Demystifying the Chinese Housing Boom

Hanming Fang
University of Pennsylvania & NBER

DEMYSTIFYING THE CHINESE HOUSING BOOM

Hanming Fang, University of Pennsylvania & NBER

Quanlin Gu, Peking University

Wei Xiong, Princeton University, CUHK (Shenzhen) &NBER

Li-An Zhou, Peking University

WE HAVE SEEN CONSTRUCTION BOOM ACROSS CHINA …

2

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 footstep of Japan to have a lost decade?
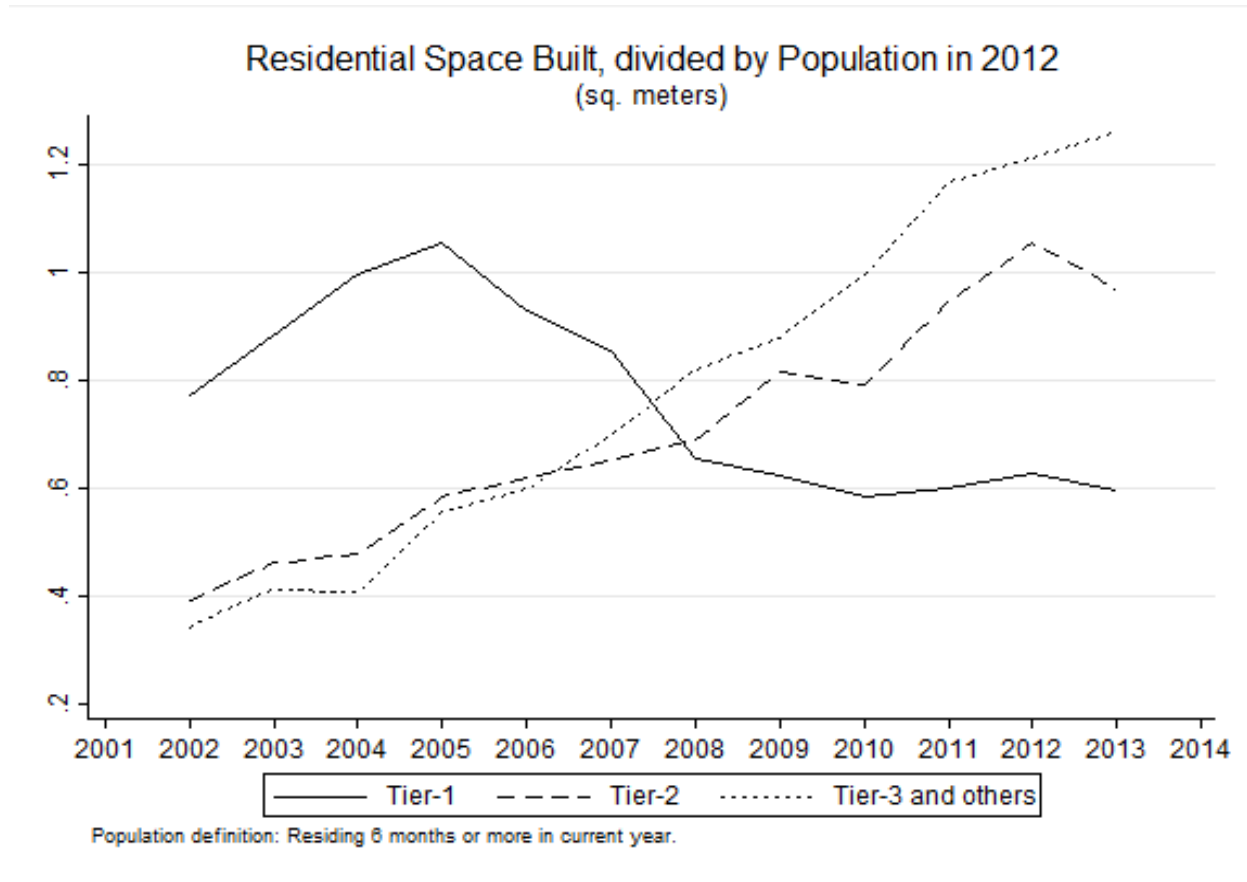
4

