"Are Rising College Premiums Capitalized into
House Prices? Evidence from China"

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Abstract

Many areas in China experienced steeply rising house prices beginning in 2003. We test whether a nationally mandated change in local residency requirements that took effect in that year may have played a role in driving up house prices by tying access to Chinese universities to local homeownership status in the presence of a rising college premium. We generate a novel dataset that combines China university admission data with household and housing market data. We find evidence of capitalization effects and a sizable increase in the likelihood of homeownership in places with preferential access to China's elite universities.

JEL classification: H22, H24, H71, O18, O12, R21, R31

Keywords: house prices, price capitalization, homeownership, college premium

I. Introduction

Many areas in China experienced steep house price increases beginning in 2003. The rapid growth in house prices coincides with a national government mandated change in local residency requirements that ties access to valuable public services such as education and health care to local homeownership. Prior to 2003, local residency was tied to state employment and most workers' residency status was "group Hukou," which granted the holder access to local public services ("local" generally means province-level, as we detail below). Beginning in 2003, across provinces in China, group Hukou no longer assures a person of access to such services. Households with group Hukou and school age children in 2003 retain access to local education at the elementary, secondary and college level. However, persons without both group Hukou in 2003 and children in the local school system must acquire household residency, also known as household Hukou, to have access to local services, by demonstrating both employment and homeownership in the locale. Similarly, new migrants to a province can attain household Hukou (hereafter referred to as Hukou) only if they can prove both employment and homeownership in a locale.[1]

We speculate that the policy change and variation in the quality of public services across locations may explain a post-2003 demand for owner-occupied housing that is stronger in some locations than others, generating demand-driven rising house prices in locations with relatively high quality public services. In this paper, we examine the role of higher education in this policy setting as motivating homeownership. University admission in China is based on a quota system rather than a nation-wide entrance exam score. The admission quota for a university is

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[1] Starting in 2010, the residency requirements for new migrants to some cities have become more onerous. For example, in Beijing, a migrant must be employed (pay social security and personal income taxes) in Beijing for five consecutive years before being allowed to purchase a home and secure a resident permit. (http://www.gov.cn/gzdt/2011-02/17/content_1804772.htm) Also, see Ahuja et al. (2010) p. 30 for a summary of recent changes to real estate policies on mainland China.

substantially larger for students with Hukou in the province the university is located in. The

value of a university education rose substantially during the introduction of China's "985"

program (Wang, 2012), which was initiated in 1998 and concentrated resources in 39 elite

Chinese universities to become leading international research and teaching institutions.[2] Recent

China data suggest that the college premium is markedly higher for college degrees earned from

elite institutions (Li et al., 2012). Figure 1 Panel A provides a histogram of the number of

admission slots in 2012 to China's 985 universities relative to the population of children age 0 to

14 (in millions) by province. Panel B reports the province-level quota relative the province-level

number of students taking exams. As can be seen from Figure 1, access to these elite universities

varies considerably by province. Moreover, the pattern of variation in quota is similar for both

measures of eligible population.

While the Chinese constitution enabled private property ownership in urban areas

beginning in 1988, large-scale housing privatization wasn't begun until 1994 (Fu et al., 2000).

Privatization generated supply and demand side effects with the selling off of state housing

assets and housing consumption adjustment to alleviate pre-reform pent-up housing demand.

Wang (2011) finds evidence that these effects had a net positive impact on the price of housing

services post 1994.

We examine the extent to which the 2003 policy change combined with preferential

access to China's elite universities fueled the demand for homeownership. We generate a novel

dataset that combines university admissions data with province, neighborhood and household

panel data. We focus on the post-housing-privatization period in China, years 2000 to 2010.

Results suggest a positive association between preferential access to China's elite 985 program

universities and residential property prices. For example, we find that a one standard deviation

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[2] A list of China's 985 universities is provided in the Appendix, Table A1.

increase in the number of 985 university admission slots per million children is associated with a 11 percentage point increase real appreciation rate of residential properties. We estimate a fixed effects model of the determinants of homeownership using household panel data from the 2000, 2004, 2006 and 2009 waves of the Chinese Health and Nutrition Survey (CHNS) and find that a one standard deviation increase in 985 admission slots per million children increases the likelihood of homeownership by roughly 7.5 percentage points, with an additional 1.7 percentage points occurring post 2003. The remainder of the paper is organized as follows. Section 2 provides an overview of education, housing and residency reform in China. Section 3 discusses existing literature review. Section 4 presents the data and econometric models. Section 5 discusses the results and section 6 concludes.

2. Institutional Background

Higher education, housing and Hukou have gone through three stages of reform since the end of Cultural Revolution, as illustrated in Figure 2. In this section, we provide detail on the institutional structure of higher education in China, with some detail on Hukou and housing reforms.[3] In the first stage, 1977-1985, the central planner set the admission quota for each university, and universities chose cut-off scores from the nation-wide college entrance exam. Students were fully funded by the government and assigned jobs before graduation. Housing was not owned, but was assigned as part of one's work unit. With the Hukou system in place at the time, students were assigned jobs and housing in the province where they held Hukou. Cross-province job assignments were rare and only existed if the target province did not have the adequate resources to produce such personnel on its own. In the second stage, 1986-1996, as

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[3] Housing market reforms are detailed in Wang (2011), Huang and Yi (2010), Huang and Clark (2002) and Fu et al. (2000). Hukou reforms are duscussed in Wang (2004) and Young (2013). See Ryan (2011) and Morgan and Wu (2011) for recent documentation of education structure and reforms.

China was gradually transforming into a market economy, universities were given an additional set of quotas for "self-funded" students. The cut-off scores were lower for students paying tuition than those fully funded by the government.[4] Quota differences remained in place across provinces.

In the third stage, post-1997, known as the market-oriented phase, all students must pay tuition and search for jobs after graduation. Universities have some autonomy as to how many students to admit and from where, however, admission standards are required to be uniform within a province. Universities annually submit planned admission quota for each province. After the plan is approved by the Ministry of Education, it is available to prospective students to view. Students choose to apply to three schools based on the scores they receive from the college entrance exam and the cut-off scores published by universities. For the same university, the cut-off scores are different for each province, chosen based on the target admission quota setup for that province. In addition, starting from 2001, the college entrance exam is no longer a universal exam across provinces. Each province can implement its own college entrance exam or use the national college entrance exam. It is well known that in some provinces the college entrance exams are much harder than those in other provinces. Therefore, the cut-off scores published by universities for admission do not convey full information. The admission quota for each province, on the other hand, allows us to identify preferential access based on place of residency.

Students are only allowed to take the college entrance exam in the province they hold residency. Going to school in a province where the exam is easier or admission standards are lower without establishing Hukou in that province is futile as the student will be "deported" back to her place of residency to take the exam. Since exams are different across provinces, the

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[4] Also known as double track phase: fully funded and self-funded.

emphases placed on course materials is also different. As a result, going to school in a province one is not a resident of is counterproductive.

