trade patterns before 2017 and after 2017 are the same, the gamma coefficients will be zero and the two equations are the same. The post-break regression can be expressed as follows:

$$(2)\ Trade_t = (\gamma_0 + \beta_0) + (\gamma_1 + \beta_1) * Year_t + \varepsilon$$

Similarly, the two equations can be combined in a full model (3) with a dummy variable *d* with a value of 0 before the break and 1 after the break and the interaction term between the dummy and year. If a break exhibits in 2017, the parameters of gammas will be different from 0, which each following a different trade pattern before and after the policy. Otherwise, there is no break in the data points. The full model can be written as follows:

$$(3)\ Trade_t = \beta_0 + \beta_1 * Year_t + (d * \gamma_0) + (d * \gamma_1) * Year_t + \varepsilon$$

Lastly, in the following function of the Chow F test (4), the subscript *F*, and *R* stands for the full model and the restricted model respectively. *q* is the number of restrictions, in another word, the number of coefficients in the restricted model, which in this case, 2. *p* is the number

of variables in the full model, which in this case, 3. *n* is the number of data points, which is 17. The equation is written as:

$$(4)\ CHOW\ F_{q,n-p-1} = \frac{(R_F^2 - R_R^2)/q}{(1-R_F^2)/(n-p-1)}$$

R^2 is the coefficient of determination, which represents the proportion of the variance for a dependent variable that can be explained by the independent variable. It can be calculated by

$$(5)\ R^2 = 1 - \frac{RSS}{TSS}$$

In formula (5), RSS stands for the residual sum of squares, which tells how much the difference between the actual trade value and the one the model predicted; TSS stands for the total sum of squares, it tells the difference between the actual trade value and the average of trade value. These values can be calculated from the regression equation:

$$(6)\ RSS = \sum_{i=1}^{n} (Trade_i - f(Year_i))^2$$

$$(7)\ TSS = \sum_{i=1}^{n} (Trade_i - avg\ f(Year_i))^2$$

After all the necessary computation, the Chow F value obtained can be compared with the critical F value with 2, 13 degrees of freedom. If the Chow F value is larger than the critical F value, it can be concluded that the break exists and the value of traded goods indeed increases.

4.3 Comparing house prices and economic growth

The second hypothesis of this thesis is to compare the growth rate between house prices and the economy and whether house prices are growing faster than the economic growth rate in the cities that are having a Free Trade Zone. To do this, both the annual house price growth and the annual economic growth of the 10 treatment cities will be collected for the time period 2017 to 2019. GDP per capita will be used as an economic performance indicator throughout this study as it is more directly comparable between cities when accounting for the population size. There are 3 years of data and 10 cities, in total there are 30 data points. For the comparison, a paired t-test will be performed. The aim of a t test is to compare whether two groups are different from each other, which is a best fit for this hypothesis. It matches the GDP growth with house price growth for a specific city in a specific year. The letter *t* is the test statistics that will be examined. $\overline{D}$ refers to the average difference between the house price growth rate and the GDP growth rate. S_D is the standard deviation of the differences. Lastly, *n* is the sample size. The formula of the t-test can be written as follows:

$$(8)\ t = \frac{\overline{D}}{\frac{S_D}{\sqrt{n}}}$$

The degree of freedom is defined as the sample size minus one. Therefore, the degree of freedom varies depending on the sample size. A different degree of freedom and significance level will lead to a different critical t value. For this sample, the degree of freedom will be 29. The selection of significance level is a trade-off between precision and information and throughout this study, a significance level of 5% will be used. By allowing mistakes to happen less than or equal to 5% at a time, better information can be obtained. A lower significance level would make the answer range wider for which the answer is no longer valuable. A 5% significance level is also the most used in academic research. If the result is larger than the

absolute critical t-value, a conclusion can be drawn that the two datasets are significantly different from each other otherwise there is not enough evidence to prove one is larger or smaller than another.

4.4 Speculation effects

To answer the third hypothesis, a synthetic cohort control model will be conducted to examine the effects of the Free Trade Zone policy on housing speculation. The reason for using this model is due to randomisation of control cities or finding an exact matching control city is not possible in this setting. A synthetic control model gives the best approximation to what would happen to the treatment if the event did not occur. In this thesis, the speculation effect can be concluded from the variation of house price growth patterns between the treatment and control cities. To set up the model, there two terms to be explained:

Treatment cities

A treatment city is where the Free Trade Zone was established in April 2017. This is the third batch of cities that is established with an FTZ. There are 14 cities across 7 provinces that received the benefit.

The filtered dataset includes 50 cities, 10 of which are the treatment cities, and the rest are potential control cities. The list of cities is shown in Appendix A. These 10 treatment cities are out of the 14 policy-benefited cities. Due to the house price data being unavailable in the NBS dataset for the remaining 4 cities, they are therefore not included in this study. Since in the synthetic model there is only one treatment variable is allowed, therefore, an average of the ten cities will be calculated and placed into the model.

