

DEMYSTIFYING THE CHINESE HOUSING BOOM

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First Research Workshop on China's Economy
IMF and Atlanta Fed

WE HAVE SEEN CONSTRUCTION BOOM ACROSS CHINA ...



WE HAVE ALSO HEARD STORIES OF GHOST TOWN IN INNER MONGOLIA ...



DOMESTIC AND GLOBAL Concerns ABOUT CHINESE HOUSING MARKETS

- Has housing become “too expensive” for Chinese households?
- What are the factors that will shape the future trajectory of the Chinese housing market?
- Is China experiencing a housing bubble #2 after the US?
- Will China follow the footsteps of Japan to have a lost decade?

SPECIFIC QUESTIONS WE ADDRESS ...

- How much have housing prices in China appreciated in the last decade?
- How did the price appreciation vary across the cities?
- Did the soaring prices exclude low-income households from participating in the housing markets?
- How much financial burden did households face in buying homes?

INSTITUTIONAL BACKGROUND

- Markets for housing emerged only after late 1990s
 - Housing used to be assigned to employees by state enterprises
 - Various reforms in 1990s (legalizing property rights to housing and abolishing housing allocation as in-kind benefit)
 - In response to 1997 Asian Financial Crisis, Chinese government established the real estate sector as a new engine of economic growth
 - PBC outlined procedures for residential mortgage loans at subsidized interest rates in 1998

Housing Price Growth 2003-2013

LIST OF CITIES

- First tier (4 cities): Beijing, Shanghai, Guangzhou, and Shenzhen
- Second tier (35 cities): 2 autonomous municipalities, capital cities of 24 provinces, and 9 vital industrial and commercial centers
 - Our sample covers 31 of them
- Third tier: regional industrial or commercial centers
 - 85 in our sample

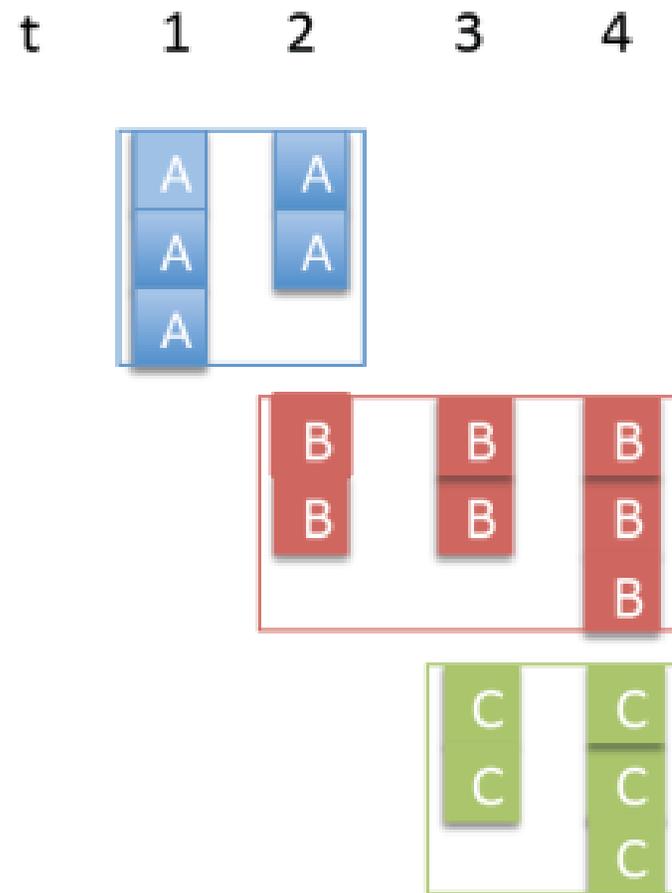
CONSTRUCTING HOUSING PRICE INDEX

Two standard approaches

- **Hedonic price regressions**, e.g., Kain and Quigley (1970)
 - **Unobserved characteristics** may lead to biased estimate
 - Rapid expansion of Chinese cities makes it especially hard to fully capture all characteristics
- **Repeated sales approach**, e.g., Baily, Muth and Nourse (1963) and Case and Shiller (1987)
 - Does not require measurement of quality
 - wastes a large fraction of transaction data; repeated sales may not be representative of the general population of homes
 - Not so many repeated sales in the nascent Chinese housing markets

A HYBRID APPROACH FOR CHINESE HOUSING MARKETS

- A large number of new home sales in each city
 - Typically apartments in development projects
 - Within a development complex, the unobserved apartment amenities are similar
 - It takes 1-2 years to sell all units in one complex



A HYBRID APPROACH FOR CHINESE HOUSING MARKETS

- Jan 2003 to March 2013, a regression *for each city*:

$$\ln P_{i,c,t} = \beta_{c,0} + \sum_{s=1}^T \beta_{c,s} \cdot 1\{s = t\} + \theta_c \mathbf{X}_i + DP_i + \varepsilon_{it},$$

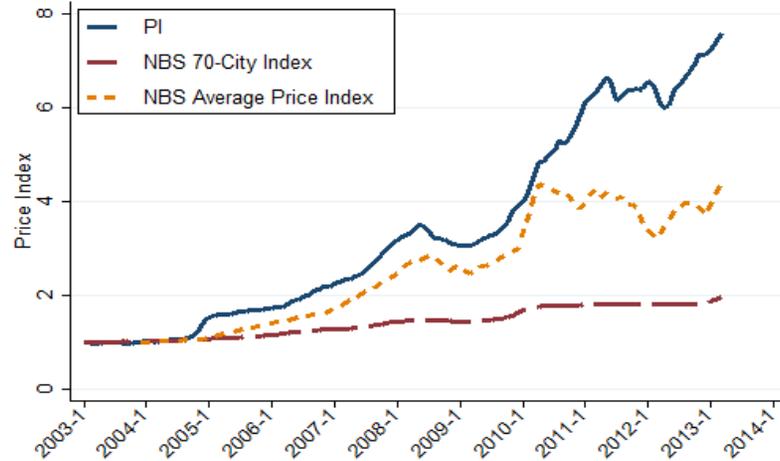
$$PI_{c,t} = \begin{cases} 1 & \text{if } t = 0 \\ \exp(\beta_{c,t}) & \text{for } t = 1, 2, \dots \end{cases}$$

DATA

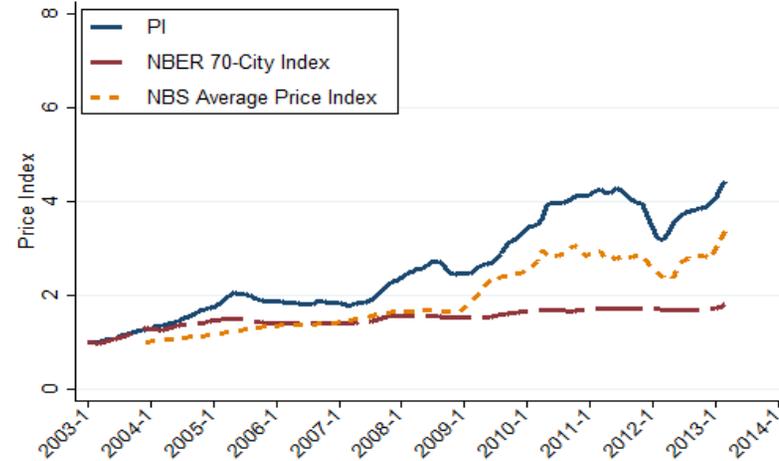
- A detailed mortgage data set for 120 major cities in 2003-2013
 - a large commercial bank with 15% market share
 - one million mortgage loan contracts dating from the first quarter of 2003 to the first quarter of 2013
- A typical mortgage contract contains information on
 - home buyers;
 - housing price and size, apartment-level characteristics (e.g., complex location, floor level, and room number)
 - loan characteristics (e.g., loan to value ratio, and down-payment)