This time period of education reform, 1998 to 2003, coincides with privatization of the housing market in China. As documented in Huang and Yi (2010), the 23rd Decree issued by the State Council in 1998 mandated that work units could no longer develop new residential housing units for their employees. Rather employees must rent or buy their housing from the market and employers integrate any housing benefits into employees' compensation rather than provide a housing unit directly. Rental housing provided by work units was sold to employees under the double track phase of partial homeownership. So called commodity housing – homes built for sale at market prices – was built as early as 1988, to facilitate privatization, but this process was hampered by publiic subsidization of housing (Fu et al., 2000), which was not fully eliminated until 2003. The historical state misallocation of housing and resulting mismatch caused rising commodity house prices post 1998 as privatization lead to housing consumption adjustment (Wang, 2011).

3. Literature

There is an emerging literature on housing markets in China. The growing importance of real estate in total private investment and household's portfolios and as a source of local government revenues has helped to motivate research of the extent to which Chinese housing markets are experiencing a house price bubble.[5] The findings are mixed. For example, Ren et al. (2012), who provide a review of this literature, use proprietary price data for 35 China cities and report finding little evidence of a real estate bubble. Using auction data for Beijing parcels, Wu

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[5] Ahuja et al. (2010) note that real estate investment accounts for roughly 20% of total investment and is a major source of China's economic growth. Moreover, lands sales accounted for as much as 30% of local government revenue in 2009.

et al. (2012) generate real house price indices and document strong growth from 2001 to 2011, particularly from 2003 to 2007 and 2009 to 2011 (a temporary leveling off occurred in 2008). In contrast to Ren et al., Wu et al., report that rising prices are not sustainable by fundamentals. Ahuja et al. (2010) conclude that for China as a whole, the current levels of house prices are not misaligned, however, there is evidence of overvaluation in some cities and market segments such as the luxury market.

Tenure decisions and the transition to private homeownership have been examine in several papers. Fu et al. (2000) model a renter's incentive to buy commodity housing using 1997 survey data and find that housing mismatch, liquidity constraints and public housing benefits have an impact. The transition to ownership of private housing is slowed by continued subsidized housing benefits for workers during this time period. Huang and Clark (2002) use a 1996 national survey of 3000 households in China to examine tenure decisions during the transition period. They find that household characteristics such as age and income affect the purchase decision, but that during this time period institutional factors such as residency and job rank remain important determinants in some locales. Research by Wu (2002) and Li and Yi (2007) also document strong institutional effects in the rent to own transition during the housing privatization process. Wang (2011) estimates the determinants of housing consumption to examine of the effect of pre-privatization misallocation of state housing on post-privatization equilibrium house prices.[6] The effect of privatization on house prices in theoretically ambiguous: while the privatization of state-owned housing generates an increase in the supply of commodity housing, the extent of pre-reform mismatch and subsequent adjustment may offset the supply-side induced downward pressure on equilibrium prices. Using pre-housing reform (1989, 1991,

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[6] Similar to Hanink et al. (2012), Wang finds that structural characteristics such as floor space in part explain the price of housing services.

1993) and post-reform (1997, 2000 and 2004) waves of China Health and Nutrition Survey (CHNS), Wang generates estimates of housing mismatch and its impact on self-reported value house price per square meter and finds a significant effect.

4. Data and empirical approach

4.1 Data

We generate a novel dataset by assembling data from university websites and the Ministry of Education to construct our key measure, $QUOTA$, of preferential access. For each province j, we compute a measure of the total preferential access granted to province j residents as the sum of elite university slots in province j and in all other provinces, i, that residency in provinces j grants, which we term the nominal quota. Specifically, $Quota_j = \sum_{i\, \epsilon\, elite\, universiteis} Quota_{ij}$, where a university is considered elite if is one of the 39 Chinese 985 program universities. We have quota data only for 2012, the year we collected it. To our knowledge, there is no published historical data on the number of admission slots for these universities. To create within-province variation over time, we generate a relative quota measure as the number of slots per eligible population. We consider two eligible province-level populations: the number of children age 0 to 14, for which we have data from 2000 to 2010, and the number of high school students taking college exams, for which we have data from 2008 to present. A data limitation is that we do not have evidence on the extent to which the nominal quota may have varied over the time period we investigate. If the nominal quota is constant over time or it changes is a proportional manner across provinces, then our estimates of the relative quota effect will be unbiased. If the nominal quota changes in a disproportionate manner across provinces, then our estimates will suffer from an omitted variable bias.

We assemble a panel of province-level data using data from the Chinese Statistical yearbook (CSY) to examine province-level house price determinants. To our knowledge, no constant quality house price data are publically available. To capture house price movements, we measure price as the average selling price (price per square meter) of residential properties in nominal RMB, computed using CSY series 5-36 and 5-37. While it is the only publically available measure of house asset price spanning the time period 2000 to 2010, this measure is limited in that it is based on the sale of both investment and owner occupied properties. Moreover, it includes both new and existing residential properties and it does not account for quality heterogeneity. There is some evidence, however, that consider this price series tracts a hedonic index reasonably well in an analysis of several China cities (Deng et al., 2012).

We refer to this measure hereafter as house price. We examine the movement of house prices according to this measure in Figure 3a, which shows house price movements in provinces in China with relatively rapid house price appreciation, and Figure 3b, which shows locations with more modest house price increases. Notice that in both graphs, house prices increase more steeply post 2003. Figure 4 shows the movement of house prices in the nine provinces in the CHNS panel data (Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning and Shandong); it can be seen that the trend in house price varies by quota status, with more pronounced increases occurring in the CHNS provinces with above median quota levels.[7] In addition, figure 5 shows that the annual rent inflation is above annual private housing inflation before 2004. The trend reverses after 2004: providing evidence that the new residency requirements that tie access to Chinese universities to local homeownership status is associated with housing prices rising faster than rental prices.

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[7] Figure 1A in the appendix shows where these provinces are located in China.

We assemble data from four waves of the CHNS: 2000, 2004, 2006 and 2009, which span the 2003 national change in residency rules, to examine homeownership determinants, providing 36 province-year clusters in our sample within which households are located. As describe by Wang (2011), the survey is a multistage, random cluster design; "counties are stratified into three levels of income and a weighted sampling technique randomly selected four counties in each province."

