The Reaction of Housing Price to the Change of Hukou Policy across China

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Abstract: The unique Hukou system in China has created an "invisible wall" between rural and urban China, in which urban residents enjoy social benefits far better than rural residents. It is common in China that a rural migrant striving hardly just to get an urban Hukou. Meanwhile, the increasing trend of housing price in China during the past decade has also been a contentious and interesting topic. This paper is trying to study whether there is some linkage between Hukou policy change and housing price in 34 cities across China, with the data from China Data Center run at the University of Michigan. The analysis suggests that the effect of Hukou policy change on housing price is not as substantive as widely thought by general public and the author himself. In most cases of the sample, the time effect seems to be relatively larger.

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Overview of the Hukou System – History, Function, and Reform

The Hukou system in China is a record of household registration, which is required by law in the People's Republic of China. It officially identifies a person as a resident of an area, urban or rural, and includes identification information such as name, parents, spouse, siblings and date of birth. China's Hukou system became law in 1958, when the National People's Congress passed its "Regulations on Household Registration in the People's Republic of China." Under the Hukou system, every Chinese citizen is assigned either a rural (agricultural), or urban (nonagricultural) Hukou classification under prefecture level. Thirty years ago, an urban Hukou provided food, cotton clothes, edible oil coupons, and entitlements to other scarce goods such as bikes and watches. In addition, an urban Hukou provided guaranteed job opportunities which would never be lost unless someone retired or voluntarily quitted. Housing would also be offered by the local governments and employers either free or at a very low cost, though the property rights of the houses still belonged to the government. Nowadays, an urban Hukou provides free primary and secondary education, as well as other benefits such as health cares and retirement benefits in that particular city. In contrast, a rural Hukou only provides access to farmland, and that's all they can get with their Hukou – no education reimbursement or health insurance. In China, whether one is entitled to receive these benefits is solely based on his/her Hukou location (Fan 2003).

The huge difference in social welfare between a rural Hukou and an urban Hukou lays the foundation of vast rural-to-urban labor migration. The urban–rural divides have been revealed in Chinese cities as social segmentation and inequality between the urban residents who have local urban Hukou status and rural migrants who live and work in urban areas without urban Hukou status (Jiang, Lu and Sato 2008). Although the rural migrants contribute significantly to the city

construction and are acknowledged as the key factor in the booming of manufacturing industries in the urban area, the Hukou registration policy discriminates against these migrants as “floating population” and denies them equal access to social welfare programs in comparison to the local urban residents. The Hukou policy forms an “invisible wall” and “a dual society” in Chinese cities: migrants earn higher incomes than their rural counterparts, but under the urban–rural segmentation policy, their incomes are much lower than the local urban residents (Wong and Wai-Po 1998). It was extremely hard for a rural citizen to achieve an urban Hukou unless one could marry to an urban person or obtain a job in urban sector, which was hard because most of rural labor was unskilled. In this sense, the experience for rural citizens in China is much like a foreigner struggling for a green card in the United States.

It was not until 1980s when such a strict migration control began to relax. The demand for labor in urban areas increased rapidly as the result of urbanization. Some local governments, mostly small cities, began to grant urban Hukou to rural migrants followed a certain criteria such as a stable urban job and residing in selected towns and cities for more than two years. A deeper Hukou reform took place from 1997 to 2002. Wang (2004) identified four main aspects of this reform:

(1) Relaxing the migration control for certain selected groups of people such as elderly parents, children, and skilled workers in small cities and towns

(2) Abolishing rural-to-urban migration quota system in small cities and towns

(3) Erasing rural/urban distinction in the Hukou system in small cities and towns

(4) Introducing the “Hukou for talents and investments” program nationwide

The 1997–2002 Hukou reform has relaxed and decentralized migration control mechanisms, mainly in the small cities and towns, but has not touched the social-political control functions of

the system. The majority of the over 100 million migrants or "floating population" still appears to be unable to change the location of their Hukou permanently, especially in big cities like Shanghai, Beijing, Guangzhou and Shenzhen, which I will call them the "Big Four" in this paper.

Chinese Housing Market Data Overview: Source, Construction and Problems

The dramatic rise of housing prices in cities across China during the past decade has generated global interest among investors, policy makers, and scholars. Due to China's rising economic importance, there has been growing concern that a potential housing price bubble in China and its aftermath would be a catastrophe not only to China but also to the world economy. Especially after the collapse of the subprime mortgage market in the United States, which caused the largest economic crisis since the Great Depression, many economists are now raising questions about the stability of housing prices in China given its extraordinary boom in values and its growing share of global growth (Deng, Gyourko, and Wu, 2012).

A high-quality housing price indicator is of enormous importance, especially in a relative nascent market like China. The improper intervention policies by the central government may directly lead to great damage to the housing market if the price indicator has transmitted incorrect signal due to systematic errors. Currently two official housing price indices are regularly updated in China, namely, the "Average Selling Price of Newly-Built Residential Buildings" (also known as "Average Price Index") and the "Price Indices for Real Estate in 70 Large and Medium sized Cities" (also known as "70 Cities Index"), both of which are calculated and reported by the National Bureau of Statistics of China. They provide the only consistent sources for analysis of Chinese housing prices. However, both two indices are seriously mistrusted and widely criticized, unfortunately, and a thorough study by Wu, Deng, and Liu (2011) indicated that both two indices are seriously downward biased.

According to the most authoritative housing market website (www.realestate.cei.gov.cn) in China (analogous to the Department of Housing and Urban Development in the United States), the "Average Price Index" covers all Chinese cities since 1998. It is the obligation by law for all real estate developers in China to report their monthly business indicators to the statistics agency of their local government, including the total volume (in floor area) of newly-built housing units sold within this period and the total price of these units, which are then reported to the National Bureau of Statistics of China for calculation. By aggregating these reported figures at various levels, and dividing the total price by total floor area of the transacted units, the average housing prices are calculated and then reported at the city, province, and national level, respectively. On the other hand, the "70 Cities Index" originally covered 35 major cities since 1998 and then expanded to 70 cities in 2005. In each month, statistical authorities of the local government send technicians to sample housing complexes to collect raw information on house transaction prices. Again, these data are then reported to the National Bureau of Statistics of China for calculation. The matching approach, one that mimics the resale price index which is widely used in many developed countries, is then adopted to calculate the index.

After data collection and calculation, the National Bureau of Statistics of China publicizes "Average Price Index" and "70 Cities Index" on the *Statistics Yearbook of China*. The detailed methodologies (which are not the main interests of this paper) can be found on the paper "House Price Index Construction in the Nascent Housing Market: The Case of China" (Section 3.1 and 3.2) by Wu, Deng, and Liu (2011). Their analyses suggest that the simple average pricing method fails to account for housing quality adjustment and hence are downward biased during the sampling period due to the ongoing trend of housing suburbanization and building density increasing in most Chinese cities. On the other hand, although the matching approach perfectly

controls for the complex-level quality changes and has been proved to work well in the resale sector, it does not account for developers' pricing behaviors (details about this is on Section 2.3) in the newly-built sector, hence this method can also lead to a downward bias during the sampling period. The authors then applied a hedonic method, which controls both quality changes over time of sales and developers' pricing behaviors in 35 major newly-built housing markets, and they provided the first multi-city constant-quality housing price index in China. The complete construction can be found on Section 3.3 of the same paper.

The data for this paper, however, is obtained from the Yearbook Database maintained by the China Data Center (CDC) here at the University of Michigan. In particular, from the *China Urban Living and Price Statistical Yearbook*, the author of this paper gained the data for selling price of residential housing per square meter in 34 large-scale and medium-scale cities from 1998 to 2007 (i.e. these are just the Average Price Index mentioned above). Population and the average real wage per employee per year for the 34 cities are gained from *China City Statistical Yearbook*, while the data for the counties that are under the jurisdiction of municipality are eliminated from the sample, so that only data in the urban area are considered in this study.