PRICE INDICES FOR FIRST TIER CITIES

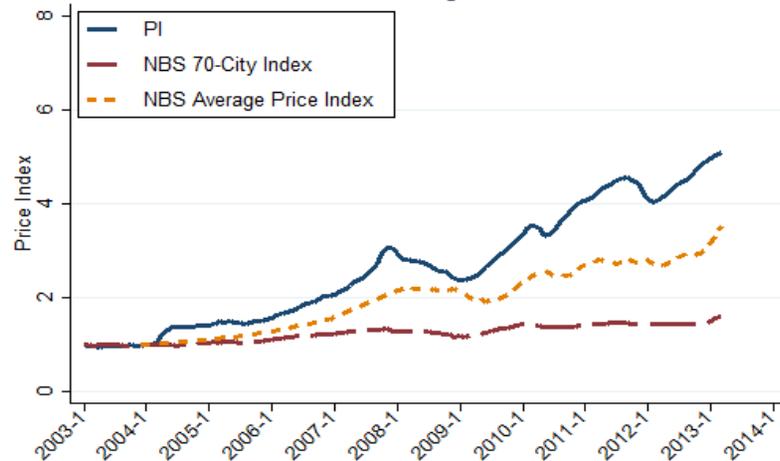
A. Beijing



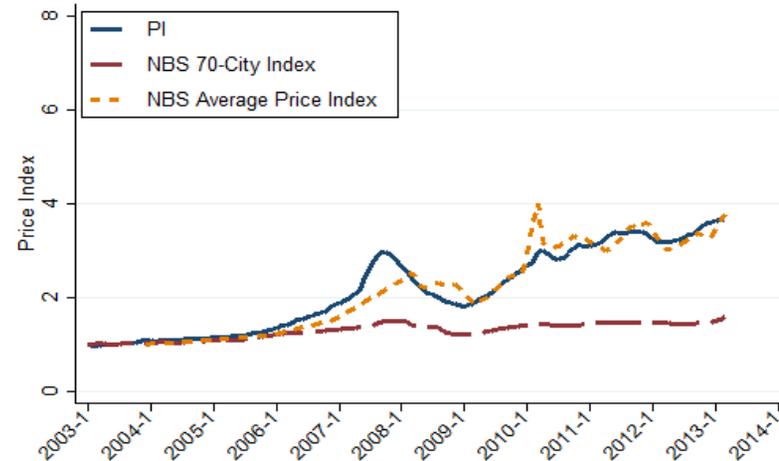
B. Shanghai



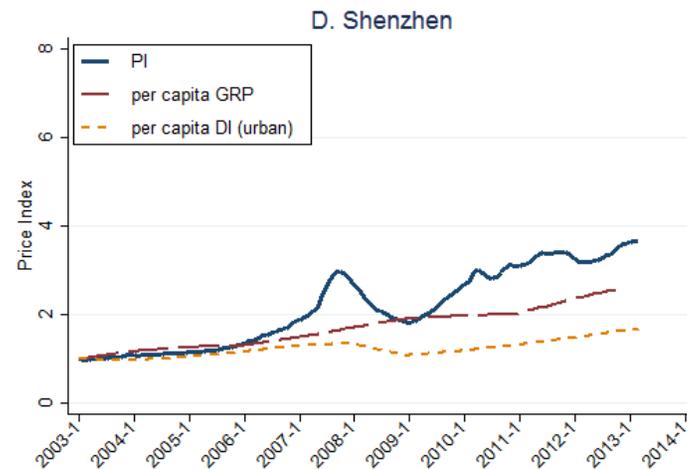
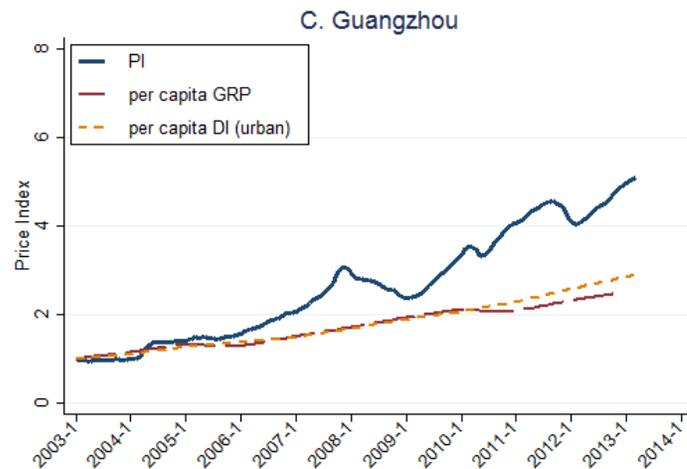
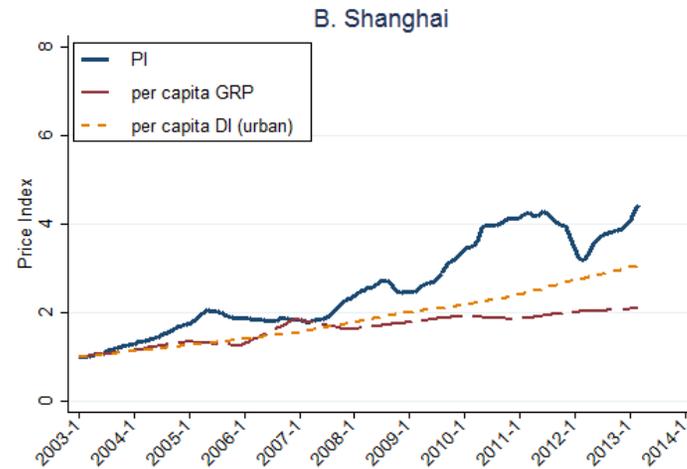
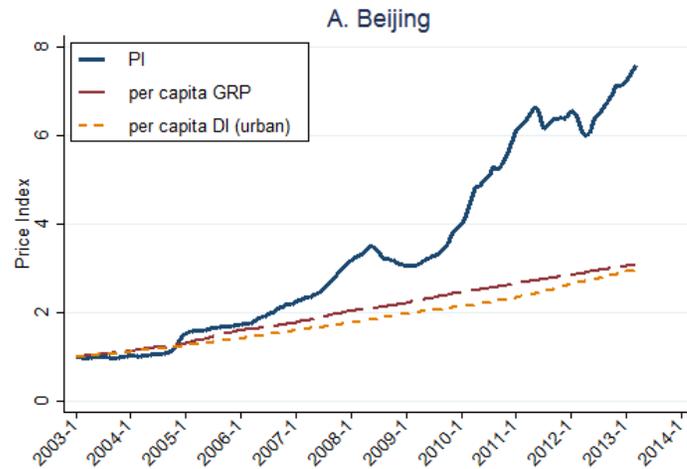
C. Guangzhou



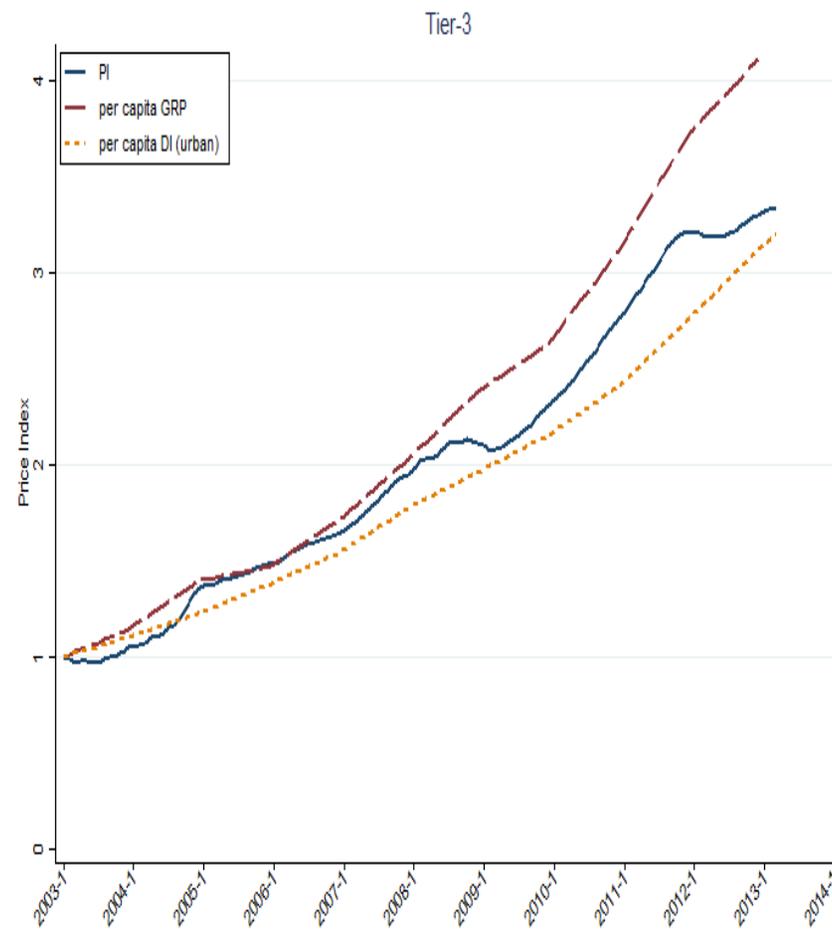
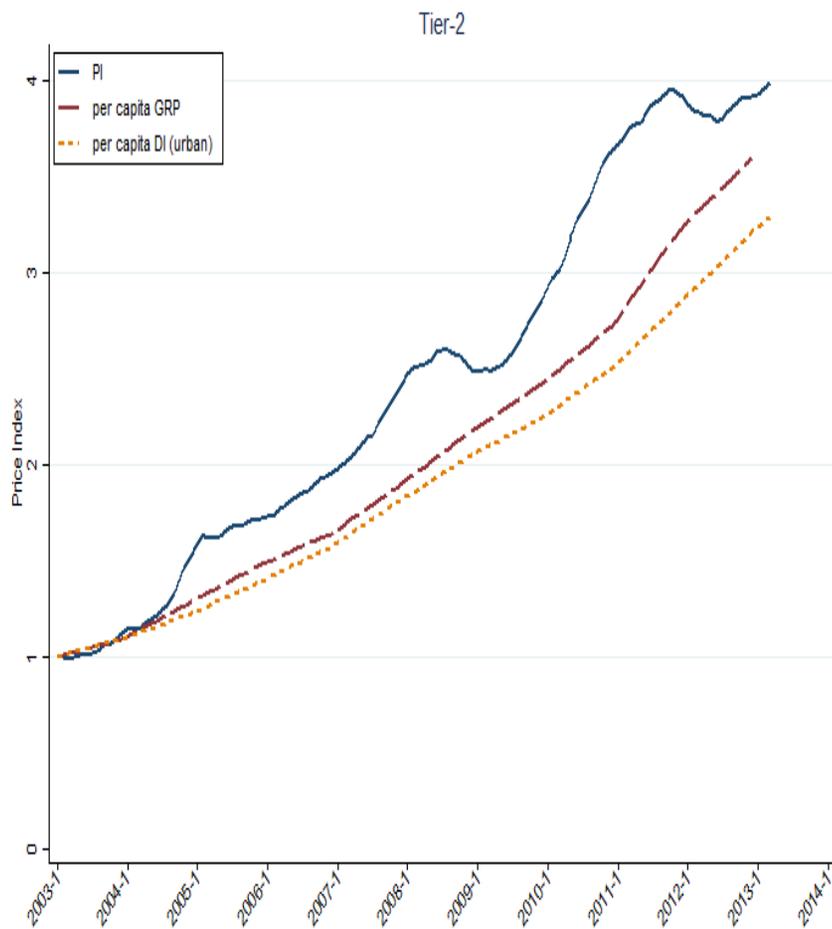
D. Shenzhen