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?
- Why caused the Chinese housing boom?
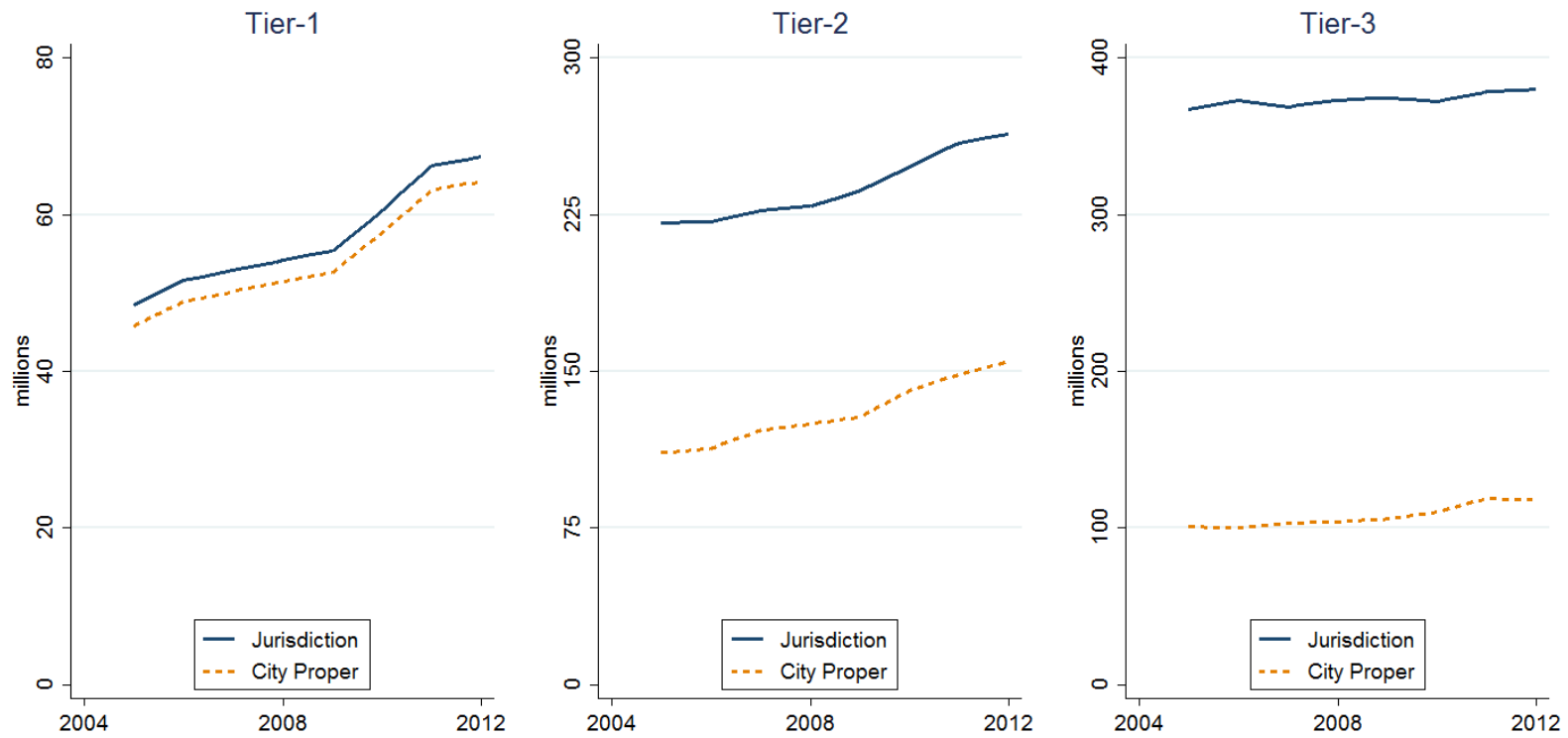
Housing Price Growth 2003-2013

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

SUPPLY OF NEW HOMES

Residential Space Built, divided by Population in 2012
(sq. meters)

Legend: Tier-1, Tier-2, Tier-3 and others

Population definition: Residing 6 months or more in current year.