Control cities

A control city, on the other hand, remains the same as before, throughout the study period. To select which cities are appropriate to be included in the control study, a synthetic control model will be applied. This model evaluates the attributes of all the cities and matches the similarity between the potential control cities and the treatment cities according to these attributes. It then assigns a certain weight to each of the control cities. If a control city varies a lot from the treatment cities before the treatment period, less weight will be assigned. In the formula, *p* stands for price and *w* stands for weight. At a given time *t*, the synthetic treatment house price will be the sum of house prices in of all the control cities times their weights. Such a formula can be depicted as follows:

$$(9)\ p_t = \sum_j w_j * p_{jt}$$

This model will construct a counterfactual treatment, which simulates a synthesised treatment group to a maximum similarity level. In this study, GDP per capita and trade volume in CNY will be used as the attributes. The free trade policy was effectively implemented in April 2017, but the announcement was first made in September 2016. Having a Free Trade Zone implies more economic activities are taking place, thus pushing further economic growth. Since speculators are aware of temporal arbitrage and may foresee future price growth, they would have bought a house as soon as they received the news. Therefore, to measure the policy

effect on the treatment of cities more accurately, the policy break should be set in 2016.

Lastly, to compare these two models, whether the actual treatment outcome and the counterfactual outcome are statistically different from each other, a paired t-test, as equation (8) will be performed.

5 Empirical analyses

5.1 Trade volume test

The summary statistics of the Chow break test for trade volume between the period 2005 to 2021 is illustrated on Table 5.1. Both the restrictive and full models show an extremely high R square value, meaning that the regression explains the variation of the model well. When the dummy variable representing the time after the policy was implemented and the interaction term added to the model, the R square value only increased by 0.018, the new R square value is 0.966, compared to 0.948 in the restricted model. Both models have explanatory power on predicting the trade patterns. Based on the p values, which both are 0.000, it can be concluded that they are significant at 5% significance level. Furthermore, the calculated Chow F value is 4.623 based on the R^2 of the restricted and full models, it is larger than the critical F value of 2.763 with 2,13 degrees of freedom. This suggests that the full model can predict well on the trade patterns and the additional variables added explanatory power to the equation.

Table 5.1. Summary statistics of the Chow break test.

Model	*R square*	*Adjusted R square*	*R square change*	*F change*	*Df1*	*Df2*	*p > F*	*Chow F*
(2)	.952	.948	.948	294.66	1	15	.000	
(4)	.972	.966	.018	42.55	3	13	.000	4.623

Note: model (2) corresponds to the restricted model which having the variable year. Model (4) corresponds to the full model which additional dummy variable d, whether the time is after the policy date 2017 or not, and the interaction term between the dummy variable d and year. Df stands for the degree of freedom, Df1 for the numerator and Df2 for the denominator.

Table 5.2. Coefficients of the two models.

Variables	***Model (2)***	***Model (4)***
constant	15.938	147.709
	(119.423)	(118.989)
year	183.965	160.931
	(11.655)***	(16.167)***
d		-2282.588
		(928.785)**
d*year		169.295
		(63.239)**

*Note: model (2) corresponds to the restricted model which having the variable year. Model (4) corresponds to the full model which additional dummy variable d, and the interaction term between the dummy variable d and year. The year is expressed as a continuous number from year 1 to year 17, which representing from 2005 to 2021. The dummy d represents whether the time is after the policy date 2017 or before. The standard deviation is shown between the brackets. ***p<0.01, **p<0.05, *p<0.10.*

The regression results are shown on Table 5.2. Model (2) shows the value of trade is growing consistently by 188.965 billion yuan each year starting from 2005 and it is significant at the 1% level. Similarly, the year coefficient in model (4) is also significant at the 1% level, while the dummy variable and the interaction term are significant at 5% significance level. A visual representation of the trend graph is depicted in Figure 5.1. Therefore, the results prove there is a structure break as the coefficient of *d*year* illustrates the trade volume increased by an additional 169.295 billion yuan each year after 2017 on top of the original 160.931 billion.

In summary, there is a significant break in the dataset in the year 2017 and the value of trade increases significantly. Based on available data, the effects of the Free Trade Zone policy on stimulating imports and re-exports, and the consequent economic growth driven by international trade, can be observed. This result is in line with the claims of Leung (2001) that lowering tariff rates would stimulate economic growth.

However, true effects of FTZ policy on trade might be even larger. At the same time as the FTZ established, there was a trade war between the US and China under Trump's administration. The US has imposed heavy tariffs on Chinese imports and China also retaliated on US goods in return. The intense relations between the two biggest economies might have a negative impact on global trade and discourage international businesses. Moreover, there is a global pandemic outbreak from 2020 causing countries to enforce citywide lockdowns. Given such external threats to trade, the growth in trade volume still significantly increased, it proves that the FTZ policy indeed adds to economic prosperity and congruent with Shanghai's case studied by Huang et al. (2017). Thus, speculator may foresee the positive influence of the FTZ policy and therefore allowing them to speculate in the housing market.