PRICE INDICES VS. INCOME FOR FIRST-TIER CITIES



HOUSING PRICE INDICES VS. INCOME FOR SECOND AND THIRD TIER CITIES:



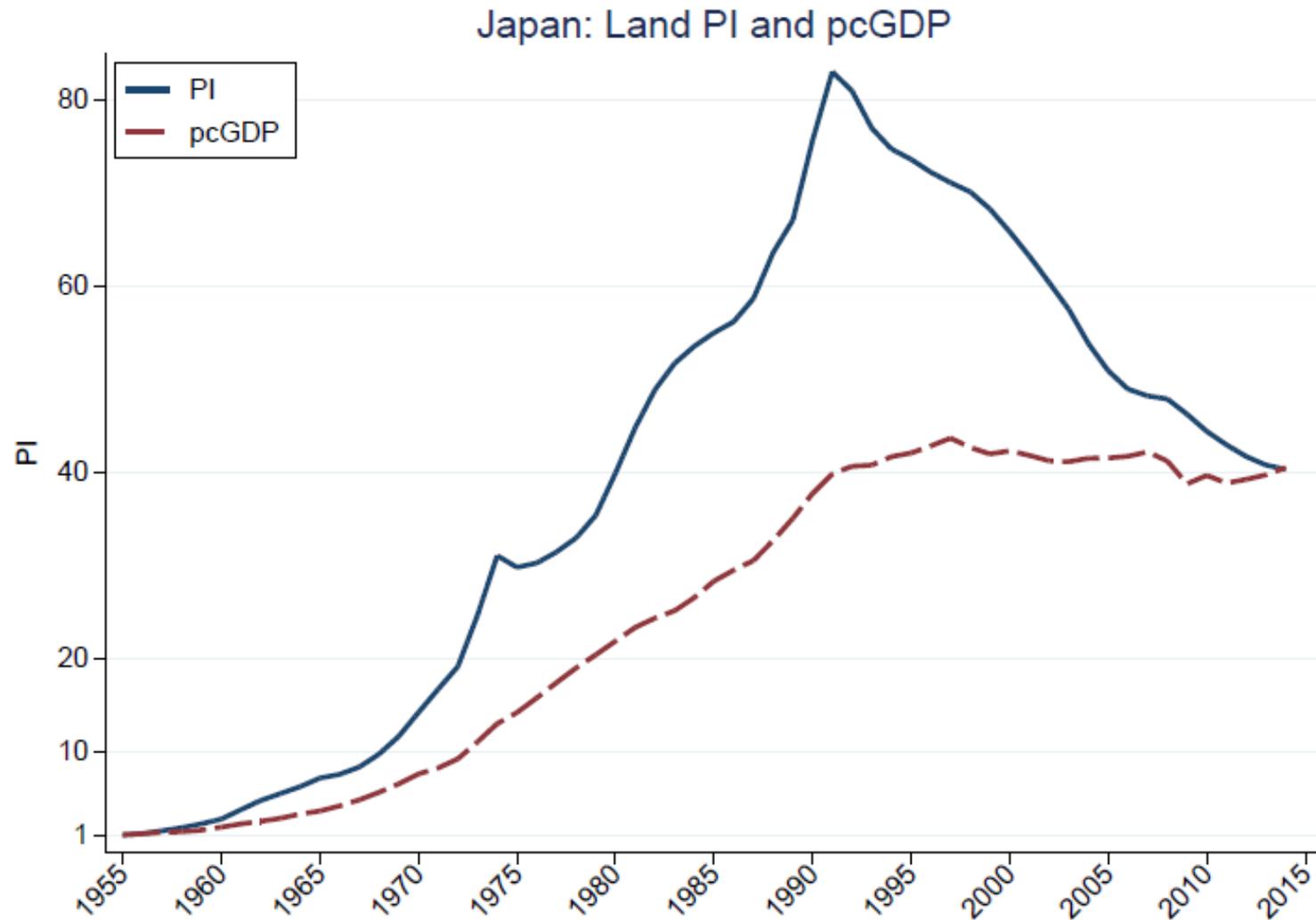
SUMMARY STATISTICS (NOMINAL)

Nominal Growth	January 2003 - December 2007					January 2009 - March 2013				January 2003 - March 2013			
	Obs	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Panel A: Tier 1 Cities													
Housing Price Index	4	.210	.027	.172	.230	.177	.033	.139	.219	.159	.031	.128	.200
Per capita GRP index	4	.114	.020	.097	.144	.066	.020	.038	.081	.094	.016	.074	.112
Per capita DI index (urban)	4	.099	.025	.061	.116	.102	.003	.098	.105	.093	.028	.051	.110
Panel B: Tier 2 Cities													
Housing Price Index	31	.168	.056	.021	.290	.116	.034	.043	.216	.132	.022	.082	.189
Per capita GRP index	30	.136	.050	.010	.235	.129	.031	.052	.191	.134	.033	.042	.189
Per capita DI index (urban)	30	.119	.025	.055	.178	.113	.013	.098	.164	.117	.015	.078	.152
Panel C: Tier 3 Cities													
Housing Price Index	85	.113	.067	-.099	.250	.114	.036	.041	.242	.106	.036	.007	.178
Per capita GRP index	85	.154	.045	.006	.260	.140	.036	.037	.214	.150	.032	.030	.231
Per capita DI index (urban)	74	.118	.020	.059	.186	.117	.011	.087	.141	.117	.012	.079	.154

SUMMARY STATISTICS (REAL)