The Chinese government did not start to report the data in the real estate market until 1998, so the data for the housing price before 1998 is not available. Other than the problem mentioned by Wu, Deng and Liu (2011), the author of this paper identifies one more potential problem: the corruption between local and central governors by misreporting the data in order to get higher government expenditure or career promotion. In addition, the author finds that data for big cities such as Beijing and Shanghai are much more abundant than other medium and small cities, some of which have a huge time gap in data reporting and thus are calculated by the author himself. Since the hedonic data is still not open to the general public, despite of these pitfalls just

mentioned, the author will stick to the data from China Data Center because they are, at least for now, the most trustworthy data at hand.

Research Interest of this Paper

This paper will focus on the fourth aspect of the 1997-2002 Hukou reform mentioned in the first section. From as early as 1994, some big cities such as Shanghai and Shenzhen began to issue the "Blue-Stamp Hukou" policy to attract high-technology talents and capital investments for the rapid pace of modernization and further boosting their economy. In addition, since houses were distributed either free or at a very low cost to urban citizens as welfare of an urban Hukou, there was a huge supply surplus where the housing constructed and under construction far outnumbered the actual housing sold (See Figure 1). Therefore, many unsold houses emerged and local governments wanted to clear those inventories eagerly. The "Blue-Stamp Hukou" policy, first started to experiment in Beijing, Shanghai, Guangzhou, and Shenzhen, stipulated that one could gain a "temporary" urban Hukou for buying a house in that city with a one-time full payment, and that temporary "blue-stamp Hukou" would become a formal/permanent urban Hukou after that person has stayed in that city for at least five years ("Documents regarding to Execution of the "Blue-Stamp Hukou" Policy").

On the other hand, the remaining 30 cities have not started this policy until 2002. Following the "Big Four", these medium and small cities began to adopt the policy one after another, ranging from 2002 to 2005. However, unlike the "Big Four", these cities offered a different deal: a rural citizen could gain a "formal/permanent" urban Hukou in that city and enjoy the corresponding welfare instantly as long as he/she buys a house in that city with a one-time full payment. The incentives for these local governments are similar to those of the "Big

Four", and now this policy continues to spread in many small cities across China as a method to solve the problem of excessive housing inventories.

In order to study how the housing price reacts to the change of Hukou policy across different cities in China, the author will start by analyzing the price reaction to the end of Hukou policy in the "Big Four" case (2001 in Beijing, 2002 in Shanghai, and 2003 in Guangzhou and Shenzhen). Then the author will apply similar methods to the other 30 cities, which started the policy ranging from 2002 to 2005. The discussions will focus on: Does the change of Hukou policy have any effect on the housing price? Is it still a significant factor after we account for the overall trend of the housing price? What does the price trend look like before and after the change of Hukou policy? And are there any differences among those cities after doing some case studies and comparisons?

Methodology and Model Construction

The author started to construct the model by generating a bunch of indicator (dummy) variables, mainly city dummy and Hukou dummy. City dummy includes 34 cities which equals to one if it refers to that particular city and equals to zero if not, whereas Hukou dummy equals to one if that particular city was in the Hukou policy execution period (i.e. greater or equal to the policy start year and smaller or equal to the policy end year) and equals to zero otherwise. Then the author also coded the time variable as a continuous variable by generating trend equals to year minus 1998 so that it can reflect the overall trend of housing price. The author further generated more interaction terms: Hukou interacts with city and trend interacts with city, through which the former reflects the effect of Hukou policy change on the housing price for each city and the latter reflects the overall housing price trend for each city.

The first model of interest, with the simplest motivation and interpretation, is:

$$\ln\text{Price} = \sum_{i=1}^{34} \alpha_i \, \text{City}_i + \sum_{i=1}^{34} \beta_i \, \text{City}_i * \text{Hukou}_i + u$$

This model measures the mean difference of housing price for each city when the Hukou policy changes i.e. the "total" effect of Hukou policy change on the housing price for each city, without considering the overall time trend of the price change for that city.

In order to learn whether the effect of Hukou policy change is still significant in the overall trend of price change, the author generated the second model of interest, which is:

$$\ln\text{Price} = \sum_{i=1}^{34} \delta_i \, \text{City}_i + \sum_{i=1}^{34} \theta_i \, \text{City}_i * \text{Hukou}_i + \sum_{i=1}^{34} \varphi_i \, \text{City}_i * \text{trend}_i + \eta$$

This model can not only reflect how the price reacts to the change of Hukou policy, but also consider the effect in the context of the overall price trend in each city so that we can try to analyze if the Hukou policy change on the housing price is still significant or not, i.e. the "partial" effect of Hukou policy change on the housing price for each city.

The "Total" Effect of Hukou Policy Change (Model 1)

Beijing, Shanghai, Guangzhou, and Shenzhen are the four most developed cities in China. In terms of GDP, they accounted for 9.6% of the national total in 1998. Guangzhou and Shenzhen were the first several cities which were opened to the world market and achieved favored policies very different from the rest of China, such as corporate income tax holidays for three years and free duty for imports that were for export processing purposes. They were the forerunners of the national economy reform in 1978 and enjoyed rapid economic and trade growth since the opening of China (Wang and Li, 2004). Shanghai, the largest city in China, did not have much change between 1980 and 1990, but it started to take off since 1991. In the early 1990s, the opening and development of Pudong as a special economic zone pushed Shanghai to the forefront of the second round of national economic reform movement. This opened Shanghai

to the outside world and boosted Shanghai's economic development. In the 1990s, the annual growth rate of Shanghai's GDP exceeded 12 percent, making it a period of the fastest economic development in Shanghai's history. Since then, Shanghai has evolved from an industrial and commercial city to the economic center of China (Yang, 2002). As the capital of China, Beijing is the nation's political, cultural, and educational center. It is home to the headquarters of 70% of China's largest state-owned enterprises (SOE). The state sector was the “commanding height” of the planned economy, and SOE were the main players in the national economy for a long time in the Chinese history because they enjoyed fiscal advantages and more public finance resources, as compared to other small and private firms. China has a long history of favoring particular regions or cities, in particular the “Big Four” (Henderson, 2003). Figure 2 shows the income growth of the “Big Four”, as compared to the national average level.

Due to a continuous need for further development which required further investment, both physical capitals and human capitals, the “Big Four” issued the “Blue-Stamp Hukou” policy in mid-1990s, and stopped the policy in 2001 for Beijing, 2002 for Shanghai, and 2003 for Shenzhen and Guangzhou. The estimated coefficients from Model 1 show the “total” effect of the Hukou policy change on the housing price for each city. Starting from 1998, the real estate market of the “Big Four” was booming (Figure 3) and richer people across China gained the chance to “buy” an urban Hukou in the most developed cities in China. Below are some summary statistics, calculated by the author using the data from Statistical Yearbook of the corresponding city, about what has happened in the “Big Four” during the “Blue-Stamp Hukou” policy execution years (on next page):

City Name	Hukou Policy Duration	Change (%) in real estate investment	Number of people who gained blue-stamp Hukou	% new Hukou holders to total population in 2002	% migrants with college education
Beijing	1998 - 2001	100.71%	190,000	1.67%	17.82%
Shanghai	1998 - 2002	123.47%	280,000	2.09%	19.34%
Guangzhou	1998 - 2003	89.48%	170,000	3.05%	12.61%
Shenzhen	1998 - 2003	107.46%	150,000	6.72%	15.37%

Since the Hukou policy had such a "positive" impact on the housing market, one may wonder why the "Big Four" stopped the policy, ranging from 2001 to 2003. There is no related literature that could explain why this is the case. However, combining the table above as well as the news and articles during 2001 to 2003, the author argues that potential reasons could be the worry about the over-heated investment in real estate market and the over-population problem caused by the under-qualified migrants to the urban area. For example, the Development and Reform Bureau of Shenzhen declared in 2003 that "we have issued approximately 150 thousands Blue-Stamp Hukou in the past six years, and to some extent, this has stimulated the development of Shenzhen, especially in the real estate market. However, the policy is hard in controlling the quality of migrants so we decide to stop the Blue-Stamp Hukou policy from now on" ("The end of Blue-Stamp Hukou in Shenzhen"). This is somehow in concord with the summary statistics above and may verify the author's hypothesis, since the large proportion of people who had no more than 12 years of education was contradictory to one of the main purposes of the issue of the "Blue-Stamp Hukou" -- attracting high-technology talents across China into big cities.