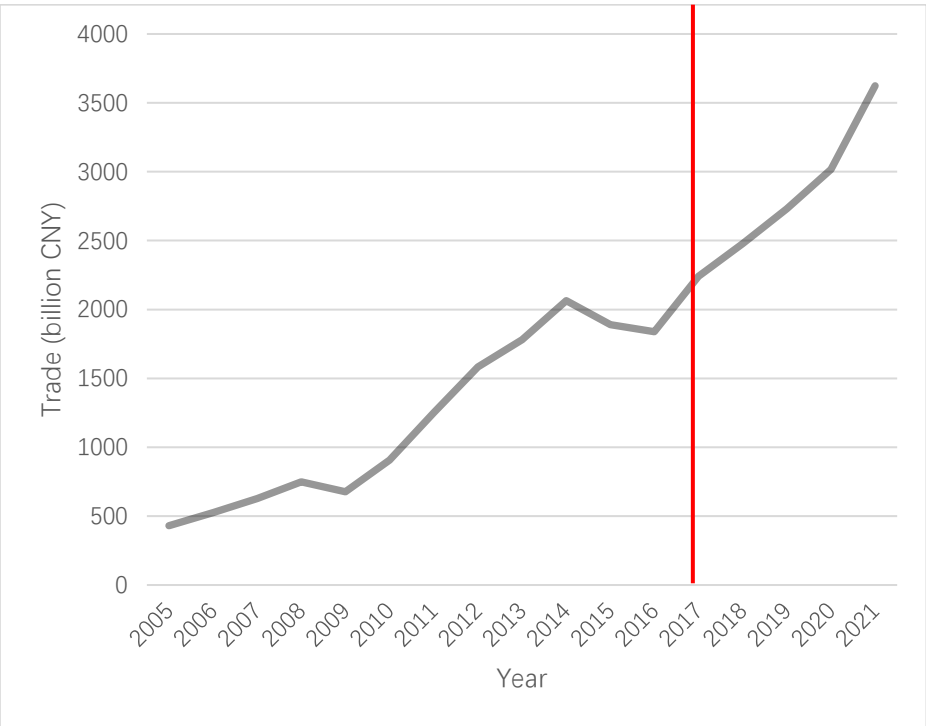

Figure 5.1. Value of trade in the 10 treatment cities, 2005-2021.

Source: Annual reports of each municipal statistics bureau.

Note Value of trade is expressed in billion yuan. The red vertical line represents the break in 2017.*

5.2 Growth rates test

The summary result of the paired t-test between house prices and GDP per capita for the ten treatment cities in the period 2017 to 2019 is shown on Table 5.3. In this test, the degree of freedom is 29, which implies that the critical t value is 1.699 at a 5% significance level. The results of this paired t-test show that the t-value is 0.4872. This value is less than 1.699, which implies there is not enough evidence to prove that the paired growth rates are significantly different from each other. In another word, the number zero falls between the confidence intervals, meaning that the differences between house price growth and GDP growth per capita can be negative or positive. Therefore, a conclusion of the house price growth rate is faster than the GDP growth rate in the policy-affected cities cannot be drawn.

Table 5.3. Summary statistics of the paired t-test

	Obs.	*Mean*	*Std. Err.*	*Std. Dev.*	*95% Conf. Interval*
House price	30	0.0914	0.0098	0.0534	(0.0715, 0.1113)
GDP per capita	30	0.0836	0.0094	0.0517	(0.0643, 0.1029)
Difference	30	0.0078	0.0161	0.0882	(-0.0251, 0.0408)

Note Obs. Stands for the number of observations, it is how many data points are included in the study. The remaining numbers represent the growth rates of house prices and GDP per capita. Std. Err. Stands for standard error; Std. Dev. Stands for standard deviation, and 95% conf. Interval stands for a 95% confidence interval.*

Hence, the result neither supports nor rejects the argument of Leung (2001) that the elasticity of house prices is smaller than the economic growth. On contrary, the fact that the house price and GDP growth are remarkably close may suggest that they are tightly connected to each other and may influence each other in time.

Despite the evidence is not strong enough, an annual increase in house prices by 9.14% is clearly not easy for wage workers, from the point of view of someone who wants to buy a house. However, it is a decent return from an investor's perspective. This rate beats the bank deposit rates of approximately 2% and the approximate return on financial assets of 4%. It does encourage people to invest in the housing market as the stock market is maybe too volatile and people believe that properties are safe assets that would only appreciate in the long run, unlike money loses its value to inflation.

5.3 Speculation test

Table 5.4. Balance of the predictors

	treated	*synthetic*
GDP per capita	47738.82	47723.63
trade	113.51	113.11

Note GDP per capita is expressed in annual average in CNY. The trade value is expressed in an annual average in billion CNY.*

The synthetic control test matches the attributes with the treatment group before the break in 2016 and stimulates a counterfactual group of treaded cities after the break. After the house price data is optimised by the algorithm, weights are assigned to the control cities. The table of weights is illustrated in Appendix B. From the table, Baotou received the most weight, being 0.131, and the rest are just assigned about one or two per cent.