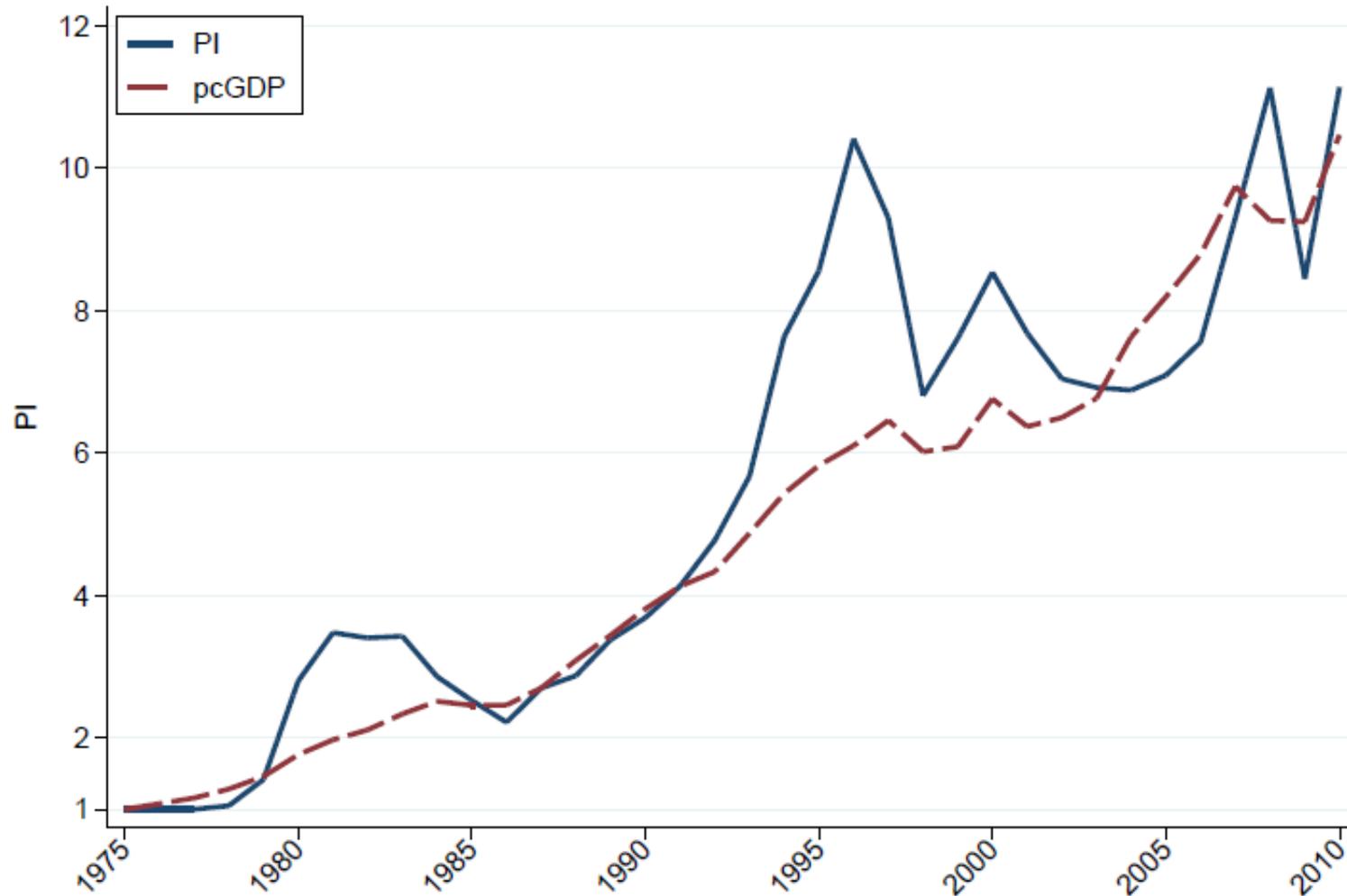
Real Growth	January 2003 - December 2007					January 2009 - March 2013				January 2003 - March 2013			
	Obs	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Panel A: Tier 1 Cities													
Housing Price Index	4	.187	.027	.148	.206	.151	.033	.113	.193	.131	.031	.100	.172
Per capita GRP index	4	.090	.020	.074	.120	.040	.020	.012	.055	.067	.016	.046	.085
Per capita DI index (urban)	4	.075	.025	.038	.092	.076	.003	.072	.079	.066	.028	.024	.083
Panel B: Tier 2 Cities													
Housing Price Index	31	.145	.056	-.002	.266	.090	.034	.017	.190	.105	.022	.054	.162
Per capita GRP index	30	.113	.050	-.013	.212	.103	.031	.026	.165	.107	.033	.015	.161
Per capita DI index (urban)	30	.095	.025	.031	.154	.087	.013	.072	.138	.090	.015	.050	.125
Panel C: Tier 3 Cities													
Housing Price Index	85	.090	.067	-.123	.227	.089	.036	.015	.216	.079	.036	-.021	.150
Per capita GRP index	85	.131	.045	-.018	.236	.114	.036	.011	.188	.123	.032	.003	.204
Per capita DI index (urban)	74	.094	.020	.036	.162	.091	.011	.061	.115	.089	.012	.052	.127

HOUSING PRICE AND GDP GROWTH IN JAPAN



HOUSING PRICE AND GDP GROWTH IN SINGAPORE

Singapore: PI and pcGDP



INCOME GROWTH AS ANCHOR FOR HOUSING PRICE

$$\text{Max } h^\alpha C^{(1-\alpha)}$$

$$\text{s.t. } C+rh=Y$$

- Optimal solution: $rh^*/Y=\alpha$
- $\Rightarrow r=\alpha Y/h^*$
- In the data, as we show, h^* is almost constant (if anything slightly decrease in the data as we will show);
- Thus rental rate (and so housing price) will grow at the same or slightly higher rate as Y .

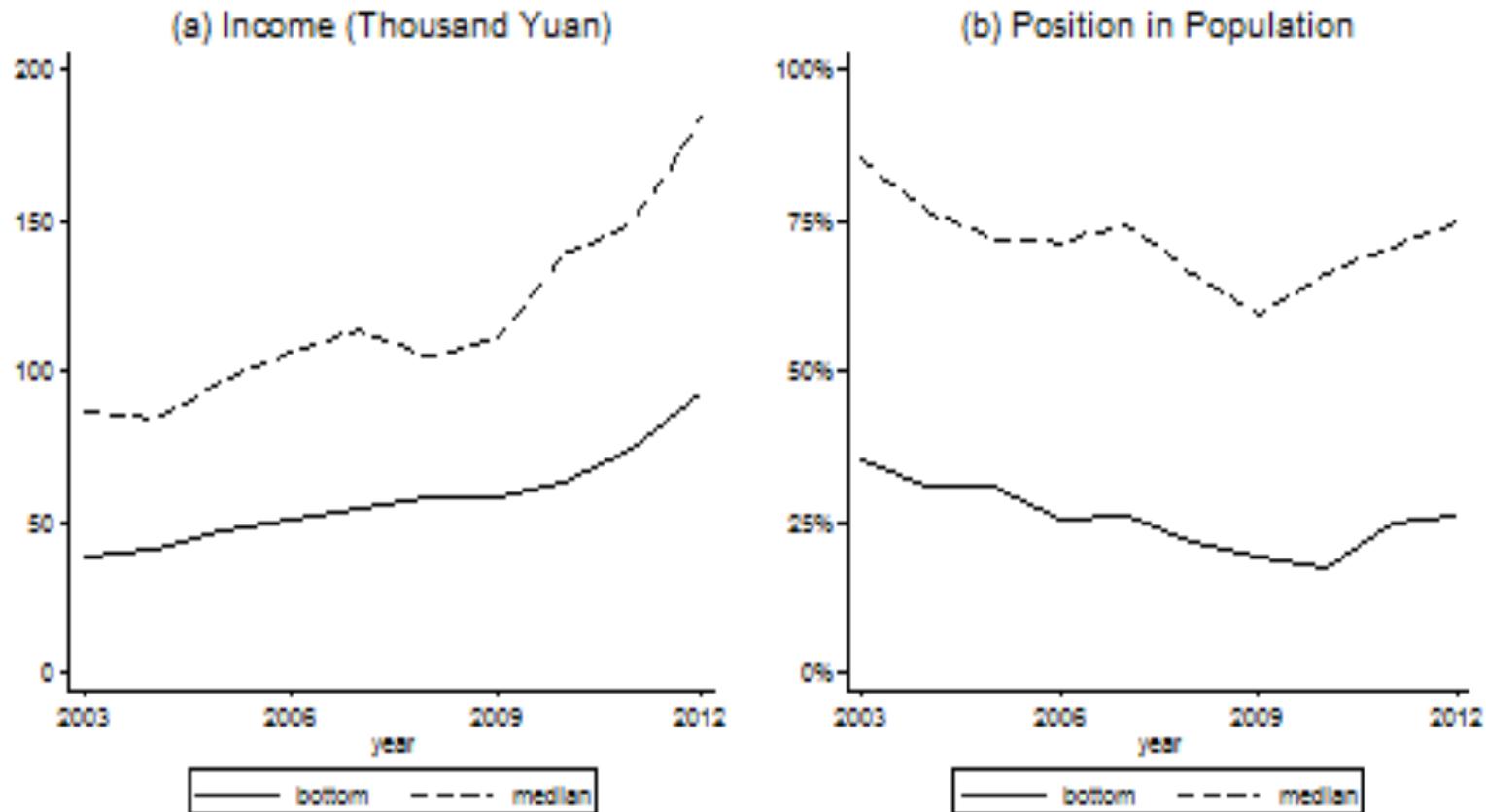
Home Buyers' Income and Their Financial Burdens

MORTGAGE BORROWERS

- We focus on two groups of mortgage borrowers
 - Bottom-income group with household income in bottom 10% of borrowers in a city during a year
 - Middle-income group with household income in range [45%, 55%]
- **p10** denotes the borrower with income at the 10 percentile;
- **p50** denotes the borrower at the median