4.2 Econometric approach

We first examine house prices using the province panel. We assess the association between the growth in house prices and preferential university access controlling for province and year fixed effects and clustering on province. Using the data on child population, we can examine house price effects of preferential access before and after the 2003 policy change. Using the data on the number of students taking exams, we can identify an association between house price movements and the relative quota for the years for which we have the student examination data: 2008, 2009 and 2010. In both of these contexts, we consider if the price capitalization effects of preferential access vary by the tightness of the housing supply relative to housing demand. To do so, we follow Deng et al. (2012) and generate a measure of excess housing supply as the ratio of the floor space of residential housing that is completed to the floor space sold in a given year, data reported in the Chinese Statistical Yearbook. Generally speaking, while these estimates are a somewhat coarse glimpse at house price capitalization, we nonetheless view them as suggestive.

We next examine the effect of the policy change on the propensity to own suing the CHNS data and the quota measure relative to the child population. We estimate the following specification for household i in province j at time t as a linear probability model:

$$Prob(own_{ijt}) = \alpha_0 + \alpha_1 QUOTA_j + \alpha_2 QUOTA_j * POST2003 + X_{ijt}{}'\beta + D_i{}'\gamma + \varepsilon_i, \quad (1)$$

where the dependent variable equals one if household *i* in province *j* owns at time *t* and zero

otherwise. *QUOTA* is defined in section 4.1. The interaction term of *QUOTA* and *POST2003*

serves as a difference-in-difference estimator, identifying the effect of the policy change on

homeownership outcomes according to the extent of preferential university access. We also

investigate whether the impact of the preferential access on homeownership varies by the

presence of children in the household. The effect can be positive or negative. If a person has

children in the school system at the time of the policy change, he or she need not purchase a

home to garner preferential education access for the children. If the children are younger than

age 5 in 2003, then the person has incentive to purchase to ensure access to the elite universities.

We identify the effect of *QUOTA* on the propensity to own from variation in *QUOTA* due to

variation within provinces over time in the eligible population as well as differences across

provinces in the level of quota and population of children.

The vector *X* captures time-varying household-level controls from the CHNS data,

including marital status, presence of children, education, age, and household income. The

relative cost of homeownership: the cost of housing services in the owner mode relative to the

cost of housing services in the rental mode, is another determinant of homeownership. The

annual cost of housing services in the owner mode is generally approximated as the user cost of

housing, which is a household–specific variable measuring the expected consumption value of

the housing services from purchasing a home (i.e., Hilber and Turner, 2014). The user cost is the

sum of depreciation and maintenance costs, the after-tax opportunity cost of the down payment,

the after-tax mortgage interest payments and after-tax property tax payments minus the expected,

nominal capital gain on the housing structure (Poterba, 1984). Of the components of user cost,

we use the CSY province-level data to approximate the contemporaneous property price

appreciation rate and rental cost. We estimate models using the growth rate in the average selling price of residential properties as a measure of the nominal capital gain and rent inflation as a proxy for the cost of rental housing, which we construct from the CSY rental CPI index in the province and year in which the household is observed.[8] In addition, we control for two measures of housing supply determinants. Both measures are from the CHNS community-level data available from the Carolina Population Center at the University of North Carolina at Chapel Hill under special contract. The first measure is the population density of the city in which the person resides, which helps to control for housing supply inelasticity. The second variable is the city-level, real, average weekly wage of construction workers, which helps to captures supply side determinants of housing prices.

The vector D is a vector of individual fixed effects. One advantage of estimating equation (1) as a fixed effect model is that household fixed effects capture unobserved heterogeneity in household characteristics – such as propensity to save of the household head – that is time invariant. In the CHNS sample, none of the households are tracked moving between provinces, thus the individual fixed effects also capture time invariant location characteristics (at the neighborhood-, municipality-, county-, province-, and national-level). Wealth is a determinant of homeownership (Turner, 2003), however, the CHNS do not report wealth data. Since changes in net asset wealth are driven in part by changes in income, once we control for fixed effects and household income, the impact of household net wealth on homeownership attainment can be expected to be limited (Hilber and Turner, 2014). We estimate (1) with a cluster correction to generate standard errors that are robust to heteroskedasticity and clustering on province.

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[8] The remaining terms in the user cost, depreciation and maintenance, are each typically set to a value of 0.02 (see e.g. Poterba, 1992), and thus would be part of the constant in an estimation.

5. Results

Table 1 reports the province-level house price capitalization estimates. Notice that the impact of quota on house price appreciation varies by time period. Referring to columns (1) and (2), we do not detect a statistically significant effect prior to 2003. Columns (3) and (4) indicate an effect that is positive and significant and varies by housing supply tightness. The effect is sizable: a one standard deviation increase in the relative quota is associated with a 7 and 11 percentage point increase in the house price appreciation rate in models (3) and (4), respectively. In models (5) and (6), where the quota is measured relative to the number of students taking exams in a province, the estimated effects of preferential access on house prices is again significant, positive and large: a one standard deviation increase in the relative quota is associated with a 26 and 35 percentage point increase in the house price appreciation rate.[9] One concern is that as an area becomes increasingly owner-occupied, residents of a given province j may affect the university quota allocations in province j. We estimate the models in Table (1) using the "foreign" quota as an instrument for the total quota, where the foreign quota in province j equals the admission slots allocated to residents in province j for elite universities in all other provinces. We find similar results to those in table 1. The effect of the foreign quota instrument is significant and positive and somewhat larger in magnitude than the total quota effect.

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[9] We also conduct an exploratory, province-level, cross-sectional analysis of the effect of preferential access on the level of house prices using data for year 2007. We report summary statistics and results in the appendix, Tables A2 and A3, respectively. Referring to Table A3, we see that the quota measure has a positive and significant coefficient. In terms of magnitude, the coefficient estimate implies that a one standard deviation increase in the quota level is associated with a $700 increase in house price per square meter, which corresponds to a roughly 20% house price increase from the mean.

Table 2 reports the sample means for the CHNS households observed at four points in time in nine provinces. We report the means for the full sample and by quota status. We partition the CHNS provinces according to above median (high quota) and below median (low quota) quota per million children, using the median quota of all provinces in China. Homeownership rates do not appear to vary by quota status on average. CHNS households in low quota provinces however have somewhat lower household income, have lower educational attainment, have a higher likelihood of having children and are slightly older than CHNS households in the high quota provinces.

Table 3 reports the estimation results for equation (1). Notice that across models, the coefficient on the variable of interest, *QUOTA*, is positive and individually statistically significant. In model (5), we allow the effect of preferential access to vary by pre- and post-year of residency change. We check for joint significance of the coefficients on *QUOTA* and the interaction term, and find significance at the 5% level. To consider the magnitude of the effect, we multiple the coefficient estimates by a one standard deviation increase in the quota per million children according to the CHNS provinces' sample characteristics.[10] The result indicates that such an increase in the quota increases the likelihood of homeownership by roughly 7.5 percentage points in models (3) and (4). In model (5), the variation by 2003 residency change is larger now -- suggesting a relative increase due to the policy change of 1.7 percentage points, after controlling for time-varying household- and province-level variables, household fixed effects and year fixed effects and clustering on province. Finally, note that with regard to the supply side measures, in model (6), we find that population density decreases the likelihood of

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[10] Note, for ease of presentation, the table 3 models were run using the quota measure per 10 million children, so we divide the coefficient estimate by 10 before computing the marginal effects.

homeownership, but we do not find a statistically significant effect of weekly construction wages.