The root mean square predicted error (RMSPE) of this model is 0.0209. this number tells the average difference between the predicted value and the actual value before the policy was announced. Table 5.4 shows the balance of the predictor attributes between the treated cities and the synthetic treated cities. Both two predictors, GDP per capita and trade between the treated cities and the synthetic treated cities are remarkably close. This suggests that the synthetic cities are a good predictor for the counterfactual study. Figure 5.2 illustrated that the synthetic treated cities are close to the treatment cities before the policy break. However, there are some differences between the two, for example, in 2009, the gap between the house prices is roughly negative 3 per cent and 4 per cent in 2015, compared to the 2005 price level. The gap figure is depicted in Figure 5.3. In other years, the differences are less than 2 per cent.

Table 5.5. Post policy price synthetic t test

	Treated	*Synthetic*	*Diff*
Price	1.798	1.693	.105
	(.211)***	(.163)***	(.049)**
Observation	4	4	4

Note: price is expressed as an index of price in 2005; *standard deviation is shown between the brackets. ***p<0.01, **p<0.05, *p<0.10.*

Based on Figures 5.2 and 5.3, a slightly faster rate of house price appreciation can be seen in the treatment cities after the policy was announced in 2016. However, the rest of the cities also follow an appreciation trend. The house price gap is around 6 per cent between the treatment and synthetic treatment, in the first two years after the announcement, and this discrepancy deepened in 2018 to 13% and it further deepened to 16% in 2019. Lastly, a t test is performed to test the differences of the result between the treatment and synthetic treatment.

The result is shown on Table 5.5, and it shows there is indeed a significant difference between the two. This variation in the price appreciation can therefore be concluded as the speculation effect. This finding provides support for the FTZ policy's influence in the housing market that people would speculate on their expectation on positive economic conditions driven by the FTZ policy. In fact, the FTZ policy may have spill over effects on other industries.

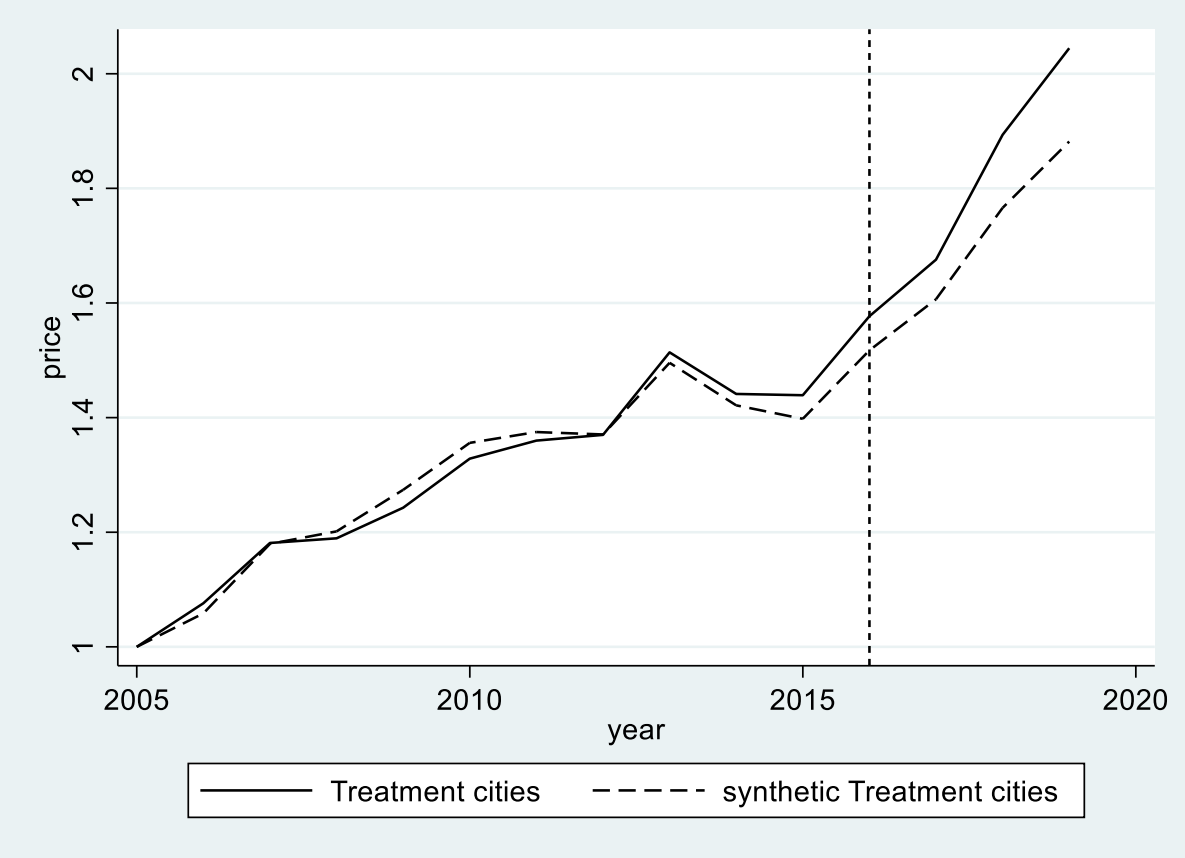

Figure 5.2. Comparison between house prices in the treatment cities and the synthetic treatment cities, 2005-2019.