Results from model 1 reflect what happened to the housing price in the "Big Four" when the Hukou policy ended. Without considering the overall trend, the housing price in all "Big Four" experienced a drop in price due to the cancellation of the Hukou policy, with the largest

decrease in Guangzhou of 28.60%, and 25.37% in Shanghai, 18.62% in Shenzhen and lowest decrease in Beijing of 16.91%, with statistical significance at 5% level (See also Figure 4 for a visual comparison).

Given the standard deviation of the log price is 0.395121, the price drops in all "Big Four" cities are substantively significant. This implies the end of policy quickly cooled down the real estate market of the "Big Four." In fact, the amount of investment in real estate market has decreased by 2.1%, 2.3%, 2.4%, and 1.7% in Guangzhou, Shanghai, Shenzhen and Beijing, respectively. The quick drop of housing price may also imply the fact that the Hukou control in the "Big Four" is very strict, indicating that buying a house is the only way to gain a Hukou in the "Big Four" – once the Hukou policy ends, the demand for housing will decrease instantly because there is no other way to gain a local Hukou. After 2003, the "Blue-Stamp Hukou" policy has never appeared again in the "Big Four".

Following the pace of the "Big Four", other medium and small cities across China also began to adopt the policy of "buying houses in exchange of local Hukou", ranging from 2002 to 2005, and the policy continues to exist in some cities now. It is clear that the estimated coefficients are positive with statistical significance at 5% level for every city, as we may expect. Without considering the overall time trend, this suggests that the Hukou policy has done a good job in alleviating the excessive housing inventory problem and boosted the real estate market across all cities in the sample (See also Figure 5, 6, 7, 8 for a visual comparison). The average "total" effect of Hukou policy change on the housing price across 30 cities is 16.33%, but the variance is also of great interest with the greatest effect in Fuzhou of 27.84%, and the smallest effect in Shijiazhuang of 4.78%.

However, an attentive reader may have already found some problems when reading through Figure 5 to Figure 8. In all cities, it is clear to see the overall trend is increasing year by year. When the policy started in some cities, the housing price has been already in the process of continuous rising. As a result, the effect of Hukou policy change on housing price in model 1 may become overestimated and less reliable if we ignore the time trend effect in the regression. Therefore, in the next model, the author will put time trend in the regression and see how "much" it matters in each city. How will the effect of Hukou change and how significant is the change?

Is the "Partial" Effect of Hukou Policy Change Significant? (Model 2)

The estimated coefficients for the trend and city interaction term from model 2 show the overall price trends in 34 cities across China, including the "Big Four". As we can see, all the estimated coefficients are positive and statistically significant at 1% level, which suggests that the overall housing price in China is in an increase trend from 1998 to 2007. We reject the null that all the coefficients for the trend and city interaction term equal to zero, so it is reasonable to include them into our regression. Our interest variable, which is the Hukou and city interaction term, also changes accordingly as compared to the results from model 1.

As what we doubt in the previous section, the estimated coefficients for the Hukou and city interaction term are much smaller than those from model 1, which suggests that model 1 does have the problem of overestimation. The author observed that all the coefficients for the Hukou and city interaction term are actually smaller in model 2, so if we consider the effect of time, we will find the effect of Hukou policy change has a smaller effect compared to what we found in model 1. However, an unfortunate problem is that all of the estimated coefficients for the Hukou and city interaction term are statistically insignificant if the author puts 34 more interaction terms into the regression.

If we continue with our analysis using model 2, we can find that in most cities, the majority of increase in housing price may actually be explained by the time effect rather than the Hukou policy change. In the "Big Four" case, the effect of Hukou policy change decreases substantively, about a change of 16% in Shanghai, 8% in Beijing, 15% in Guangzhou and 10% in Shenzhen. The differences suggest that decrease in price is partially counteracted by the overall price increase, so the effect of Hukou policy change is not that big as we thought. Same finding applies to other 30 cities. Before considering the time trend, the Hukou and city interaction terms were picking up the time trend. Once the time trend is included, it turns out that most of the Hukou effect is really just a time effect. Nonetheless, there are still some cities whose differences between model 1 and model 2 is not that substantive, such as Hangzhou, Nanjing and Haikou. Compared to the whole sample, these cities still maintain a relatively same effect of Hukou policy change even with the time effect is included in the regression. After included the time effect and reconsidered the effect of Hukou policy change on housing price, the author found one interesting correlation: approximately, the average effect seems to be larger in cities which started the policy earlier. This pattern may be explained by two hypotheses. Firstly, those people who could not afford the house in the "Big Four" chose to reside and buy the urban Hukou in the cities near the "Big Four" such as Tianjin (a city very close to Beijing) and Hangzhou (a city very close to Shanghai), once they knew that they could get a formal urban Hukou in that city as soon as they paid the full payment of housing. Thus these cities were the first several cities that enjoyed the boom in real estate market among the 30 cities other than the "Big Four," and when the remaining cities started the policy as late as in 2005, people had less incentive or budget to buy more houses. Secondly, cities that started the policy later are the cities that are relatively less developed, most of which are located at Northwest and Southwest part of

China. These cities did not have enough incentives for further development, or their budget constrain would not allow them to do so due to the central government's favoring policy towards big cities like the "Big Four." Therefore, these cities started the policy relatively later and the effect of Hukou policy change on housing price is relatively weaker, since buying a house in these cities is not that attractive compared to other big cities. Here is the summary statistic table that supports the findings:

Year when Cities Changed the Hukou Policy	Average Effect of Hukou (including Trend)	Maximum Effect and City Name	Minimum Effect and City Name
2002	14.96%	Hangzhou 18.11%	Hefei 10.52%
2003	9.72%	Tianjin 12.17%	Nanning 7.08%
2004	6.44%	Qingdao 14.67%	Changchun 2.29%
2005	2.64%	Changsha 4.95%	Shijiazhuang 0.35%

Trend Before and After the Hukou Policy Change

After studying the effect of Hukou policy change on the housing price across cities in China, both with time effect and without time effect, the author began to consider the price change year by year across all cities, both before and after the Hukou policy change year. This is motivated by two reasons: first, since the overall trend may underestimate changes in some particular periods which may be boosted up by the relatively larger increase in later time; and second, since the significance level of the results from model 2 is not as persuasive as we want.

Running the previous model again but replacing the Hukou times city interaction term with Hukou times trend interaction term, whose coefficients reflect the average difference of the price trend before and after the Hukou policy change year across all cities, we got the result of

6.4951% and it is statistically significant at 5% level. However, in order to do a case distinction, the author further analyzed the raw data of the study and the summary statistics is in the Appendix II of this paper. Before the Hukou policy change, every city has maintained a relatively stable price increase of around 2% per year, with some exception which were actually decreasing. However, it is common that the Hukou change year did brought some change to the housing price across all cities, with the average difference of 6.30%, which is very similar to the regression result.