6. Conclusion

In this paper, we examine the extent to which new residency requirements that tie access to Chinese universities to homeownership status in the presence of a rising college premium may have fueled the demand for homeownership in certain places and help explain the demand-driven, rapidly rising house values in many Chinese locales. We create a measure of preferential access to China's 39 elite universities, those that are part of the so called "985 program," that varies by province over time, and link this measure to province-level data from the Chinese Statistical Yearbook, to examine house price effects, and household and neighborhood panel data from the CHNS, to examine homeownership effects. We find evidence of a positive association at the province level between the growth in house prices and preferential access to elite universities, suggesting that the 2003 change in residency requirements lead to capitalization of the rising college premium into local house prices. Using household panel data, we find a positive and significant effect of preferential access on the likelihood of homeownership, which increases post 2003, following the national change in residency status.

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Table 1. Evidence of House Price Capitalization of Preferential University Access

Panel A. Regression model. Dependent variable: real house price appreciation rate

	(1)	(2)	(3)	(4)	(5)	(6)
	All provinces pre-policy	Tight housing supply pre-policy	All provinces Post-policy	Tight housing supply post-policy	All provinces 2008-2010	Tight housing supply 2008-2010
Quota/child	-0.00111	-0.00009	0.000123*	0.000171**		
	(0.00076)	(0.00015)	(0.00006)	(0.00008)		
Quota/examinees					0.0138**	0.0193***
					(0.0052)	(0.0023)
Constant	0.857	0.157	0.0271	-0.0168	-0.122	-0.217***
	-0.53	-0.105	-0.0587	-0.0747	(0.099)	(0.044)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year obs.	93	46	279	139	93	46

Panel B. Summary statistics

	Quota/child		Quota/examinees	
	Mean	Std dev	Mean	Std dev
All provinces post-policy change	900	592		
Tight housing supply post-policy change	960	662		
All provinces 2008-2010			18.9	8.8
Tight housing supply 2008-2010			18.6	7.2

Real house price is computed by the authors as the real average selling price (price per square meter in 2011 RMB) of residential properties using Chinese Statistical Yearbook series 5-36 and 5-37. Models (1) and (2) are estimated using 2000 to 2002 data, and models (3) and (4) are estimated using post-policy data from 2003 to 2010. Province-level data on the number of students taking college entrance exams are available from 2008 to present, and Models (3) and (4) use these data. Provinces used in the "Tight housing supply" estimations are those that have a below-the-median "excess" housing supply, measured as the ratio of annual residential units built to annual residential units sold. Standard errors in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 2. CHNS Sample Means by Province-Level Quota Allocation.

	Full Sample	High Quota	Low Quota
homeownership	0.904	0.906	0.902
income	3.04	3.21	2.82
age	53	52	55
college	0.05	0.07	0.04
children	0.55	0.51	0.60
married	0.89	0.91	0.87
quota per million children	586	854	433
rent inflation	0.03	0.03	0.03
nominal price growth	0.10	0.10	0.11
population density	1464	1592	1243
average weekly construction wage	43	45	54
household-year observations	14281	4789	8362

Notes. Data are longitudinal CHNS data for the years 2000, 2004, 2006 and 2009. Income is measured as total household income (in thousands of 2011 RMB). Rent and price data are from the Chinese Statistical Yearbook and vary at the province-year level. We define high quota and low quota provinces as those with a quota per one million children (age zero to 14) above and below the median quota of China's 31 provinces, respectively. Population density, expressed as 1000s of persons per square mile, and the average weekly construction wage, expressed in 2011 RMB, are for the in the city in which the household is located and obtained as part of the CHNS community-level variables from the Carolina Population Center (CPO) at the University of North Carolina at Chapel Hill.

Table 3. Probability of Homeownership: CHNS Households.

|	(1)	(2)	(3)	(4)	(5)	(6)
income	-0.0022**	-0.0022**	-0.0021**	-0.0021**	-0.0020**	-0.0005
	(0.0009)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0006)
age	0.0179***	0.0136***	0.0110**	0.0109**	0.0083*	0.0042
	(0.0037)	(0.0038)	(0.0039)	(0.0040)	(0.0038)	(0.0112)
college	0.0625*	0.0637*	0.0547	0.0545	0.0566*	0.0303
	(0.0322)	(0.0315)	(0.0305)	(0.0305)	(0.0301)	(0.0342)
kids	0.0002	0.0000	0.0032	-0.0035	0.0036	-0.0227
	(0.0247)	(0.0246)	(0.0240)	(0.0337)	(0.0240)	(0.0229)
married	-0.0135	-0.0130	-0.0157	-0.0156	-0.0172	0.0103
	(0.0554)	(0.0545)	(0.0545)	(0.0544)	(0.0550)	(0.0308)
Quota		0.0047**	0.0053**	0.0053**	0.0032**	0.0050*
		(0.0017)	(0.0017)	(0.0016)	(0.0012)	(0.0013)
rent inflation			0.6295**	0.6283**	0.6506**	0.6150
			(0.2602)	(0.2604)	(0.2543)	(0.344)
price growth			0.0928	0.0924	0.1182	-0.0109
			(0.1263)	(0.1264)	(0.1322)	(0.107)
kids*quota				0.00003		
				(0.00006)		
quota*2003					0.0012*	
					(0.0006)	
pop density						-0.0034**
						(0.0014)
constr. wage						-0.0004
						(0.0008)
constant	-0.1667	-0.0506	0.0487	0.0539	0.2202	0.3150
	(0.2157)	(0.1990)	(0.2166)	(0.2244)	(0.1995)	(0.544)
Household FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
hh-year obs.	4696	4696	4696	4696	4696	3145

Dependent variable equals one if the household owns and zero otherwise. Data are household panel data from the CHNS for the years 2000, 2004, 2006 and 2009. *QUOTA* is divided by 10 in these estimations. Population density is 1000s of person per square km in the household's city of location. Model (6) includes years 2004, 2006 and 2009 since community population density and construction wage data are only available beginning in 2004. Errors are clustered on province and cluster-robust standard errors are in parentheses.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 1. 2012 Admission Ratio Relative to Eligible Population by Province