Note The house price is expressed in relative terms of which the price in 2005 normalised to one. The dashed line represents the time the Free Trade Policy was announced in 2016. The synthetic treatment cities are made up of forty control cities matched with two attributes: GDP per capita and trade volume. The intuition of the synthetic model is what would have happened to these cities if the policy did not take place.*

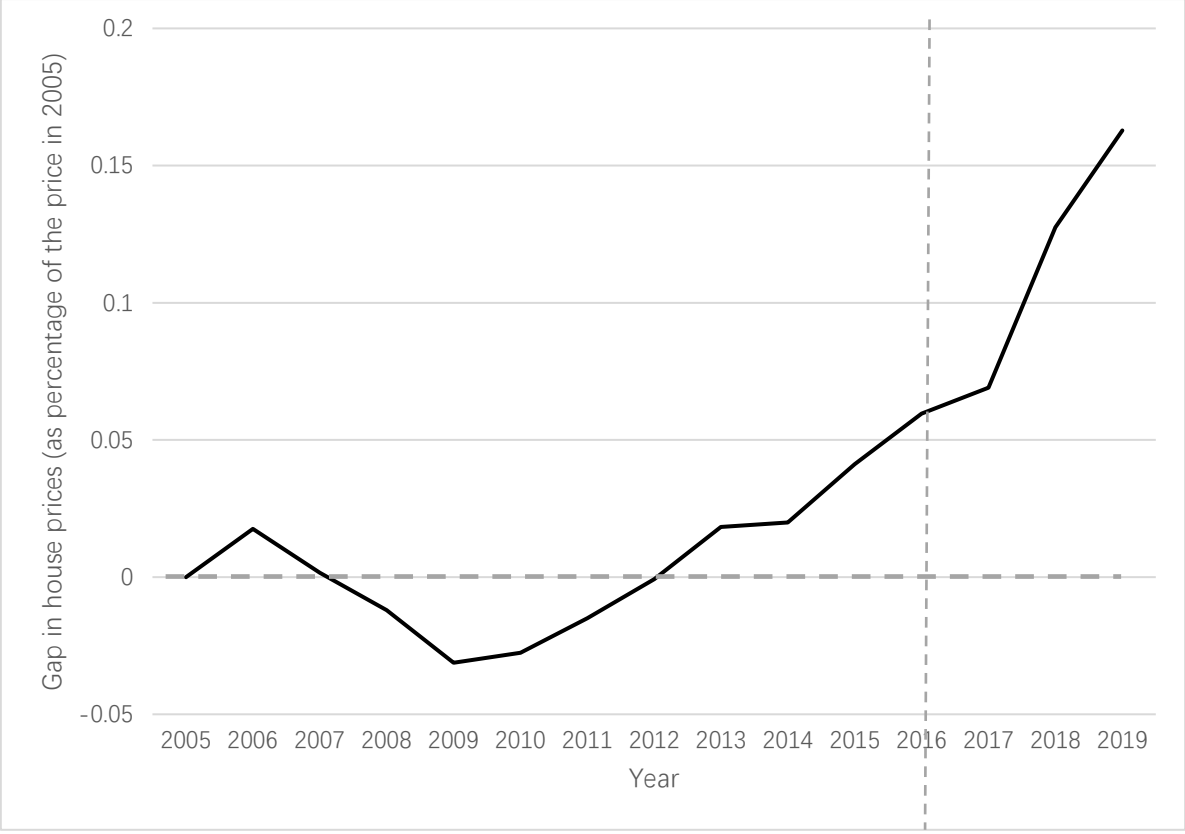

Figure 5.3. Differences between the house prices in the treatment cities and synthetic treatment cities, 2005-2019.

Note the vertical dashed line represents the announcement of the Free Trade Zone policy in 2016. The horizontal dashed line represents the gap between the treated cities and the synthetic treated cities. The gap is expressed in the percentage of the 2005 price level.*

6 Conclusion

This thesis conducted a few tests on the impacts of the Free Trade Zone policy on housing speculation. The trade volume test supports the free trade policy is able to stimulate more trading activities, and the trading pattern is significantly deviating from the pre-policy growth. From this result It is possible that the trading engagement contributes to additional GDP growth after the policy implemented. These findings align with the scholars' argument as explained in the literature review section. In fact, given some negative macroeconomic factors like the trade war between the US and China and Covid-19 yet the volume traded still maintaining a high level of growth, the actual benefits may be even larger if these negative events did not happen. The growth rate test shows that there is not enough evidence for a faster rate of growth in house prices than in GDP. Nonetheless, given the high house price growth, this implies a strong incentive for citizens to invest in the property market thus may lead to housing speculation. Finally, in the speculation test, the results revealed that there is a continuous impact of the FTZ policy on the house prices in the policy-benefited cities. The discrepancy between the treated and control cities are getting larger as time goes by.