In the "Big Four" case, housing prices in those cities have kept an average of 1-2% annual increase until a big drop in the Hukou change year. However, the housing price has taken off after the Hukou change year, especially in the case of Guangzhou and Shenzhen, whose average annual growth is 19.67% and 11.43% after the end of "Blue-Stamp Hukou" policy. Though one might feel curious why Shanghai and Beijing experienced a smaller trend (5.85% and 7.11%), their prices have gone up by an even larger number of 32.76% and 28.65% after 2007, which are not shown in my dataset (which is from 1998-2007 only). This is very interesting, because the price did drop off after the cancellation of Hukou policy, when people know that they could no longer gain that city's Hukou even if they buy houses with full amount payment. However, one year after the policy end year, people's enthusiasm in the housing market revitalized and they continued to buy houses in the "Big Four" cities, despite of knowing that they could not get a formal/permanent Hukou in that city instantly. One possible explanation is by Yu (2006), who argued that people who bought houses in the "Big Four" were "investing for future" – i.e. for their children. Because if one owns a house in that city, even without Hukou himself, his/her children, if born in that city, can get the Hukou and enjoy all the benefits that city's Hukou brings, including free primary and secondary school education, free child care such as

vaccination, and even a lower college entrance exam point as compared to other small cities with average enrollment line almost 100 points higher than those in the “Big Four.” In China, “one point difference in the college entrance exam can decide a person’s entire life” (Ma, 2008). This argument may provide a good explanation the trend after the Hukou policy change year in the “Big Four.” Other factors, of course, play a role such as more Hukou are even open to foreigners in the “Big Four” from 2006 (Zhu, 2006), as well as general economic factors such as inflation and the increase of income in the “Big Four.”

In the case of other 30 cities, most of them had a steady increase in housing market at around 3% annually, and may or may not due to the Hukou policy change, their annual growth has increased to around 10% annually after the Hukou policy change year. The largest effect happened in Wuhan, a city located in the middle of China, with a difference of 15.66% between annual growth before and after the Hukou policy change year. But taking a further look at data for Wuhan suggests that Wuhan has already in a continued growing trend since 2001, and the role of Hukou in Wuhan’s case may just be complimentary rather than decisive. Results in model 2 also show that the estimated coefficient for the Wuhan times Hukou interaction term only equals to 4.02% (though, unfortunately, it is statistically insignificant). Such a disparity may suggest that in Wuhan, the Hukou effect plays a relatively small role in explaining the change in housing price. While in cities such as Haikou, the effect of Hukou policy change on housing price may be considered to be “effective”. Not only is the difference of the annual price growth before and after the Hukou policy substantive (11.50%), but also the difference between the Hukou change year and the year before. Data, as well as figure 6, suggests a very large jump of the housing price after the policy. Before 2003, Haikou only maintained an annual growth rate1.76%, whereas after the Hukou policy came into the stage, it has risen up to 13.26%

annually. Coincidently, result from model 2, again, though not statistically significant, also suggests a 15.618% effect of Hukou change even after taking time effect into consideration. This finding actually coincides with an empirical study by Gu (2004) showing that a potential housing bubble in the Haikou housing market, but in his paper, he did not argue that Hukou policy change could possibly play a role in explaining it. Taking a further look at the data, combined with the results from model 2, the author temporarily concluded that most of the price changes are induced by the overall trend of increasing housing price, while only a very small number of cities (around 4-6) such as Hangzhou, Nanjing, Ningbo and Tianjin might have the change mainly induced by people's pursue of an formal/permanent Hukou in that city. However, this conclusion is weak and needs further research and verification, both on data and methodology.

Conclusion, Final Thought and Further Research Interest

Thorough the paper, the author analyzed the price reaction to the Hukou policy change, both in the context of the overall time trend and without it. In the meanwhile, price trends before and after the Hukou policy change year are studied with both regression model analysis and summary data analysis. A temporarily conclusion can be made that, in general, the effect of Hukou policy change on housing price is not as substantive as expected, and in most cases, the time effect seems to have a relatively larger effect. However, some cities, though not a big proportion, still enjoyed the booming in real estate market due to the Hukou policy change, especially those cities that started the policy earlier. However, this conclusion is based on imperfect data and the time of the actual year of Hukou policy change remains to be verified, thus it needs to be further researched once more authentic data is available.

One particular thing that interests the author a lot during this research process is that after people know that they cannot gain a Hukou in the "Big Four," their enthusiasm has not been

reduced but instead, revitalized after one year's decrease. One recent article about Shanghai says that "if you walk on the street in Shanghai now, there is a one-half chance that you will meet a people who do not hold Shanghai Hukou" ("Migrants in Shanghai"). Even many migrants have a sad life in Shanghai, with no homes but just shelters, with a wage lower than the official minimum wage, they still choose to reside in Shanghai, and this puts Shanghai as the No.7 populous city in the world. Meanwhile, the housing price in Shanghai is incredibly high with one rough estimate arguing that it takes a person 70 years to pay the full amount of housing in Shanghai, while this number is 9 years as of the world average (Lang, 2011). What are all the reasons behind all of these? Does it still have something to do with Hukou? That would be the author's further research interest not only since Shanghai has relatively the best data among all cities in China, but also as a place where the author has been living for 18 years.

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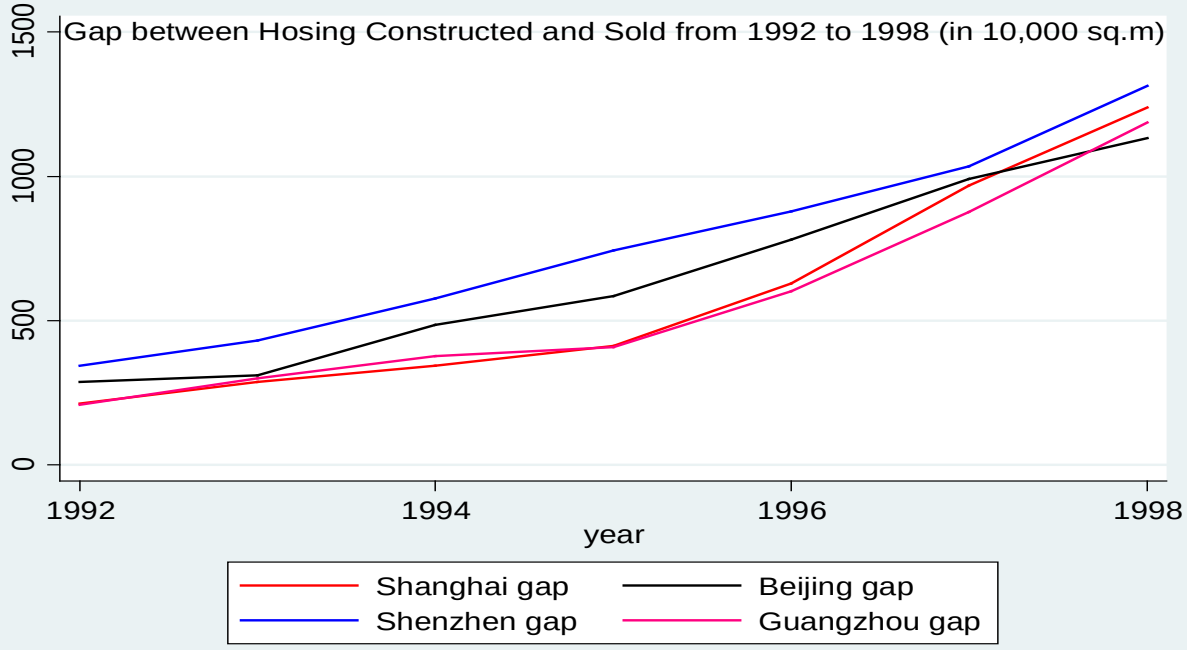