Panel A: Relative to Child Population
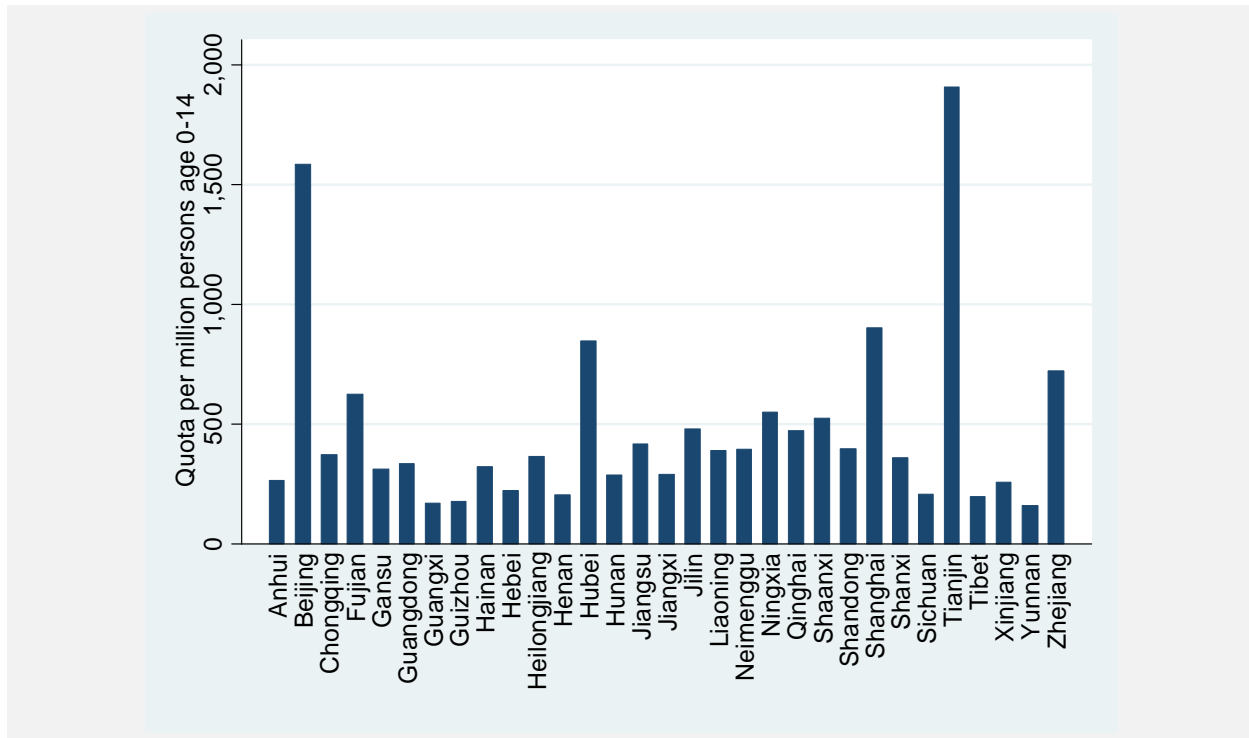
Panel B: Relative to Number of Students Taking College Exams
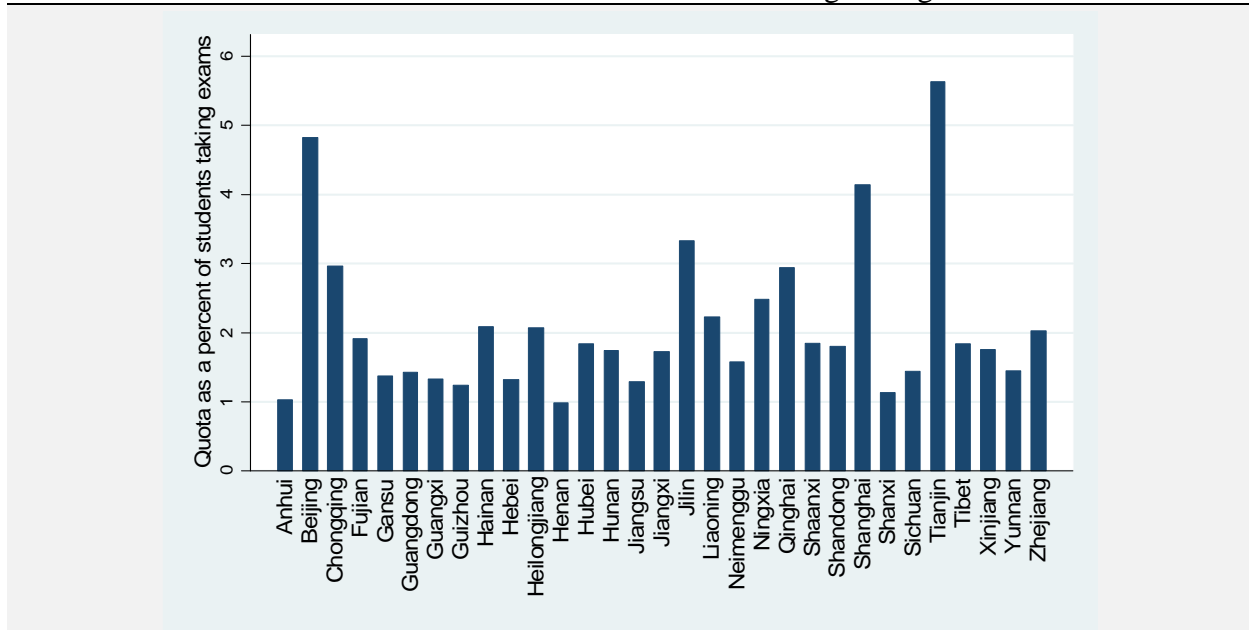
Notes. Child population data are from the Chinese Statistical Yearbook. The quota data and number of students taking exams by provinces are assembled by the authors.

Figure 2. Timeline.

Education: Centrally   Double track   Market oriented
             planned   phase   phase