Based on these tests, a conclusion can be drawn that there is significant evidence to support that speculation in the treated cities is based on positive economic prosperity that is driven by the Free Trade Zone policy announcement in 2016. In fact, most of the control cities also experienced an increase in house prices at the same time as the treated ones. This brings to the limitation of this research: first, there is a lack of previous study on housing speculation on Free Trade Zone policy, which is challenging while conducting the literature review; second, data availability and sample size. The NBS only has house price data on the 70 cities in their sample size, data of some other treated cities are not available and cannot be included in this study. The result obtained for the treatment is only partially true and does not reflect the whole picture. Moreover, due to time constraint of this research, in the synthetic control test, only two variables are used in the matching process which maybe inadequate to find a perfect match. Third, in the synthetic test, the pre policy gap is as high as 4% in 2015, it is higher than other years before this date which are just around 2%. It is possible 2015 is the starting point of the divergence in house price. One possible explanation is speculator already foresee the policy is likely to be announced for these cities as early as 2015. Furthermore, the lasting appreciation in the recent years could be driven by other, which this thesis fails to consider. In fact, housing speculation can be based on other factors as well, such as income and location, but those factors are omitted in this study. Lastly, the case study of housing speculation in China may not be a suitable reference for other countries since society is different from each other.

Undeniably, real estate has a substantial contribution to the Chinese economy over the past few decades and restructured China in many ways and a large speculative behaviour is observed throughout the country. Nevertheless, being largely dependent on real estate development, is a threat to the economy, especially given the huge bubbles in the prices. Once the bubbles burst, the economy may collapse. To make the market become healthy, sustainable, and properly functioning in China, it should not restrict people's rights to acquire one but stop housing speculation. Over speculation drives up the price and inflated the demand on the expenses of a future potential crisis, just like the global financial crisis in 2008. To reduce speculation, it can be done by imposing a capital gains tax, speculation tax, or a sales ban for a considerable period of time. This would strongly discourage speculator buyers since the tax would outweigh the gains and the money cannot be withdrawn quickly. The drawback is it would involve additional administrative costs which taxpayers would need to

pay for, and the identification of speculator buyers would be hard to judge. However, given that there is a strong speculation on favourable economic conditions, it is possible to implement such policy to hinder the speculators at the same time allowing the economy to prosper. Such a policy would encourage real buyers that demand a house of their own at an affordable price and less threat to the economy by the overdependency on housing development. A recommendation to future research is that to study the effect of such policies on housing speculation.

Appendix A List of studied cities

Control Cities	Treatment Cities
Anqing	Chengdu
Baotou	Chongqing
Beihai	Dalian
Beijing	Luoyang
Bengbu	Luzhou
Changchun	Shenyang
Changde	Wuhan
Changsha	Xian
Dali	Yichang
Dandong	Zhengzhou
Ganzhou	
Guilin	
Guiyang	
Hangzhou	
Hefei	
Hohhot	
Huizhou	
Jilin	
Jinhua	
Jining	
Jinzhou	
Jiujiang	
Lanzhou	
Nanchang	
Nanchong	
Ningbo	
Pingdingshan	
Qinhuangdao	
Quanzhou	
Shaoguan	
Taiyuan	
Urumqi	
Wenzhou	
Wuxi	
Xining	
Xuzhou	
Yinchuan	
Yueyang	
Zhanjiang	
Zunyi	

Appendix B List of weights

Cities	Weight
Anqing	.019
Baotou	.131
Beihai	.021
Beijing	.019
Bengbu	.02
Changchun	.024
Changde	.021
Changsha	.029
Dali	.019
Dandong	.021
Ganzhou	.019
Guilin	.02
Guiyang	.021
Hangzhou	.028
Hefei	.023
Hohhot	.031
Huizhou	.022
Jilin	.023
Jinhua	.023
Jining	.021
Jinzhou	.021
Jiujiang	.02
Lanzhou	.022
Nanchang	.024
Nanchong	.019
Ningbo	.023
Pingdingshan	.02
Qinhuangdao	.021
Quanzhou	.023
Shaoguan	.02
Taiyuan	.024
Urumqi	.024
Wenzhou	.022
Wuxi	.036
Xining	.021
Xuzhou	.022
Yinchuan	.023
Yueyang	.021
Zhanjiang	.02
Zunyi	.019

Appendix C: Synthetic cohort results

YEAR	TREATED	SYNTHETIC	DIFF
2005	1.000	1.000	0
2006	1.076	1.058	0.018
2007	1.181	1.180	0.002
2008	1.189	1.201	-0.012
2009	1.243	1.274	-0.031
2010	1.328	1.356	-0.028
2011	1.360	1.375	-0.015
2012	1.370	1.371	-0.001
2013	1.514	1.496	0.018
2014	1.441	1.421	0.020
2015	1.439	1.398	0.041
2016	1.577	1.517	0.060
2017	1.676	1.607	0.069
2018	1.894	1.766	0.127
2019	2.045	1.882	0.163