Figure 1

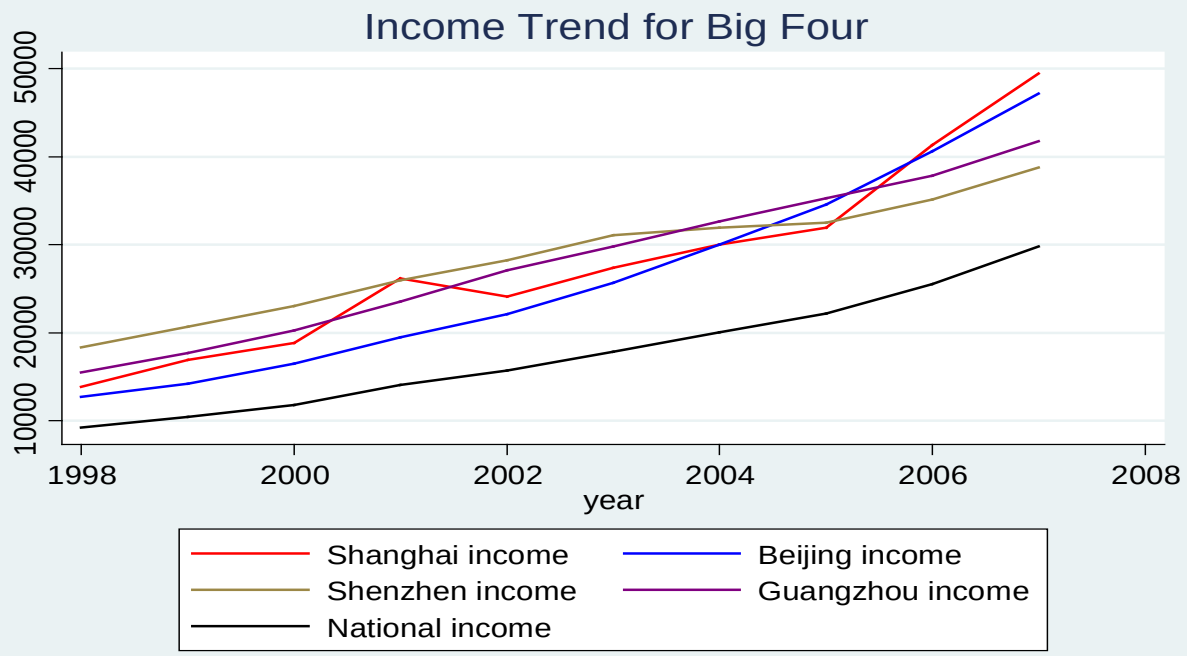


Figure 2

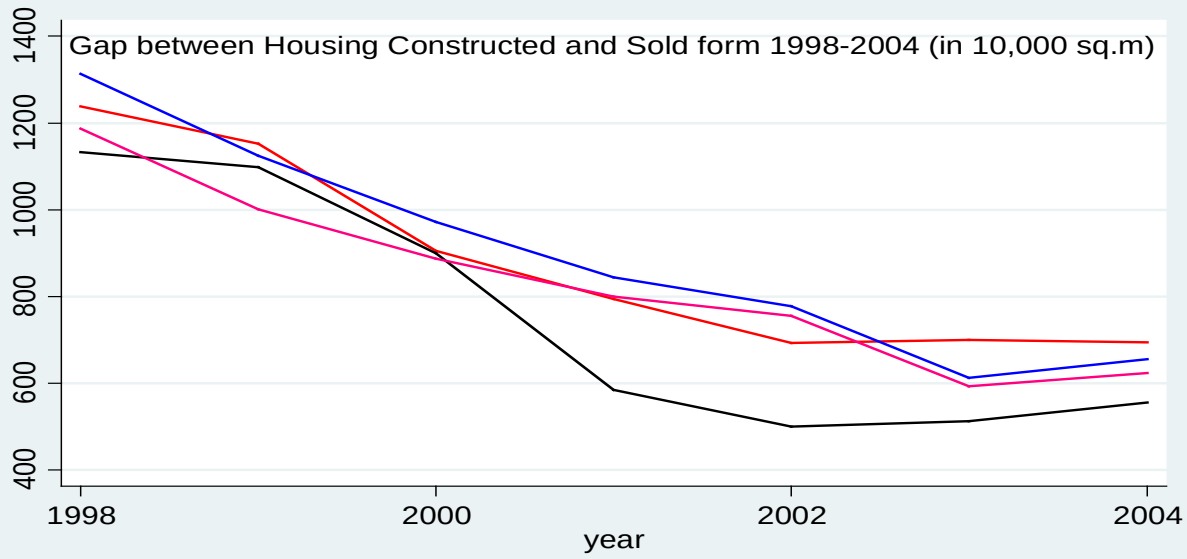


Figure 3

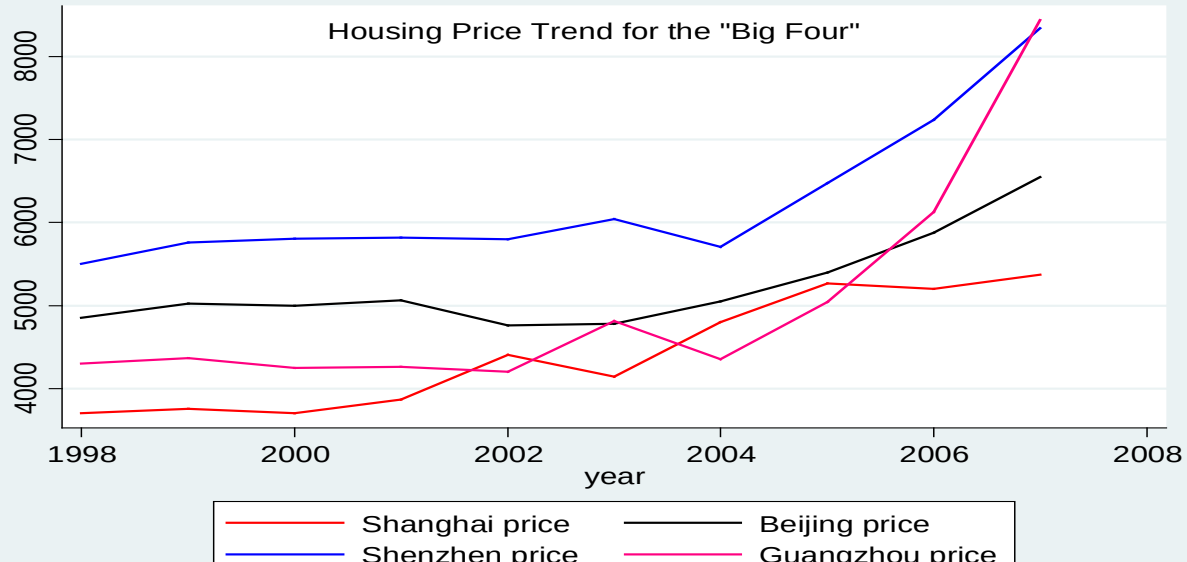
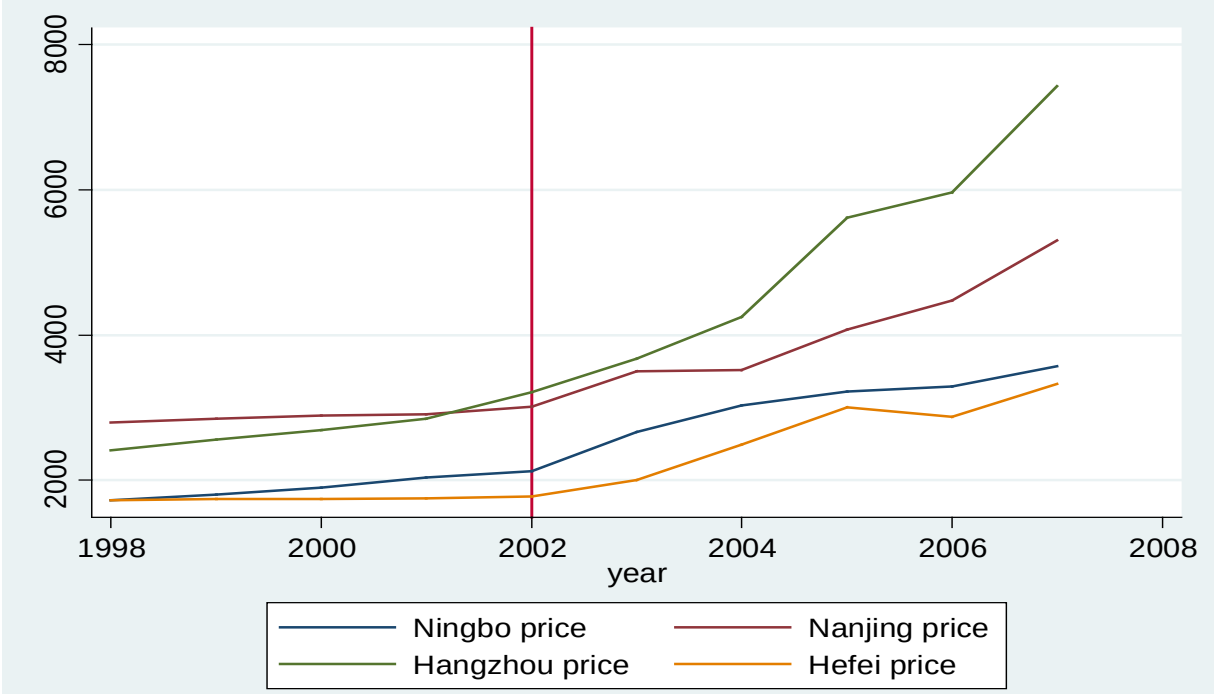
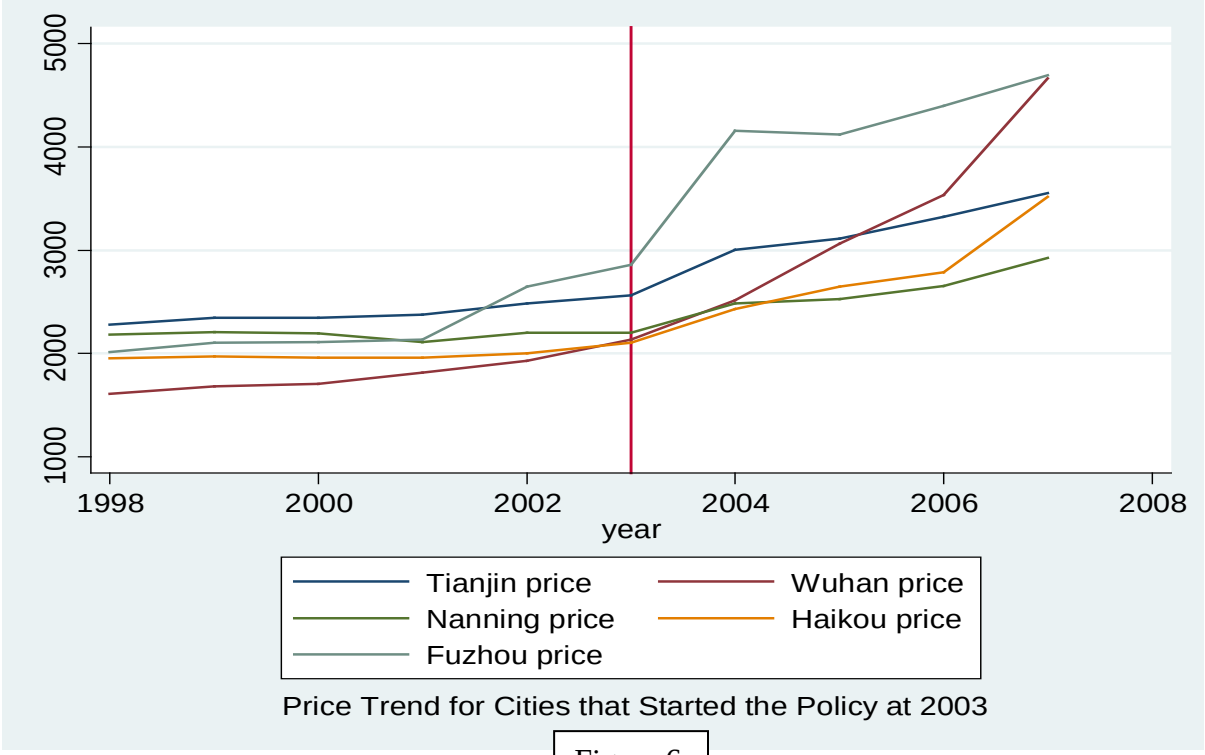