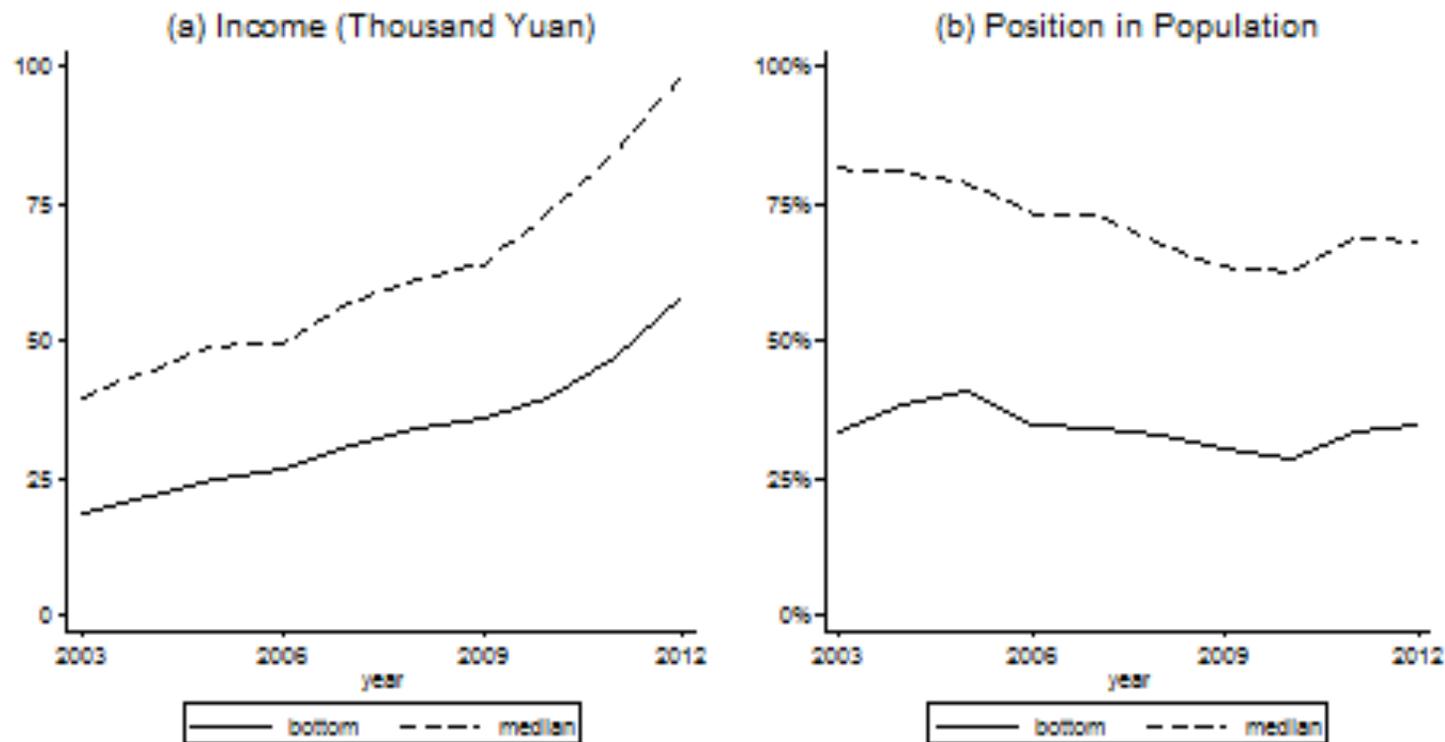
ANNUAL INCOME OF MORTGAGE BORROWERS IN TIER 1: LEVEL AND POSITION IN POPULATION

Income of Bottom and Median Mortgage Borrowers: Tier 1



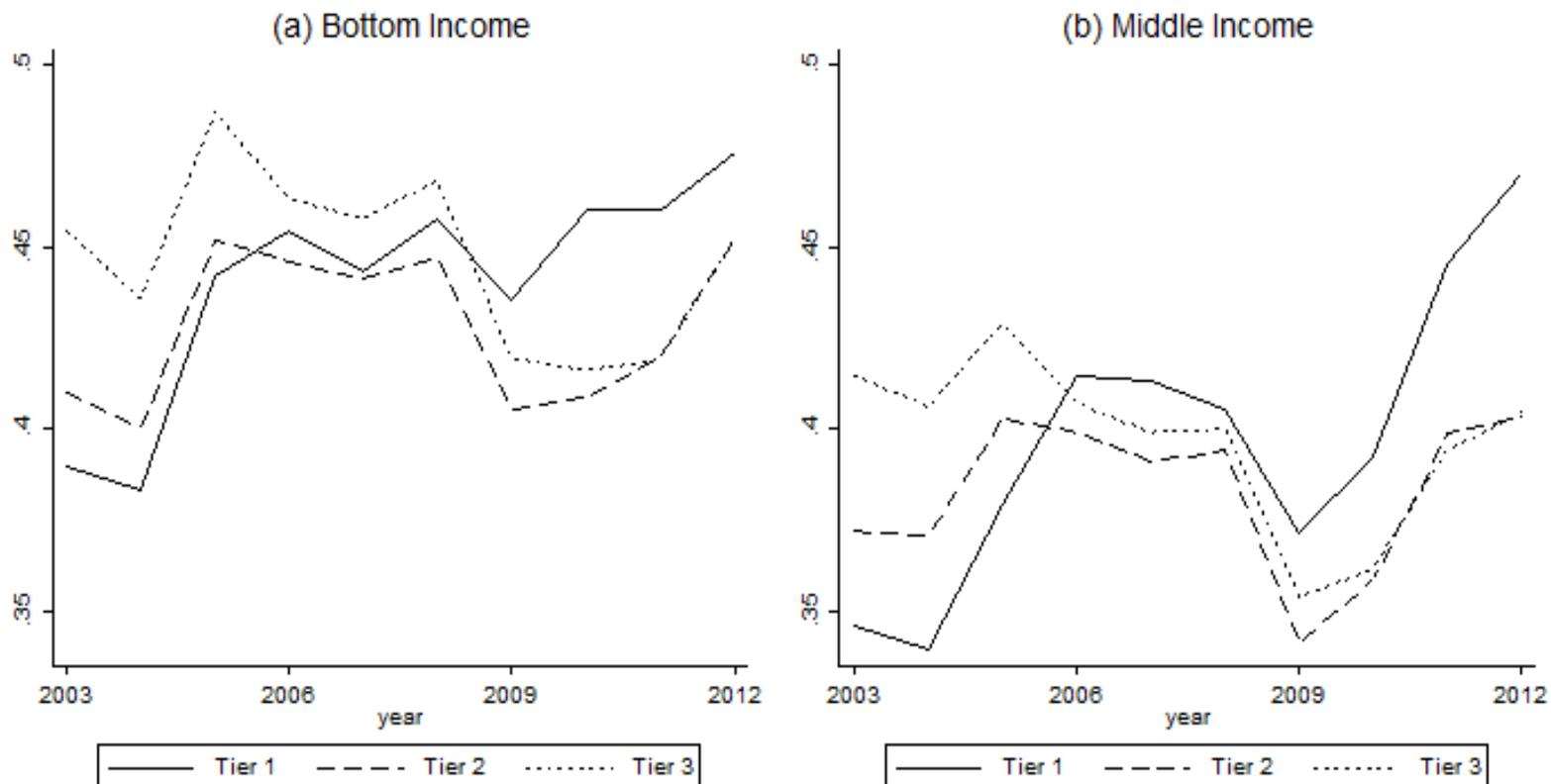
ANNUAL INCOME OF MORTGAGE BORROWERS IN TIER 2: LEVEL AND POSITION IN POPULATION

Income of Bottom and Median Mortgage Borrowers: Tier 2



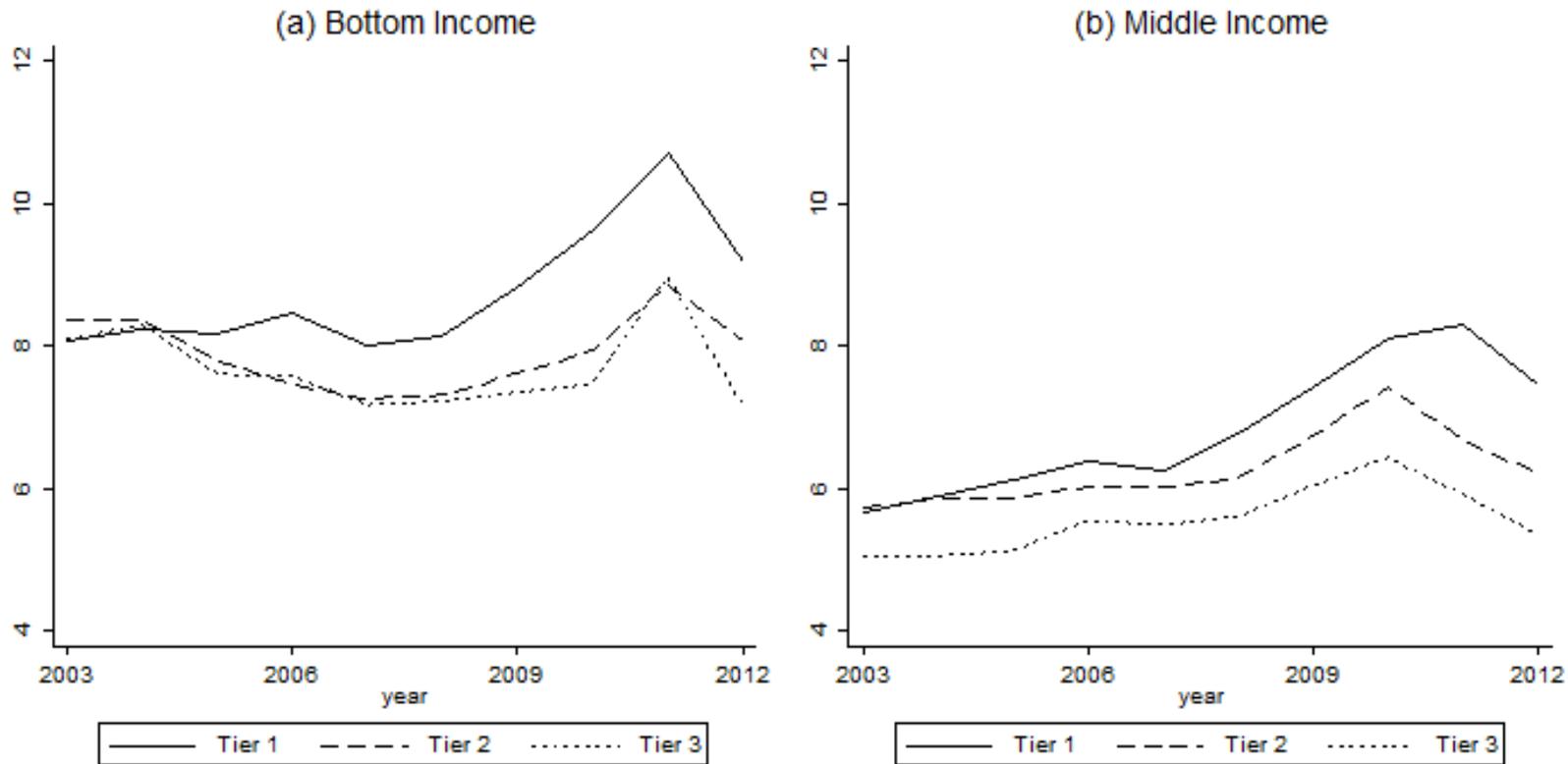
MORTGAGE DOWN PAYMENT: HIGH 35%-45%

Downpayment Ratio, Mortgage Data



PRICE-TO-INCOME RATIO OF MORTGAGE BORROWERS: HIGH!

Price-to-Income Ratio, Mortgage Data



FINANCIAL BURDEN OF MORTGAGE BORROWERS

- Consider a price-to-income ratio of 8
 - 40% down payment implies a saving of 3.2 years of household income
 - A mortgage loan at 4.8 times of annual income
 - 6% mortgage rate implies ~29% of income to pay mortgage interest
 - With a maximum 30 year mortgage maturity, $4.8/30=16\%$ income to pay down mortgage (linear amortization)
- Hidden debt to pay for the mortgage down payment?
 - Banks are allowed to grant only one mortgage on one home
 - Young people typically rely on parents or other family members to pay the down payment

FINANCIAL BURDEN AND EXPECTED INCOME GROWTH

- Why would (bottom-income) borrowers endure such financial burden?