Appendix D: Timeline of the establishment of the Free Trade Zones

Batch	***Time of approval***	***Name***	***City***
1	29/09/2013	China (Shanghai) Pilot Free Trade Zone	Shanghai
2	21/04/2015	China (Tianjin) Pilot Free Trade Zone	Tianjin
		China (Fujian) Pilot Free Trade Zone	Fuzhou, Xiamen
		China (Guangdong) Pilot Free Trade Zone	Guangzhou, Shenzhen, Zhuhai
		China (Shanghai) Pilot Free Trade Zone	Shanghai *(expansion)*
3	01/07/2017	China (Liaoning) Pilot Free Trade Zone	Shenyang, Dalian, Yingkou
		China (Zhejiang) Pilot Free Trade Zone	Zhoushan
		China (Hubei) Pilot Free Trade Zone	Wuhan, Yichang, Xiangyang
		China (Henan) Pilot Free Trade Zone	Zhengzhou, Luoyang, Kaifeng
		China (Chongqing) Pilot Free Trade Zone	Chongqing
		China (Sichuan) Pilot Free Trade Zone	Chengdu, Luzhou
		China (Shaanxi) Pilot Free Trade Zone	Xian
4	16/10/2018	China (Hainan) Pilot Free Trade Zone	Hainan Island
5	27/07/2019	China (Shanghai) Pilot Free Trade Zone	Shanghai *(expansion)*
6		China (Shandong) Pilot Free Trade Zone	Jinan, Qingdao, Yantai
		China (Jiangsu) Pilot Free Trade Zone	Nanjing, Suzhou, Lianyungang
		China (Guangxi) Pilot Free Trade Zone	Nanning, Qinzhou, Congzuo
		China (Hebei) Pilot Free Trade Zone	Baoding, Shijiazhuang, Tangshan,
		China (Yunnan) Pilot Free Trade Zone	Kunming, Honghe, Dehong
		China (Heilongjiang) Pilot Free Trade Zone	Harbin, Heihe, Suifenhe
7	21/9/2020	China (Beijing) Pilot Free Trade Zone	Beijing
		China (Hunan) Pilot Free Trade Zone	Changsha, Yueyang Chenzhou

		China (Anhui) Pilot Free Trade Zone	Hefei, Wuhu, Bengbu
		China (Zhejiang) Pilot Free Trade Zone	Hangzhou, Ningbo, Jinhua

Source: Wikipedia.

References

Acharya, V. V., & Richardson, M. (2009). Causes of the financial crisis. *Critical Review*, *21*(2-3), 195–210. https://doi.org/10.1080/08913810902952903

Borowiecki, K. J. (2009). The Determinants of House Prices and Construction: An Empirical Investigation of the Swiss Housing Economy. *International Real Estate Review*, *12*(3), 193–220.

Cai Jing Shi Yi Ren. (2021). *房地产现状：20%GDP、40%财政收入，60%家庭资产*. [Real estate status: 20% GDP, 40% fiscal revenue, 60% household assets]. Retrieved from: https://www.163.com/dy/article/GQAQPP9B0552NZ1I.html

Cao, J., Huang, B., & Lai, R. N. (2015). On the effectiveness of Housing Purchase Restriction Policy in China: A difference in difference approach. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2584275

Chen, Z., & Wang, C. (2021). Effects of intervention policies on speculation in housing market: Evidence from China. *Journal of Management Science and Engineering.* https://doi.org/10.1016/j.jmse.2021.08.002

Chow, G. C. (1960). Tests of equality between sets of coefficients in two linear regressions. *Econometrica*, *28*(3), 591. https://doi.org/10.2307/1910133

CLS. (2017). *西南财大：全国住房空置率超 20% 二三线城市情况尤为严峻*. [Southwest University of Finance and Economics: The national housing vacancy rate exceeds 20%, and the situation in second- and third-tier cities is particularly severe]. Retrieved from https://www.cls.cn/detail/304587

Delgado, M. (2021). *U.S. House Prices Are Rising Exponentially Faster Than Income (2021 Data).* Real Estate Witch. Retrieved from https://www.realestatewitch.com/house-price-to-income-ratio-2021/

Fan, G., Xie, X., Chen, J., Wan, Z., Yu, M., & Shi, J. (2022). Has China's Free Trade Zone Policy Expedited Port Production and development? *Marine Policy*, *137*, 104951. https://doi.org/10.1016/j.marpol.2021.104951

Gunia, A. (2022). *China's mortgage boycotts are spreading and could get worse*. Time. Retrieved from https://time.com/6198624/china-mortgage-boycotts/