Figure 4



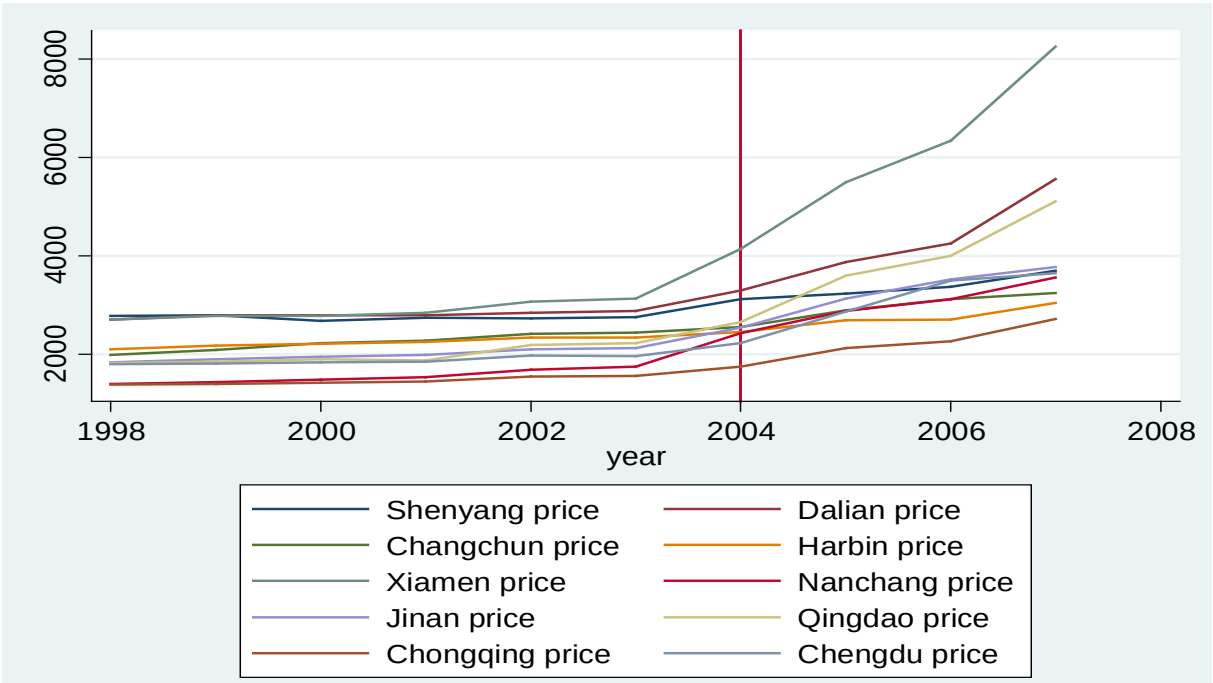
Price Trend for Cities that Started the Policy at 2002