National college entrance exams   Provincial college entrance exams

1986   1992   1997 1998   2001   2003   Present

Housing Reform: Public rental units   Double track phase   Full Privatization

Hukou Reform: Group Hukou   Tied to private houses
                 tied to work units   Household Hukou
                 or Household Hukou
                 tied to rental units   Blue Hukou   Temporary
                                                                       Residential
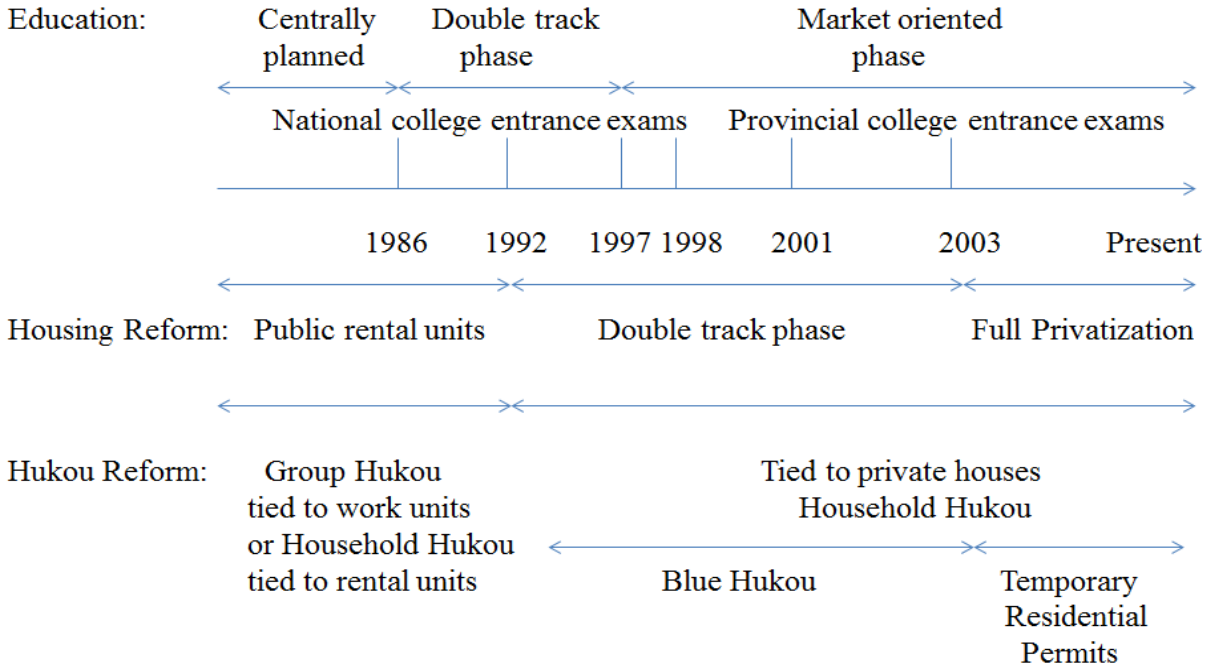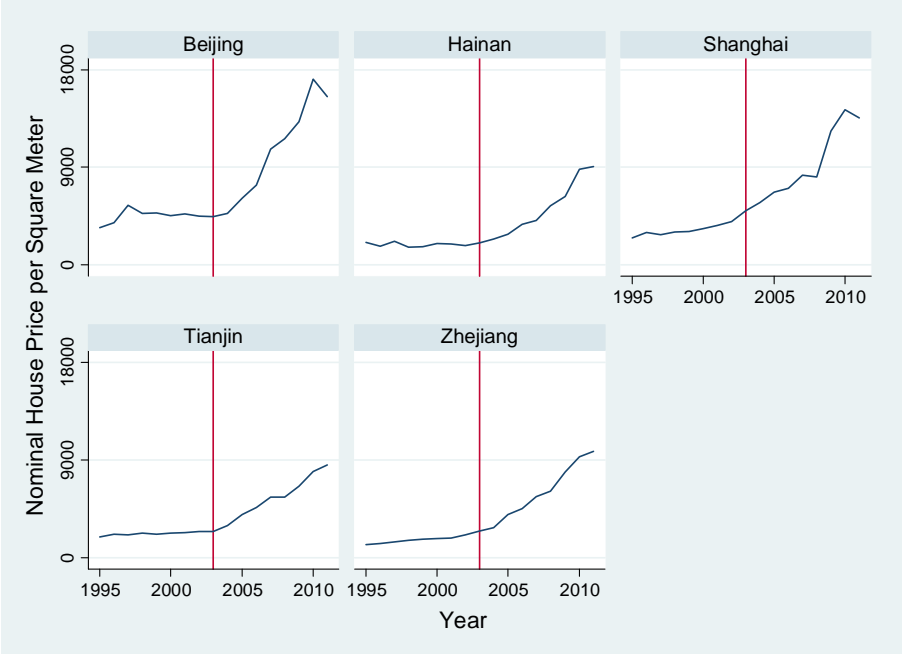   Permits

Figure 3a. Nominal Average Selling Price of Residential Properties. Selected Provinces.