Huang, D., Van, V. T., Hossain, M. E., & He, Z. (2017). Shanghai Pilot Free Trade Zone and its effect on economic growth: A counter-factual approach. *Open Journal of Social Sciences*, *05*(09), 73–91. https://doi.org/10.4236/jss.2017.59006

Idrovo-Aguirre, B. J., Lozano, F. J., & Contreras-Reyes, J. E. (2021). Prosperity or real estate bubble? exuberance probability index of real housing prices in Chile. *International Journal of Financial Studies*, *9*(3), 51. https://doi.org/10.3390/ijfs9030051

Levin, E. J., & Wright, R. E. (1997). Speculation in the housing market? *Urban Studies*, *34*(9), 1419–1437. https://doi.org/10.1080/0042098975493

National Bureau of Statistics. (2022). *National data.* Retrieved from https://data.stats.gov.cn/

Nielsen, B. (2022). *Why housing market bubbles pop*. Investopedia. Retrieved August 5, 2022,

from https://www.investopedia.com/articles/07/housing_bubble.asp

Numero. (2022). *Property Prices Comparison Between Shanghai and New York, NY.* Retrieved from: https://www.numbeo.com/property-investment/compare_cities.jsp?country1=China&country2=United+States&city1=Shanghai&city2=New+York%2C+NY

Olarreaga, M. (2016). Trade, Infrastructure, and Development. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.2893415

Peng, X. (2022). *China's population is about to shrink for the first time since the great famine struck 60 years ago. Here's what it means for the world*. The Conversation. Retrieved from: https://theconversation.com/chinas-population-is-about-to-shrink-for-the-first-time-since-the-great-famine-struck-60-years-ago-heres-what-it-means-for-the-world-176377

Qijia. (2022). *有钱人如何绕过限购* [How rich people can bypass purchase restrictions]. Retrieved from: https://zixun.jia.com/article/1059475.html

Ren, Z. (2021). *房地产对经济金融影响的量化测算* [Quantitative Calculation of Real Estate's Impact on Economy and Finance]. Retrieved from: https://finance.sina.com.cn/zl/china/2021-10-29/zl-iktzscyy2363864.shtml

Richardson, H. W., Vipond, J., & Furbey, R. A. (1974). Determinants of Urban House prices. *Urban Studies*, *11*(2), 189–199. https://doi.org/10.1080/00420987420080341

Schneider, P. H. (2005). International Trade, economic growth and Intellectual Property Rights: A panel data study of developed and developing countries. *Journal of Development Economics*, *78*(2), 529–547. https://doi.org/10.1016/j.jdeveco.2004.09.001

Sina News. (2016). *我国新增7 自贸试验区年底或挂牌 中央认同自贸区战略成功* [Our country's 7 new pilot free trade zones may be listed at the end of the year, the central government recognizes the success of the free trade zone strategy]. Retrieved from: http://finance.sina.com.cn/china/gncj/2016-09-01/doc-ifxvqcts9084760.shtml

Stevenson, A., & Li, C. (2021). *China Evergrande defaults on its debt. now what?* The New York Times. Retrieved from https://www.nytimes.com/2021/12/09/business/china-evergrande-default.html

Sutton, G. D. (2002). Explaining changes in house prices. *BIS Quarterly Review*, (6), 46–55.

Taplin, N. (2022). *China's rural banking smash-up*. The Wall Street Journal. Retrieved from https://www.wsj.com/articles/chinas-rural-banking-smash-up-11658730968

Volovik, N. (2016). Free trade zone between Eurasian Economic Union and Socialist Republic of Vietnam comes into force. *SSRN Electronic Journal*, *10*, 20–24. https://doi.org/10.2139/ssrn.2856456

Wang, Z., & Zhang, Q. (2014). Fundamental factors in the housing markets of China. *Journal of Housing Economics, 25*, 53–61. https://doi.org/10.1016/j.jhe.2014.04.001

Wong, W. L., Lee, C., & Koong, S. S. (2019). Housing prices in Peninsular Malaysia: Supported by income, foreign inflow or speculation? *International Journal of Housing Markets and Analysis*, *12*(3), 424–441. https://doi.org/10.1108/ijhma-01-2018-0001

Xinhua. (2011). *Beijing issues new rules to limit house purchase*. China Daily. Retrieved August 5, 2022, from https://www.chinadaily.com.cn/china/2011-02/16/content_12028324.htm

Xinhua News. (2020). *“三条红线”下房企难再任性买买买*. [Under the "Three Red Lines", it is difficult for real estate companies to buy and buy arbitrarily]. Retrieved from http://www.xinhuanet.com/fortune/2020-09/11/c_1126479980.htm

Xu, L., & Tang, B. (2014). ON THE DETERMINANTS OF UK HOUSE PRICES. *International Journal of Economics and Research*, *5*(2), 57–64.

Yang, X., Wu, Y., Shen, Q., & Dang, H. (2017). Measuring the degree of speculation in the residential housing market: A spatial econometric model and its application in China. *Habitat International*, *67*, 96–104. https://doi.org/10.1016/j.habitatint.2017.06.005