- Suppose an income growth rate of 10%
 - Income will grow to 1.6 times in 5 years
 - Current price to future income in 5 years is only 5!
- Households may also expect housing prices to rise at high rates, as motivated by the expectations of high income growth in the cities

THE ROLES OF GOVERNMENT

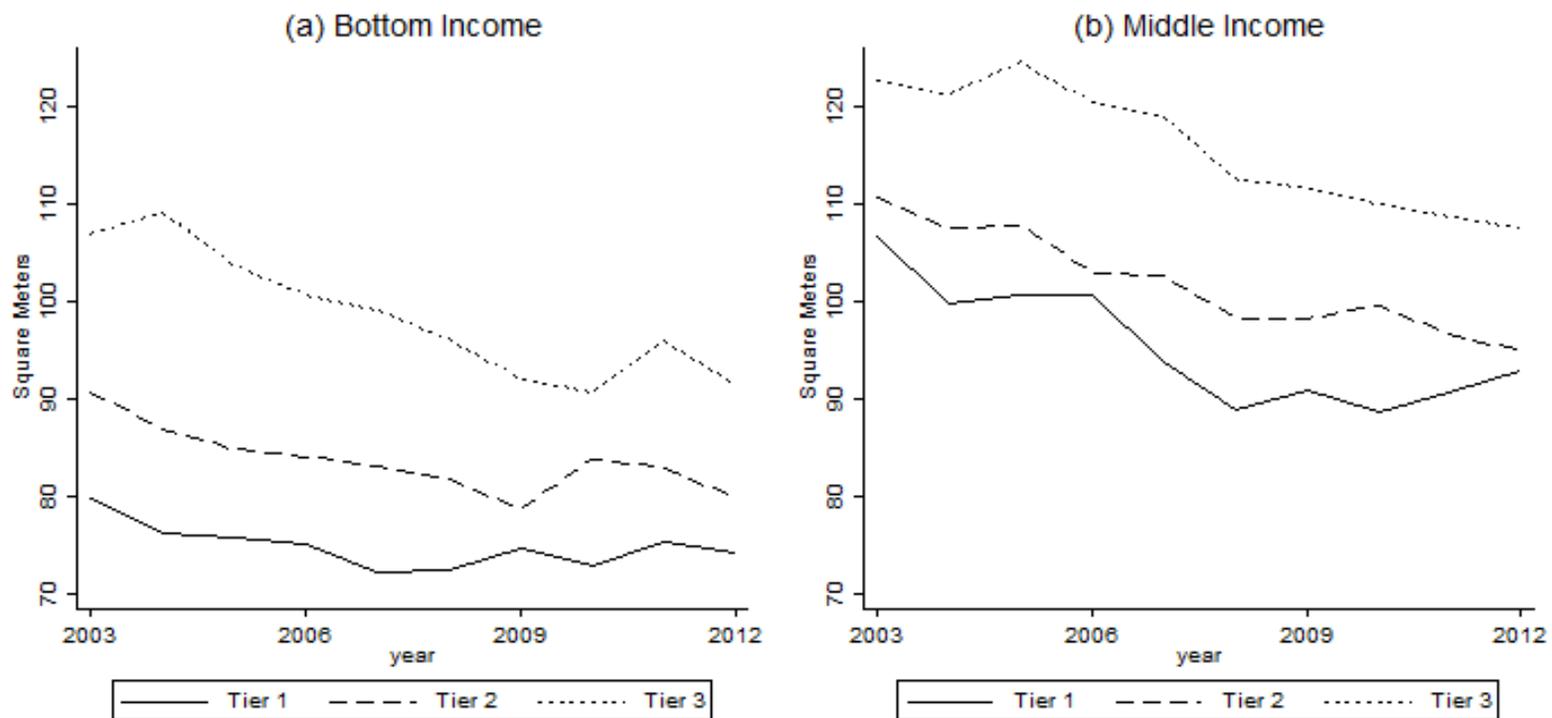
- Housing markets are widely perceived to be too important to fail
 - Helps explain the robust expectations about housing prices
- The central government frequently intervened in housing markets
- Land sales are a key source of fiscal revenue for local municipalities

INTERVENTIONS BY CENTRAL GOVERNMENT

- In September 2007, raised the minimum down payment ratio from 30 percent to 40 percent, and capped the monthly mortgage payment-to-income ratio at 50%.
- In April 2008, it imposed tax on capital gains from housing sales.
- In October 2008 it reversed these policies. It reduced the minimum mortgage rates to 70 percent of the benchmark rate and the down-payment ratio back to 30 percent.
- Starting from April 2010, following the guidelines of the central government, 39 of the 70 major cities in China introduced the *housing purchase restriction policies*.