Notes. Data are Yuan per square meter and computed by the authors using Chinese Statistical Yearbook series 5-36 and 5-37.
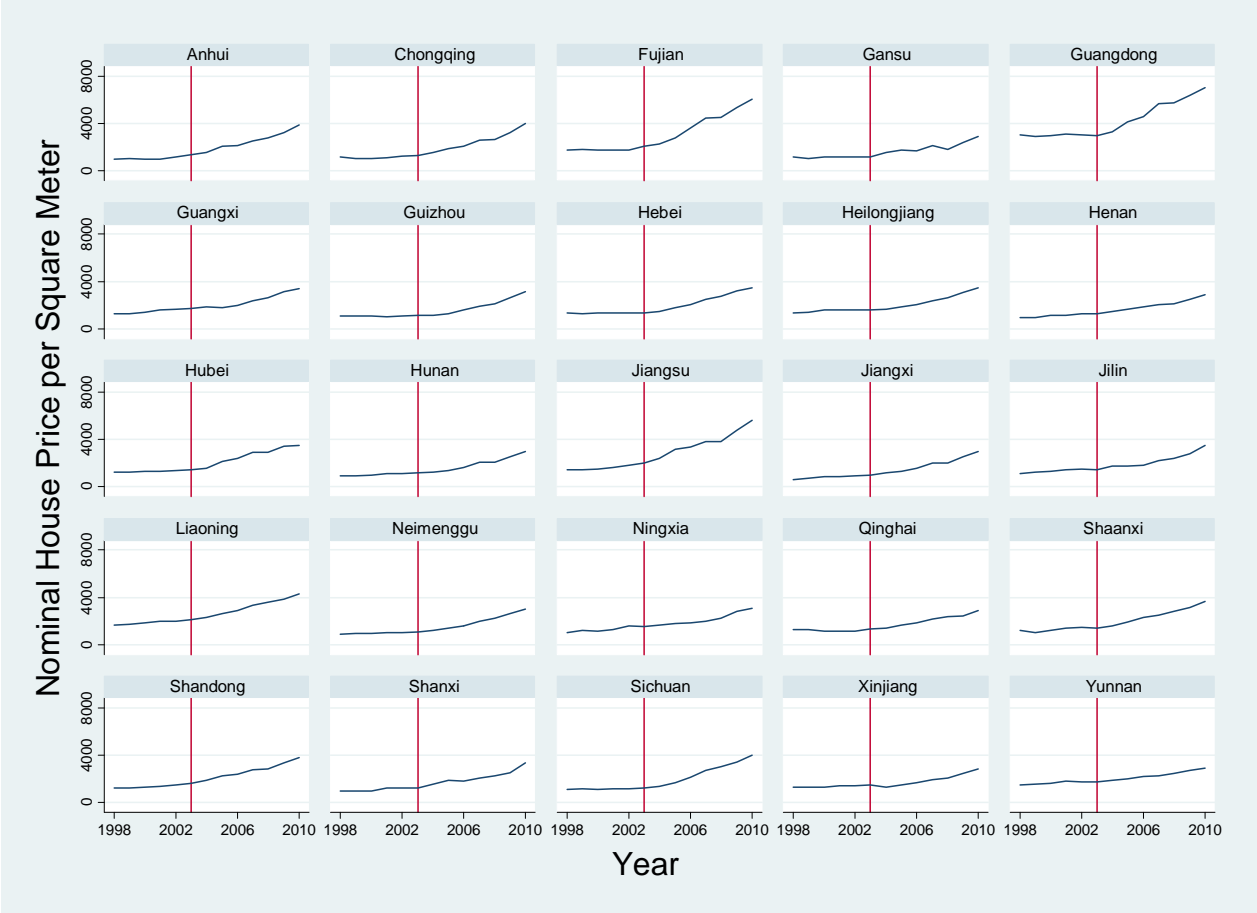
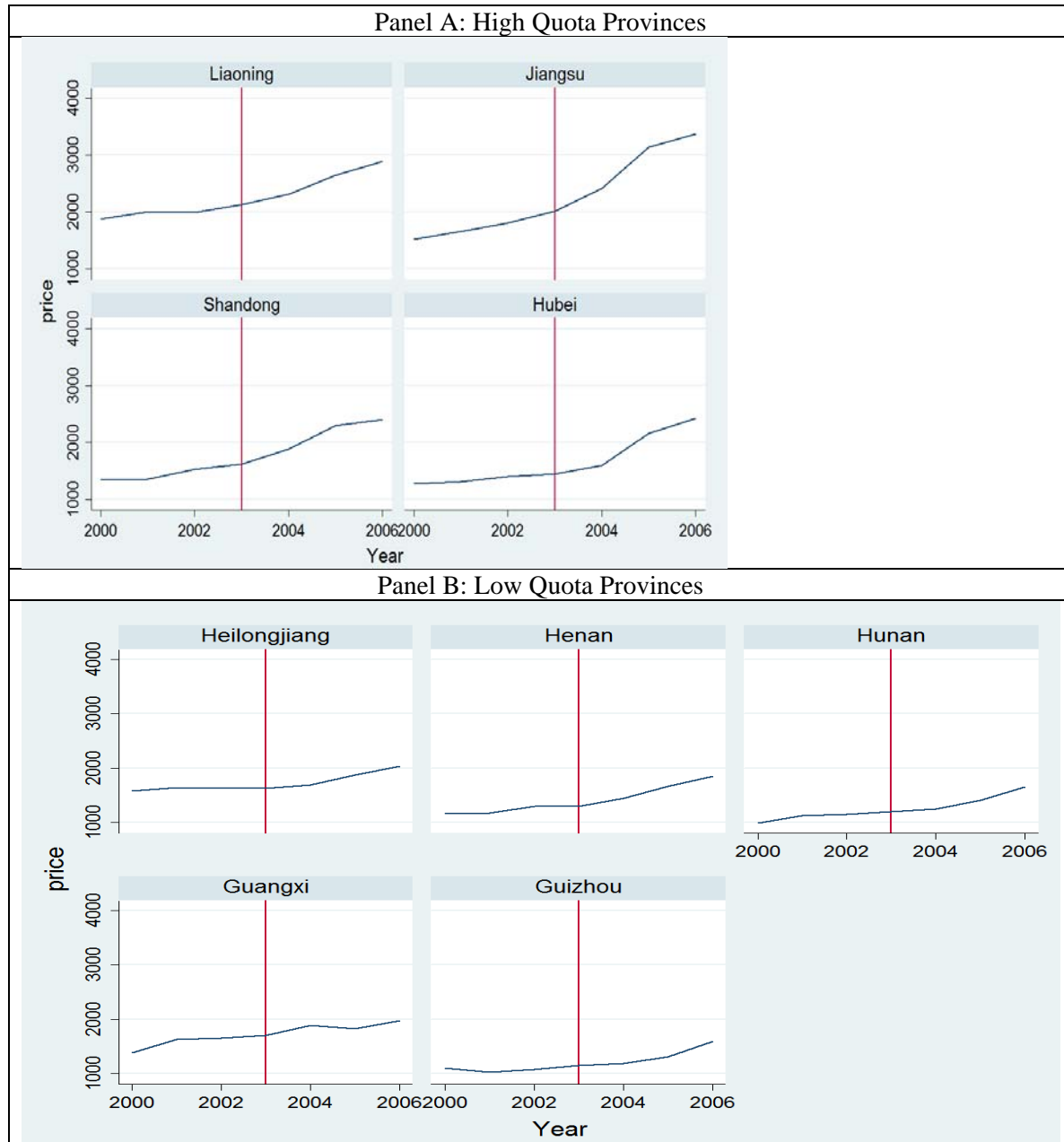Figure 3b. Nominal Average Selling Price of Residential Properties. Selected Provinces.


Notes. Data are Yuan per square meter and computed by the authors using Chinese Statistical Yearbook series 5-36 and 5-37.

Figure 4. Nominal Average Selling Price of Residential Properties in CHNS Provinces.

Panel A: High Quota Provinces

Panel B: Low Quota Provinces

Notes. Data are Yuan per square meter and computed by the authors using Chinese Statistical Yearbook series 5-36 and 5-37. High quota and low quota provinces defined as those with a 2004 quota per one million children (age zero to 14) above and below the median quota in China's 31 provinces, respectively.