# DEMAND (A): POPULATION GROWTH IN CITIES

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

10

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
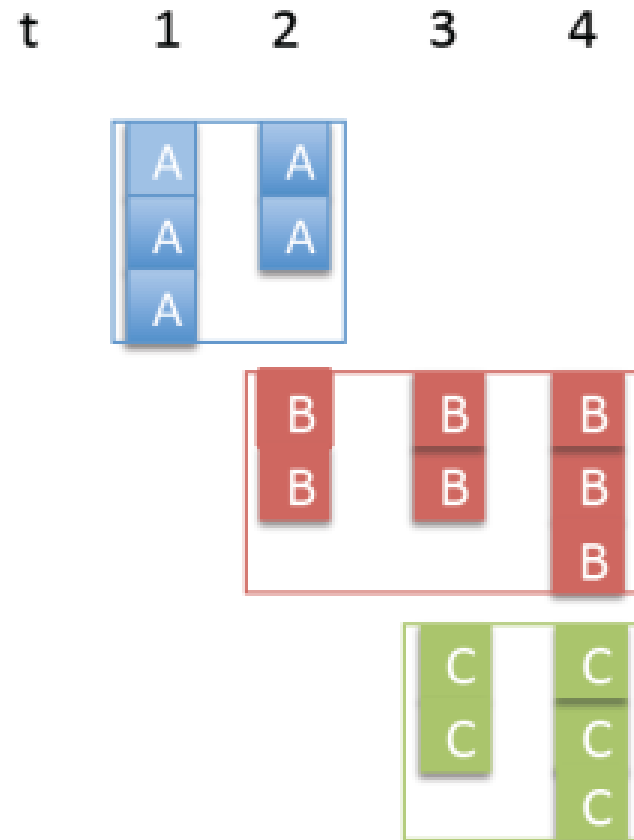
A HYBRID APPROACH FOR CHINESE HOUSING MARKETS

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

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

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

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)