Figure 5



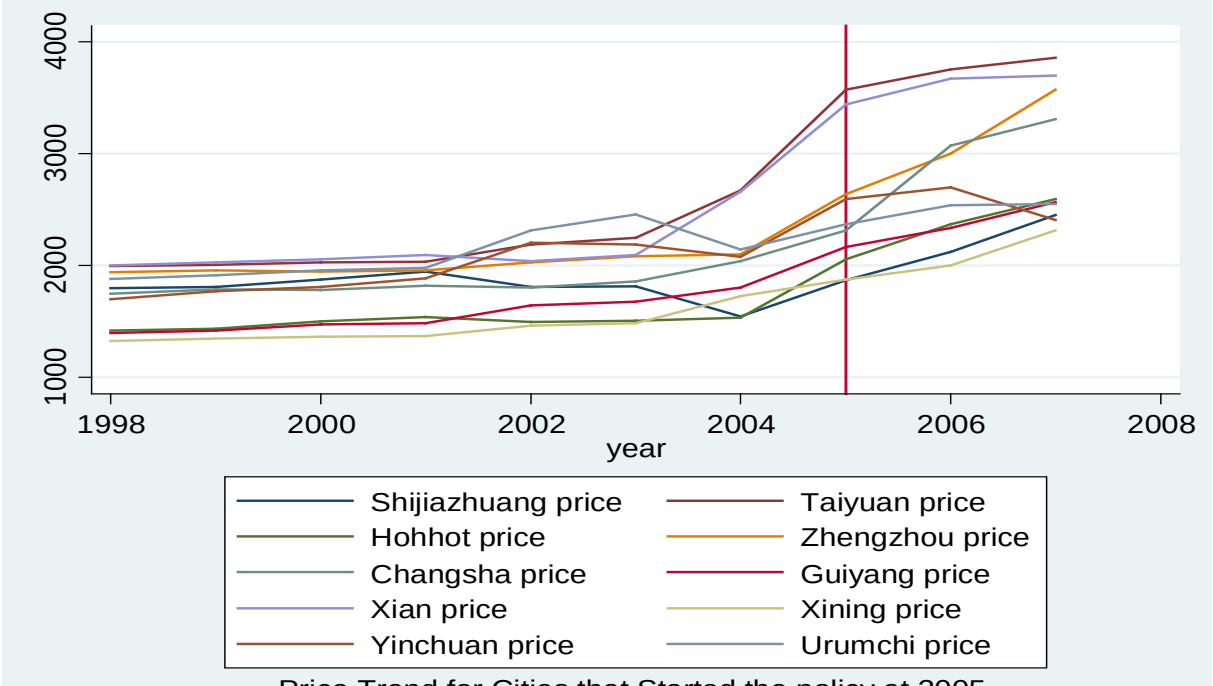
Price Trend for Cities that Started the Policy at 2003

Figure 6



Price Trend for Cities that Started the Policy at 2004

Figure 7



Price Trend for Cities that Started the policy at 2005

Figure 8

Appendix I

Regression Results from Model 1 and Model 2

VARIABLES	Model 1 lnprice	Model 2 lnprice	VARIABLES	Model 1 lnprice	Model 2 lnprice
Shanghai	8.50394***	8.20614***	Nanning	7.68849***	7.65858***
	(-0.048)	(0.109)		(0.007)	(0.028)
Beijing	8.58802***	8.25065***	Haikou	7.58616***	7.46584***
	(0.052)	(0.075)		(0.004)	(0.075)
Guangzhou	8.66636***	8.22850***	Chongqing	7.27236***	7.10882***
	(0.138)	(0.266)		(0.021)	(0.074)
Shenzhen	8.84979***	8.66167***	Chengdu	7.51038***	7.33877***
	(0.068)	(0.140)		(0.006)	(0.078)
Tianjin	7.76889***	7.67444***	Guiyang	7.34720***	7.20997***
	(0.014)	(0.040)		(0.037)	(0.020)
Shijiazhuang	7.52161***	7.42111***	Kunming	7.76583***	7.72904***
	(0.015)	(0.054)		(0.009)	(0.030)
Taiyuan	7.62599***	7.46425***	Xian	7.62700***	7.55349***
	(0.017)	(0.082)		(0.008)	(0.049)
Hohhot	7.30222***	7.18182***	Xining	7.26847***	7.14220***
	(0.013)	(0.073)		(0.036)	(0.032)
Shenyang	7.91915***	7.85030***	Yinchuan	7.56990***	7.45505***
	(0.009)	(0.042)		(0.041)	(0.022)
Dalian	7.93215***	7.76442***	Urumchi	7.64235***	7.52960***
	(0.008)	(0.092)		(0.040)	(0.022)
Changchun	7.71112***	7.58399***	trendSH	-	0.04254***
	(0.034)	(0.017)		-	(0.013)
Harbin	7.70348***	7.61593***	trendBJ	-	0.05190***
	(0.017)	(0.026)		-	(0.012)
Nanjing	7.95837***	7.83016***	trendGZ	-	0.05838
	(0.009)	(0.055)		-	(0.036)
Hangzhou	7.87174***	7.65598***	trendSZ	-	0.02508
	(0.034)	(0.066)		-	(0.018)
Ningbo	7.52995***	7.40131***	trendTJ	-	0.04722***
	(0.035)	(0.033)		-	(0.016)
Hefei	7.48926***	7.39877***	trendSJZ	-	0.05025*
	(0.024)	(0.041)		-	(0.026)
Fuzhou	7.64479***	7.50086***	trendTY	-	0.08087***
	(0.013)	(0.060)		-	(0.031)
Xiamen	7.94862***	7.68482***	trendHHHT	-	0.04816*
	(0.022)	(0.136)		-	(0.029)
Nanchang	7.28809***	7.08975***	trendSY	-	0.04590***
	(0.020)	(0.076)		-	(0.012)
Jinan	7.57716***	7.39890***	trendDL	-	0.08387**
	(0.022)	(0.075)		-	(0.038)
Qingdao	7.58558***	7.38850***	trendCC	-	0.05085***
	(0.037)	(0.091)		-	(0.008)
Zhengzhou	7.59337***	7.47207***	trendHEB	-	0.04377***
	(0.012)	(0.081)		-	(0.010)
Wuhan	7.49828***	7.28311***	trendNJ	-	0.08547***
	(0.043)	(0.078)		-	(0.018)
Changsha	7.49537***	7.38008***	trendHZ	-	0.14384***
	(0.008)	(0.074)		-	(0.020)

Appendix I - Continued

Regression Results from Model 1 and Model 2

VARIABLES	Model 1 lnprice	Model 2 lnprice	VARIABLES	Model 1 lnprice	Model 2 lnprice
trendNB	-	0.08576***	hukouTJ	0.18782***	0.12169
	-	(0.016)		(0.057)	(0.094)
trendHF	-	0.03619**	hukouSJZ	0.04778	0.00346
	-	(0.014)		(0.079)	(0.152)
trendFZ	-	0.09595***	hukouTY	0.13051***	0.02617
	-	(0.022)		(0.108)	(0.189)
trendXM	-	0.13190**	hukouHHHT	0.14666***	0.02586
	-	(0.052)		(0.112)	(0.199)
trendNC	-	0.13223***	hukouSY	0.13142***	0.04806
	-	(0.022)		(0.050)	(0.073)
trendJN	-	0.08913***	hukouDL	0.13041***	0.05892
	-	(0.029)		(0.113)	(0.194)
trendQD	-	0.07883**	hukouCC	0.17718***	0.02292
	-	(0.031)		(0.061)	(0.057)
trendZZ	-	0.04852*	hukouHEB	0.17427***	0.0446
	-	(0.028)		(0.049)	(0.052)
trendWH	-	0.08607***	hukouNJ	0.21346***	0.1539
	-	(0.026)		(0.085)	(0.102)
trendCS	-	0.04612*	hukouHZ	0.26812***	0.18111
	-	(0.027)		(0.137)	(0.116)
trendNN	-	0.01197	hukouNB	0.25706***	0.15824
	-	(0.009)		(0.086)	(0.105)
trendHK	-	0.06016**	hukouHF	0.18619***	0.10522
	-	(0.030)		(0.063)	(0.090)
trendCQ	-	0.08177***	hukouFZ	0.27840***	0.09863
	-	(0.027)		(0.101)	(0.153)
trendCD	-	0.11440***	hukouXM	0.16463***	0.05486
	-	(0.023)		(0.169)	(0.286)
trendGY	-	0.04574***	hukouNC	0.12663***	0.03452
	-	(0.005)		(0.130)	(0.146)
trendKM	-	0.01840	hukouJN	0.14415***	0.03151
	-	(0.014)		(0.109)	(0.171)
trendXA	-	0.02940	hukouQD	0.24090***	0.14673
	-	(0.019)		(0.136)	(0.182)
trendXN	-	0.04209***	hukouZZ	0.13542***	0.02281
	-	(0.011)		(0.109)	(0.170)
trendYC	-	0.03828***	hukouWH	0.16056***	0.08022
	-	(0.009)		(0.133)	(0.137)
trendURMQ	-	0.03759***	hukouCS	0.18007***	0.04949
	-	(0.013)		(0.111)	(0.168)
hukouSH	-0.25372***	-0.09101	hukouNN	0.19063***	0.07079
	(0.052)	(0.082)		(0.036)	(0.045)
hukouBJ	-0.16906***	-0.08601	hukouHK	0.22933***	0.11618
	(-0.045)	(0.065)		(0.085)	(0.152)
hukouGZ	-0.28598**	-0.13932	hukouCQ	0.25249***	0.05636
	(0.140)	(0.185)		(0.100)	(0.143)
hukouSZ	-0.18620***	-0.08079	hukouCD	0.20629***	0.12572
	(0.068)	(0.101)		(0.117)	(0.142)