Figure 5. Inflation in Rent vs. Inflation in Housing

Graphs by province

inflation_rent   inflation_house
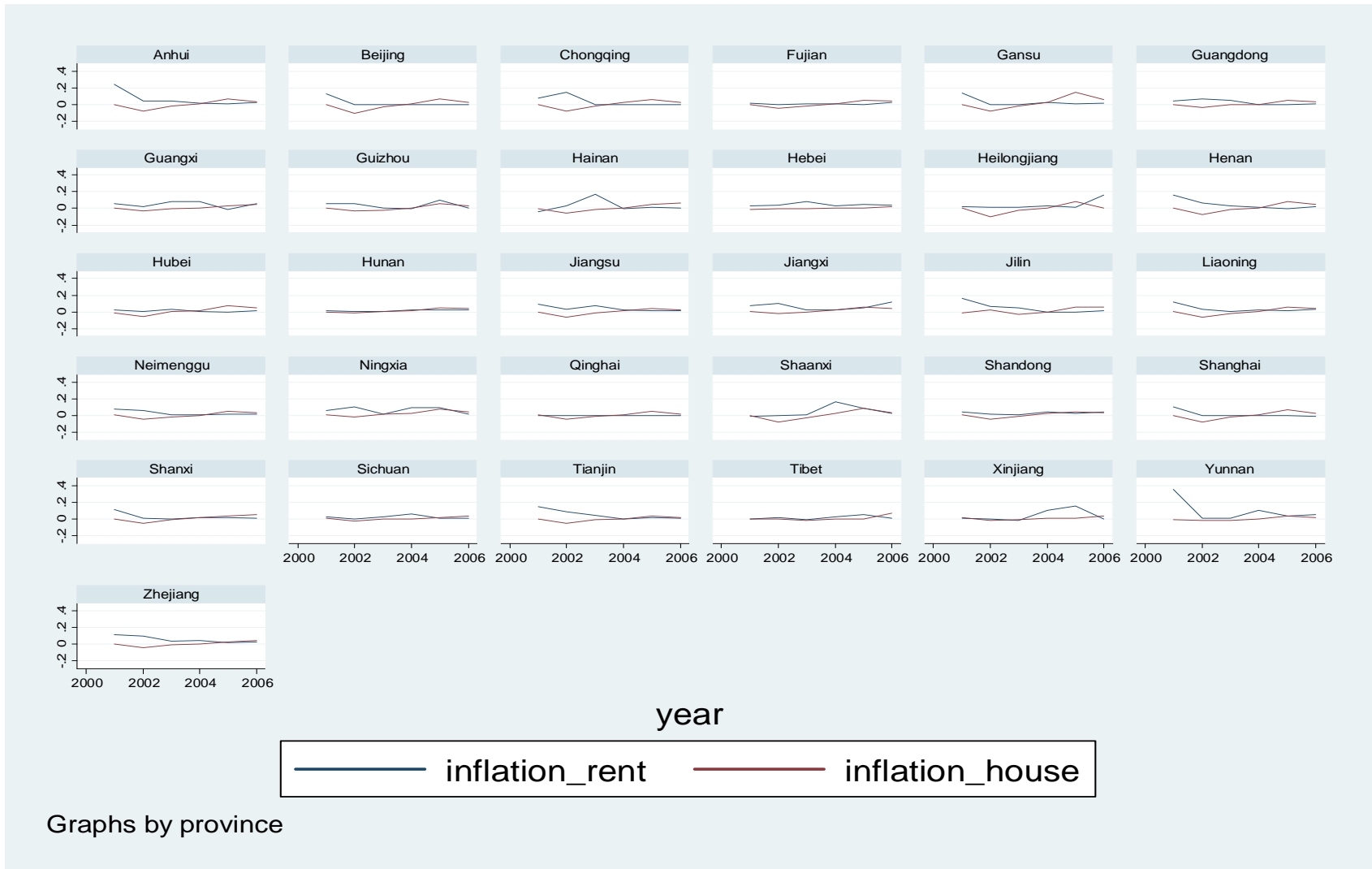
Notes. Data are annual inflation in rent and private housing from Chinese Statistical Yearbook series 9-6.

Appendix: Table A1. List of China's "985" Program Universities

List of 985 universities	Provinces
University of Science and Technology of China (USTC)	Anhui
Tsinghua University	Beijing
Peking University	Beijing
Renmin University of China	Beijing
Beihang University	Beijing
Beijing Normal University	Beijing
Beijing Institute of Technology	Beijing
Minzu University of China	Beijing
Chongqing University	Chongqing
Xiamen University	Fujian
Lanzhou University	Gansu
Sun Yat-Sen University	Guangdong
South China University of Technology	Guangdong
Harbin Institute of Technology	Heilongjiang
Huazhong University of Science and Technology	Hubei
Wuhan University	Hubei
Hunan University	Hunan
Central South University	Hunan
National University of Defense Technology	Hunan
Nanjing University	Jiangsu
Southeast University	Jiangsu
Jilin University	Jilin
Northeastern University	Liaoning
Dalian University of Technology	Liaoning
Xi'an Jiaotong University	Shaanxi
Northwest Polytechnical University	Shaanxi
Northwest A&F University	Shaanxi
Shandong University	Shandong
Ocean University of China	Shandong
Shanghai Jiaotong University	Shanghai
Fudan University	Shanghai
Tongji University	Shanghai
East China Normal University	Shanghai
University of Electronic Science and Technology of China	Sichuan
Sichuan University	Sichuan
Nankai University	Tianjin
Tianjin University	Tianjin
Zhejiang University	Zhejiang

Appendix Table A2. 2007 Province-Level Summary Statistics.

	Mean	Std Dev	Min	Max
Panel A: All provinces				
price	3303.3	2006.3	1899.4	10661.3
disposable income per capita	13111.4	3563.8	10012.3	23622.7
% employment private sector	0.66	0.10	0.51	0.86
housing stock per capita	900.7	359.1	384.4	1979.9
% urban	0.47	0.15	0.28	0.89
% green space	0.33	0.08	0.00	0.43
Population (millions)	42.0	27.1	2.9	96.6
sample Size	31	31	31	31

Notes. Data are from the 2007 Chinese Statistical Yearbook. Price is measured as the average selling price (price per square meter) of residential properties in nominal RMB and computed by the authors using Chinese Statistical Yearbook series 5-36 and 5-37.

Appendix Table A3. Cross-sectional determinants of Province-Level Residential Property Prices.

	(1)	(2)	(3)	(4)
quota per million children	4.263***	1.719***	1.180**	2.043***
	(0.7447)	(0.5583)	(0.4742)	(0.6441)
disposable income per capita in logs		6094.1***	5086.9***	4266.9***
		(822.1)	(872.4)	(856.8)
% employment private sector			6058.4***	6272.5***
			(1415.1)	(1306.3)
housing stock per capita			2.2496***	1.3844
			(0.6671)	(1.0876)
% urban				1927.5
				(2895.8)
% green space				4856.4**
				(1933.2)
constant	1685.87***	-.0005***	-.0005***	-.0004***
	(377.9)	(7643.3)	(7998.6)	(7614.2)
N	31	31	31	31
r2	0.530	0.841	0.915	0.934
F	32.775	74.355	70.019	56.887
Ll	-267.482	-250.648	-240.985	-237.001

Notes. The dependent variable is price, measured as the average selling price (price per square meter) of residential properties in nominal RMB and computed by the authors using Chinese Statistical Yearbook series 5-36 and 5-37.. Data are for all provinces in China and from the 2007 Chinese Statistical Yearbook, except for the quota data, which is assembled by the authors. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Figure A1. Map of China.

Provinces in CHNS survey: Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning and Shandong. Source: CHNS Map of Survey Region, downloaded 11/18/2014. http://www.cpc.unc.edu/projects/china/about/proj_desc/chinamap