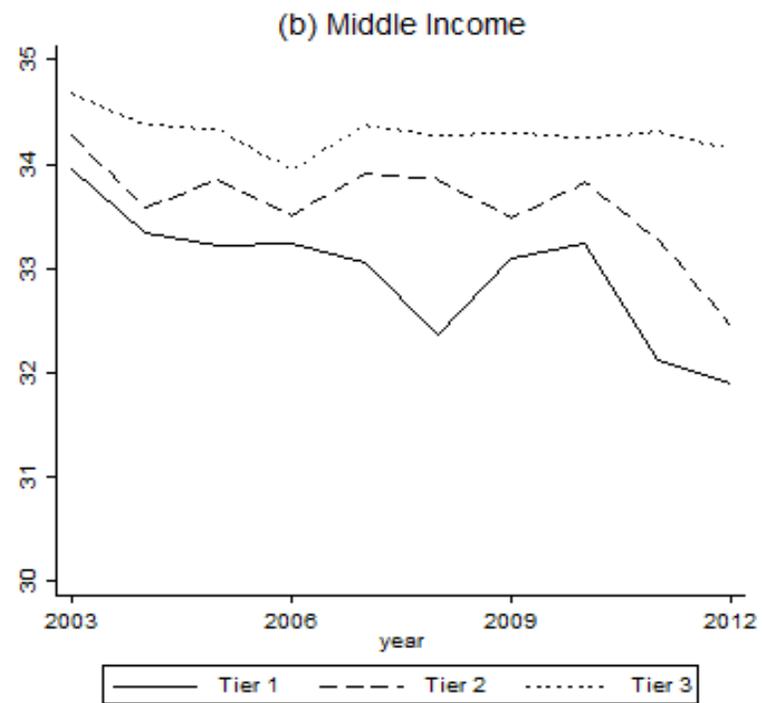
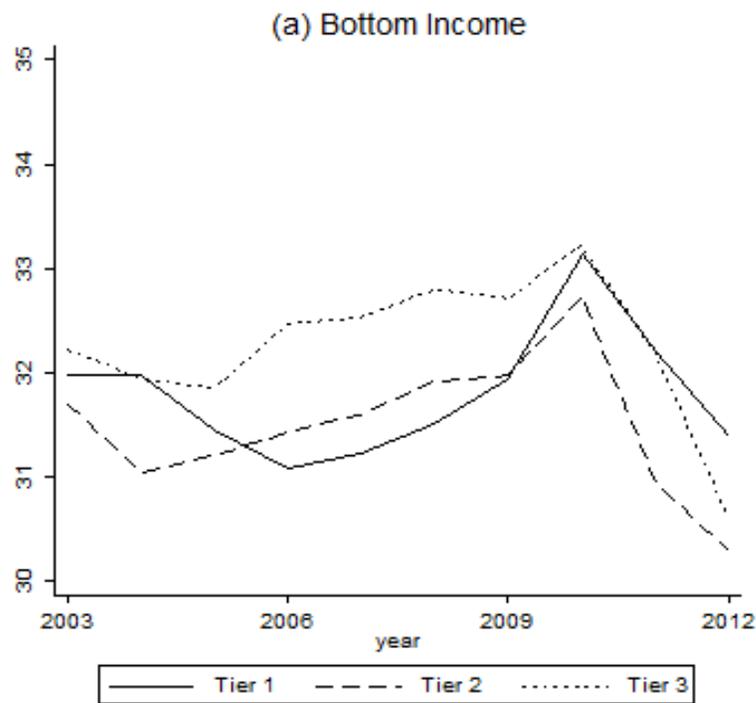
HOME SIZE

Size of Home, Mortgage Data



AGE OF MORTGAGE BORROWERS

Age of Buyer, Mortgage Data



FRACTION OF SECOND MORTGAGES

- Banks are allowed to grant only one loan on one home
- Second mortgages are used to buy non-primary homes

	2011	2012	2013
First-Tier Cities	5.3%	5.2%	11.8%
Second-Tier Cities	2.0%	2.4%	3.3%
Third-Tier Cities	1.0%	1.3%	1.8%

SUMMARY

- Enormous housing price appreciation across Chinese cities
 - Comparable household income growth, except in the first-tier cities
 - Steady participation by low-income households
- Household leverage is not a particular concern
 - Housing market is unlikely a trigger for a financial crisis in China
- Though default risk is low, payment risk may be high
- High housing prices across Chinese cities build on high growth expectation.
 - It may crash with an economic downturn and amplify the downturn

Risk Factors of the Chinese Housing Markets

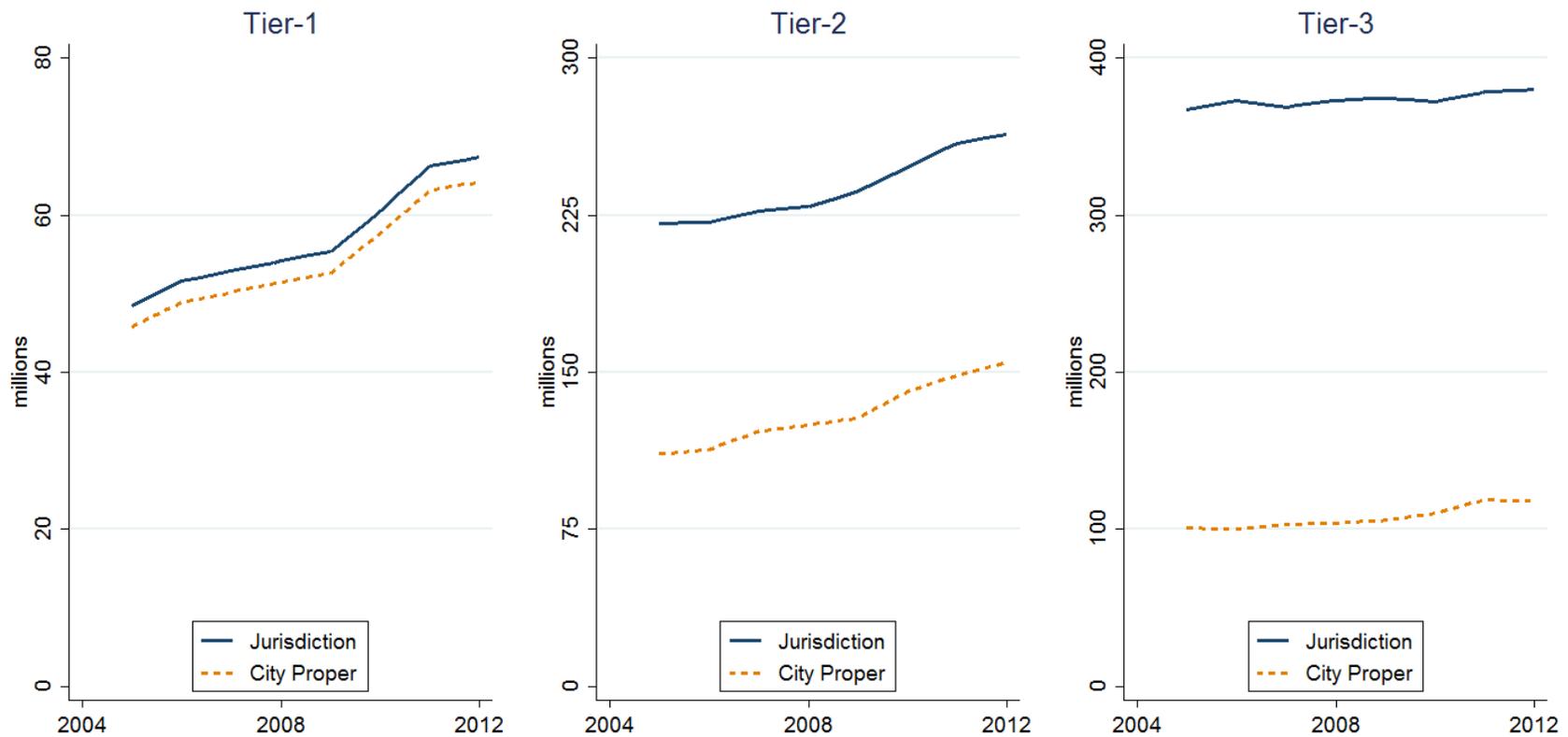
RISK FACTOR A: SLOWDOWN IN INCOME GROWTH

- Banks are not exposed to severe risk in residential mortgages
 - Leverage might be a concern for real estate developers and local governments
- Housing markets are nevertheless fragile with respect to household expectation about future income growth
 - If economic growth slows down, households may not be willing to pay 8 times of their income to buy homes

RISK FACTOR B: DEMOGRAPHIC TRENDS

- Chinese population is rapidly ageing and is expected to decline from 2030.
- The prime age population for home buyers, those between 30 and 49 has already started to decline from 2005 for China as a whole.
- Using the 2000 Chinese Census micro data, we find that in 2030 the prime age population in China will decline to about 62% of the corresponding level in 2000.
- Relaxation of the one-child policy, and relaxation or even abolishment of the strict *Hukou* policy, could significantly increase the demand of housing in the cities.