Appendix I - Continued

Regression Results from Model 1 and Model 2

	Model 1	Model 2
VARIABLES	lnprice	lnprice
hukouGY	0.08599***	0.02727
	(0.058)	(0.030)
hukouKM	0.09103***	0.00961
	(0.034)	(0.088)
hukouXA	0.10711***	0.03409
	(0.075)	(0.142)
hukouXN	0.06024***	0.00479
	(0.067)	(0.068)
hukouYC	0.05909***	0.00878
	(0.051)	(0.069)
hukouURMQ	0.07647***	0.01146
	(0.045)	(0.087)
Observations	340	340
R-squared	1.000	1.000

Appendix II -- Summary Statistics of Annual Housing Price Growth Rate from 1998 to 2007
(Bold Number in the Box Refers to the Hukou Change Year)

City	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Beijing	1.23%	1.94%	2.32%	***-6.24%***	3.90%	5.75%	6.88%	8.72%	10.34%
Shanghai	1.42%	1.77%	2.54%	3.17%	***-5.65%***	10.88%	5.76%	3.42%	3.35%
Nanjing	1.23%	1.61%	5.12%	5.52%	***20.08%***	11.03%	15.81%	9.94%	18.44%
Hangzhou	2.23%	3.45%	5.51%	12.12%	***20.45%***	6.53%	24.43%	16.19%	12.47%
Ningbo	1.49%	3.14%	4.55%	14.12%	***18.75%***	13.89%	6.20%	2.17%	8.63%
Hefei	1.12%	1.44%	1.87%	1.45%	***8.04%***	23.99%	20.67%	-4.39%	10.72%
Guangzhou	1.22%	2.45%	2.53%	2.55%	12.54%	***-11.12%***	15.72%	18.42%	24.87%
Shenzhen	1.42%	2.11%	2.24%	2.42%	7.76%	***-7.31%***	7.09%	11.86%	15.34%
Nanning	0.87%	0.72%	1.64%	3.36%	7.98%	***7.60%***	-3.78%	11.22%	10.09%
Haikou	-0.34%	-0.60%	-0.15%	6.16%	3.77%	***17.28%***	18.46%	5.13%	16.20%
Wuhan	0.44%	0.48%	2.12%	6.34%	10.77%	***18.55%***	21.70%	15.44%	21.93%
Tianjin	1.13%	1.12%	1.23%	4.71%	4.06%	***13.52%***	5.99%	6.71%	7.01%
Fuzhou	0.45%	0.28%	6.04%	10.90%	16.56%	***25.33%***	2.96%	6.72%	6.44%
Shenyang	-2.44%	-3.79%	1.97%	3.44%	2.33%	6.28%	***11.45%***	10.52%	9.56%
Dalian	0.55%	0.21%	0.21%	1.49%	1.37%	3.15%	***10.41%***	8.45%	14.56%
Changchun	2.11%	2.61%	2.68%	6.09%	6.51%	7.26%	***8.88%***	7.48%	15.65%
Xiamen	0.24%	0.07%	2.23%	8.13%	2.08%	19.20%	***22.73%***	15.20%	20.12%
Nanchang	2.14%	3.23%	4.05%	9.53%	4.08%	8.32%	***16.46%***	20.83%	13.81%
Jinan	1.66%	2.79%	1.84%	5.84%	1.09%	12.33%	***14.57%***	12.51%	7.15%
Qingdao	2.12%	2.32%	1.16%	3.45%	1.70%	13.34%	***21.51%***	11.01%	17.59%
Chengdu	0.99%	1.32%	5.32%	6.87%	7.08%	13.41%	***19.04%***	21.91%	4.17%
Chongqing	1.24%	1.21%	1.42%	5.83%	5.44%	12.02%	***16.87%***	9.32%	10.96%
Harbin	1.23%	1.79%	1.94%	3.50%	4.32%	6.58%	***8.25%***	4.56%	12.94%
Guiyang	1.98%	3.94%	2.81%	3.41%	2.19%	7.32%	10.36%	***7.79%***	4.18%
Kunming	0.21%	0.27%	-0.29%	-4.32%	2.09%	6.50%	6.70%	***7.28%***	3.47%
Xian	1.99%	1.28%	1.94%	-2.52%	2.69%	6.99%	5.33%	***6.71%***	1.89%
Urumchi	1.65%	2.48%	1.01%	6.86%	6.09%	-4.58%	5.52%	***11.71%***	8.21%
Yinchuan	1.88%	2.20%	4.25%	6.96%	-0.90%	-5.02%	4.84%	***7.52%***	2.37%
Xining	1.14%	1.11%	0.51%	6.86%	1.29%	6.31%	4.76%	***5.35%***	5.88%
Changsha	-0.42%	-0.39%	2.13%	-0.98%	3.05%	3.87%	3.48%	***5.05%***	6.07%
Zhengzhou	-0.31%	-0.51%	0.61%	3.52%	2.76%	0.76%	5.67%	***9.47%***	7.71%
Shijiazhuang	1.56%	3.70%	3.94%	-7.08%	0.27%	4.81%	10.87%	***9.14%***	10.13%
Taiyuan	1.22%	1.09%	0.24%	3.66%	2.78%	8.78%	3.64%	***5.76%***	8.33%
Hohhot	2.44%	4.52%	2.46%	2.66%	0.66%	3.28%	4.81%	***5.11%***	9.62%

Appendix II -- Continued

City	Avg.Trend before the Hukou Change	Avg.Trend after the Hukou Change	Difference
Beijing	1.83%	7.11%	5.28%
Shanghai	2.22%	5.85%	3.63%
Nanjing	3.37%	13.85%	10.48%
Hangzhou	5.82%	14.90%	9.08%
Ningbo	5.85%	7.77%	1.92%
Hefei	1.47%	12.74%	11.27%
Guangzhou	4.25%	19.67%	15.42%
Shenzhen	3.19%	11.43%	8.24%
Nanning	2.91%	5.84%	2.93%
Haikou	1.76%	13.26%	11.50%
Wuhan	4.03%	19.69%	15.66%
Tianjin	2.45%	6.57%	4.12%
Fuzhou	6.86%	5.37%	-1.49%
Shenyang	1.55%	10.04%	8.49%
Dalian	1.39%	11.50%	10.11%
Changchun	5.45%	11.56%	6.11%
Xiamen	6.39%	17.66%	11.27%
Nanchang	6.27%	17.32%	11.05%
Jinan	5.11%	9.83%	4.72%
Qingdao	4.81%	14.31%	9.50%
Chengdu	6.99%	13.04%	6.05%
Chongqing	5.43%	10.14%	4.71%
Harbin	3.87%	8.75%	4.88%
Guiyang	4.57%	4.18%	-0.39%
Kunming	1.59%	3.47%	1.88%
Xian	2.52%	1.89%	-0.63%
Urumchi	2.71%	8.21%	5.50%
Yinchuan	2.02%	2.37%	0.35%
Xining	3.14%	5.88%	2.74%
Changsha	1.53%	6.07%	4.54%
Zhengzhou	1.78%	7.71%	5.93%
Shijiazhuang	2.58%	10.13%	7.55%
Taiyuan	3.05%	8.33%	5.28%
Hohhot	2.95%	9.62%	6.67%
	Average 3.58%	Average 9.88%	Average Difference **6.30%**