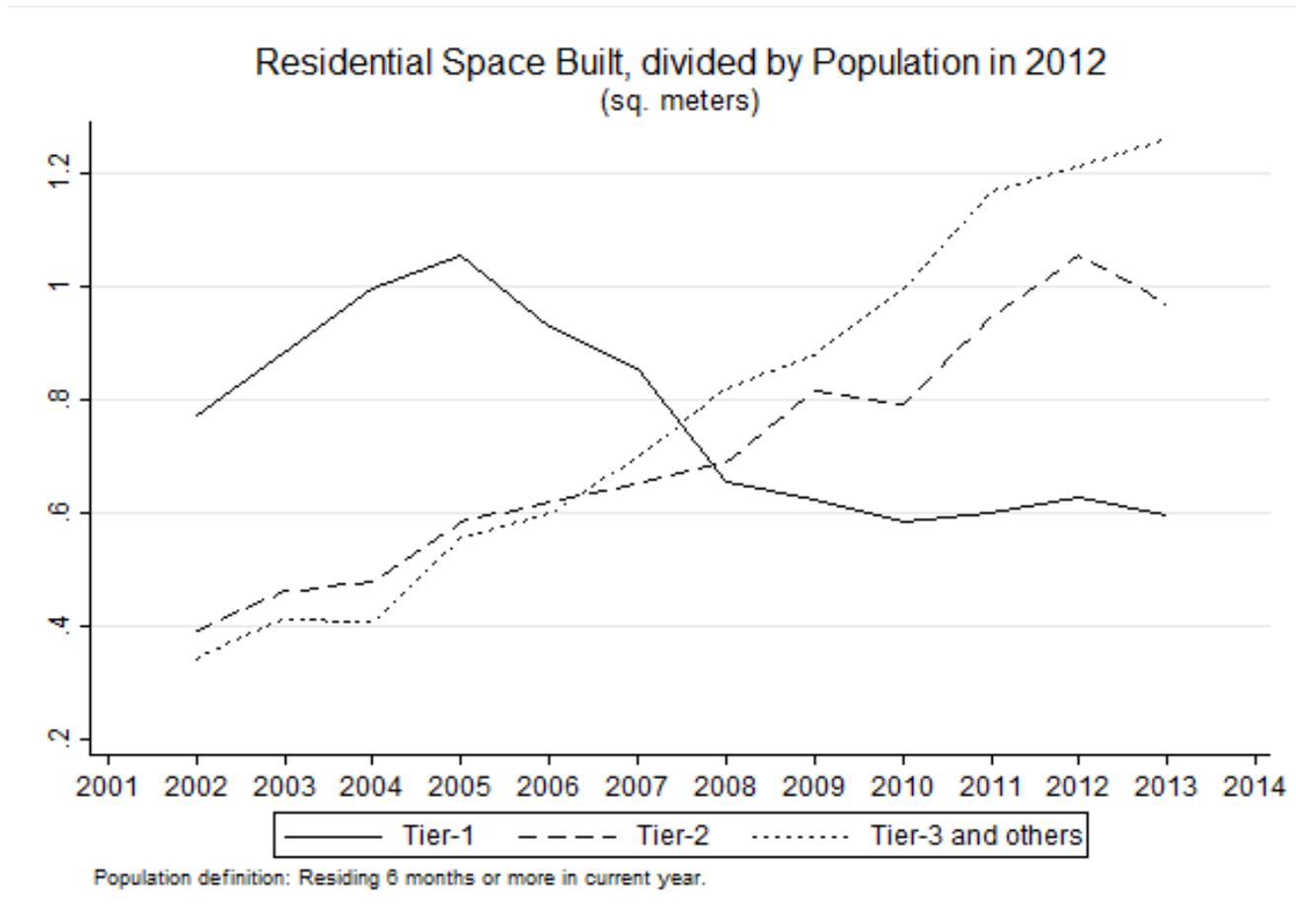
POPULATION GROWTH IN CITIES



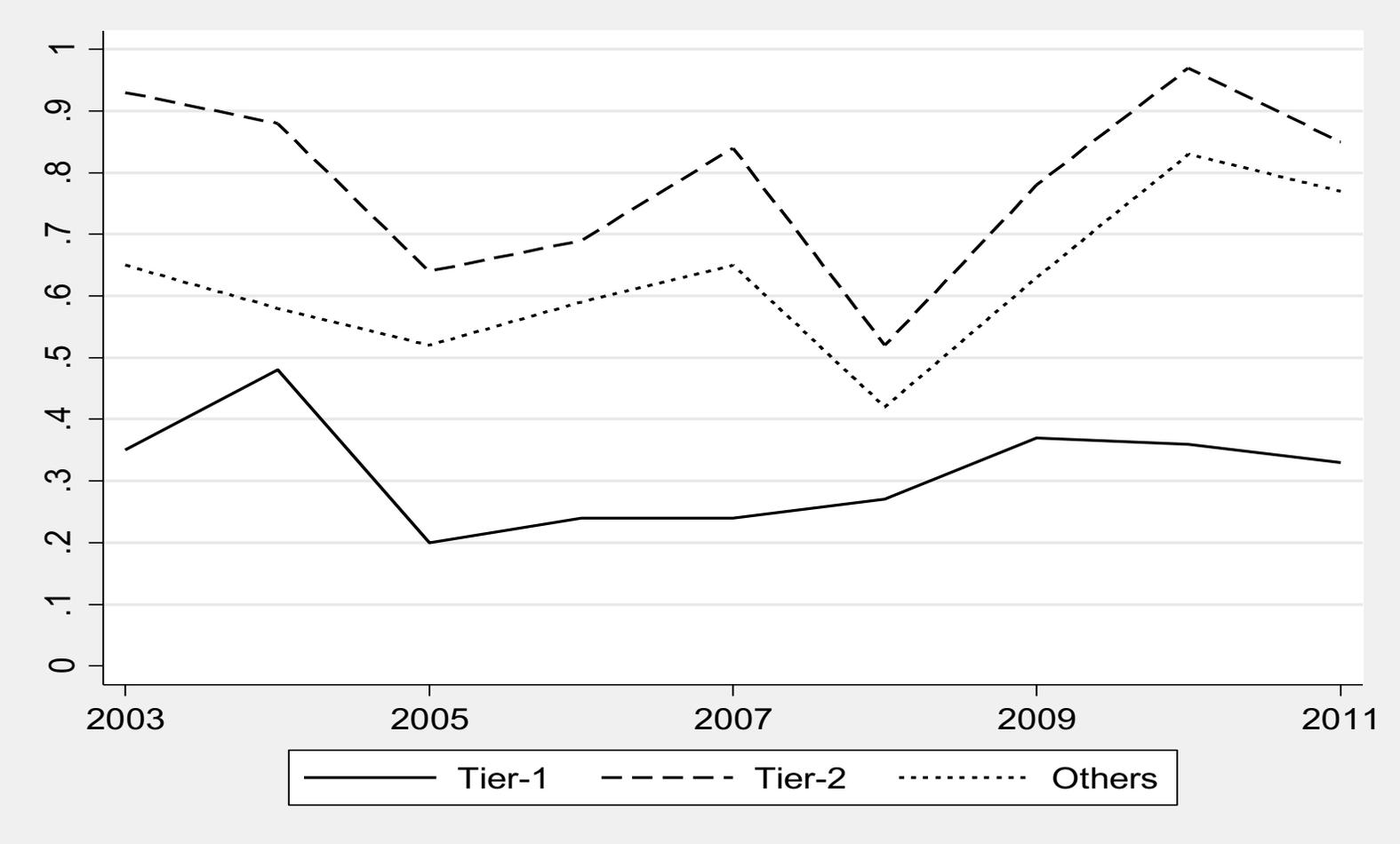
RISK FACTOR C: FISCAL REFORM

- Housing supply is much more elastic in second and third tier cities than in first tier cities.
- The continued increase in new construction in second and third tier cities is related to the heavy reliance of local governments on land sales revenue.

SUPPLY OF NEW HOMES



SHARE OF LAND REVENUE IN CITY BUDGET



FISCAL REFORM

- Property taxes.
- The introduction of property tax in all cities is now on the policymakers' agenda.
- The introduction of property tax, in conjunction with fiscal reform that provides local governments revenue sources that are not tied to selling land, is likely to fundamentally change the investors' expectation that real estate sector is “too important to fall” for the local government.

RISK FACTOR D: REFORMS TO RETIREMENT INSURANCE

- First-tier cities in China, such as Shanghai and Beijing, are privileged in many dimensions.
- The current social insurance system, particularly the health care and the health insurance system, in China are implemented under a *prefecture- or county-level* planning framework
- **Does not facilitate a** transition of the housing stocks from the older generation to the young generation.
- This creates strong **disincentive** for the elderly to relocate as they retire.