13

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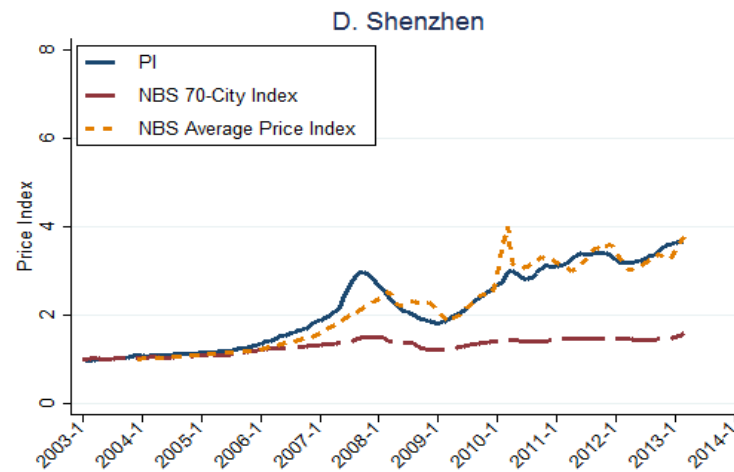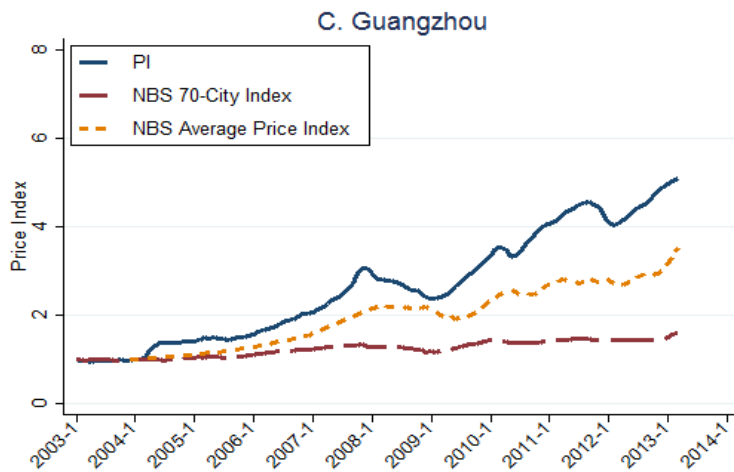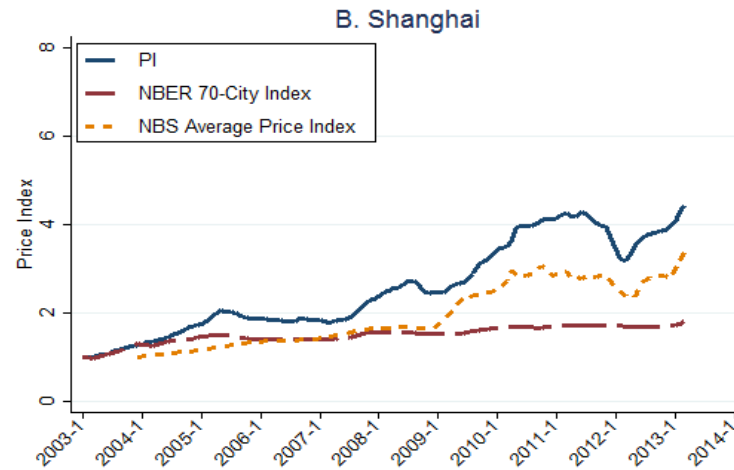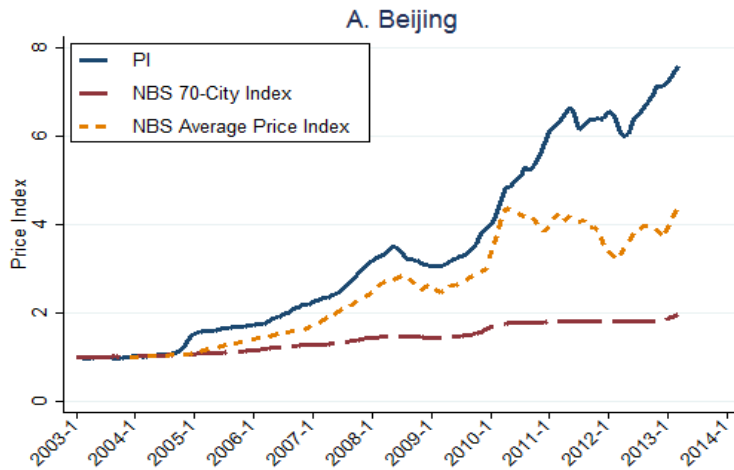
PRICE INDICES VS. INCOME FOR FIRST-TIER CITIES
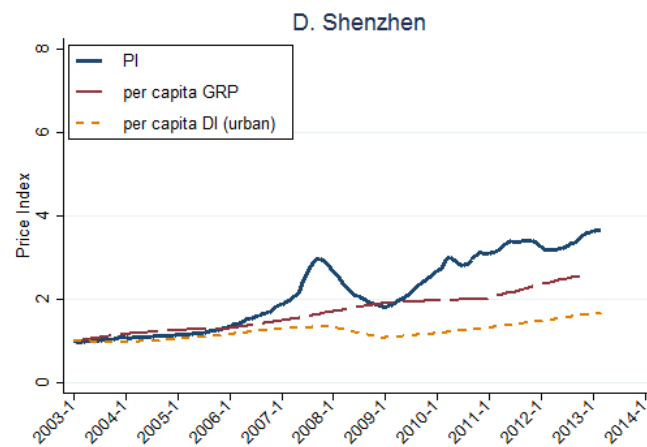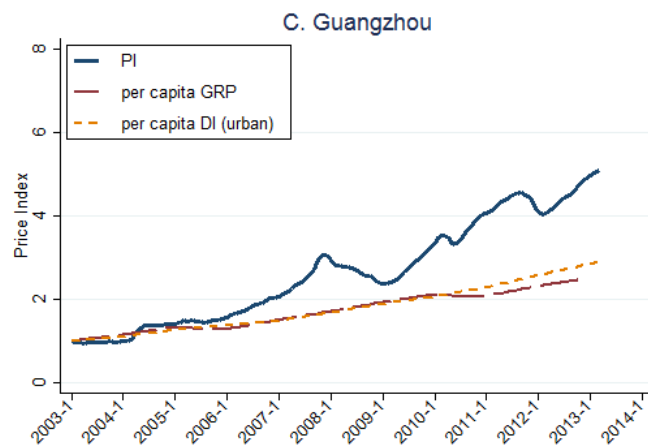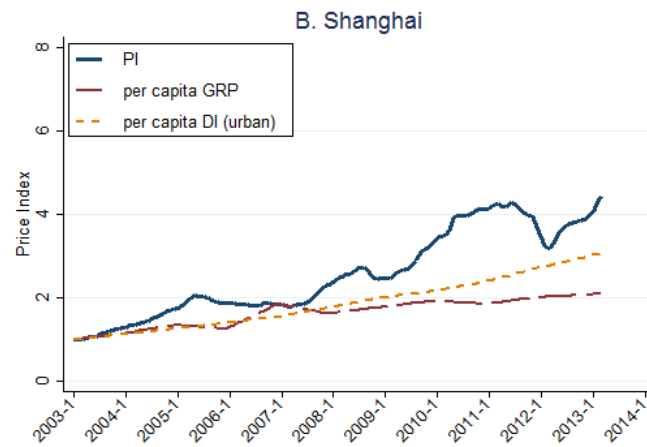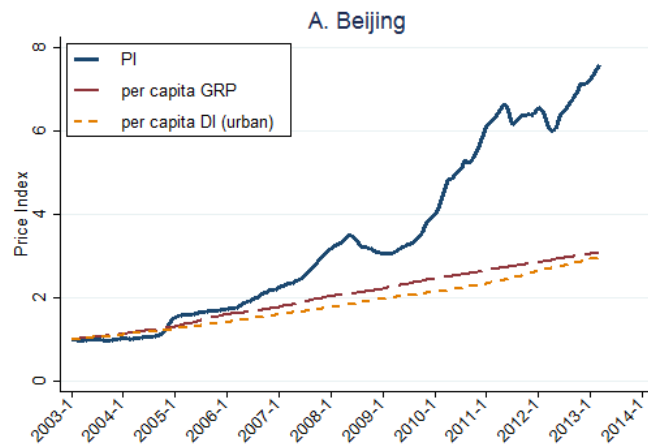
HOUSING PRICE INDICES VS. INCOME FOR SECOND AND THIRD TIER CITIES:

SUMMARY STATISTICS (NOMINAL)

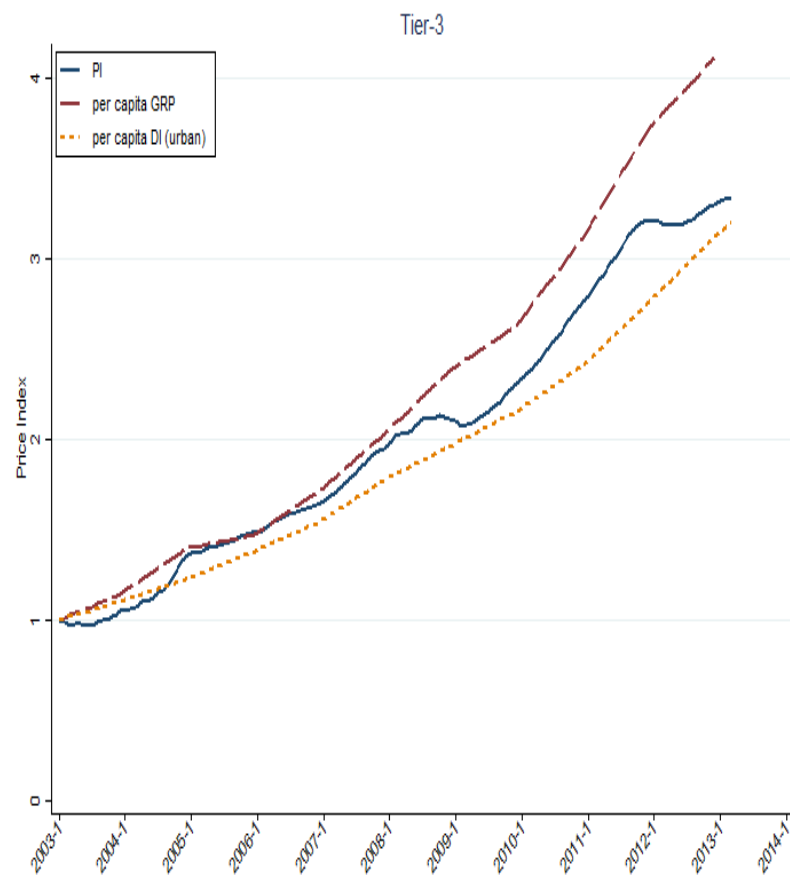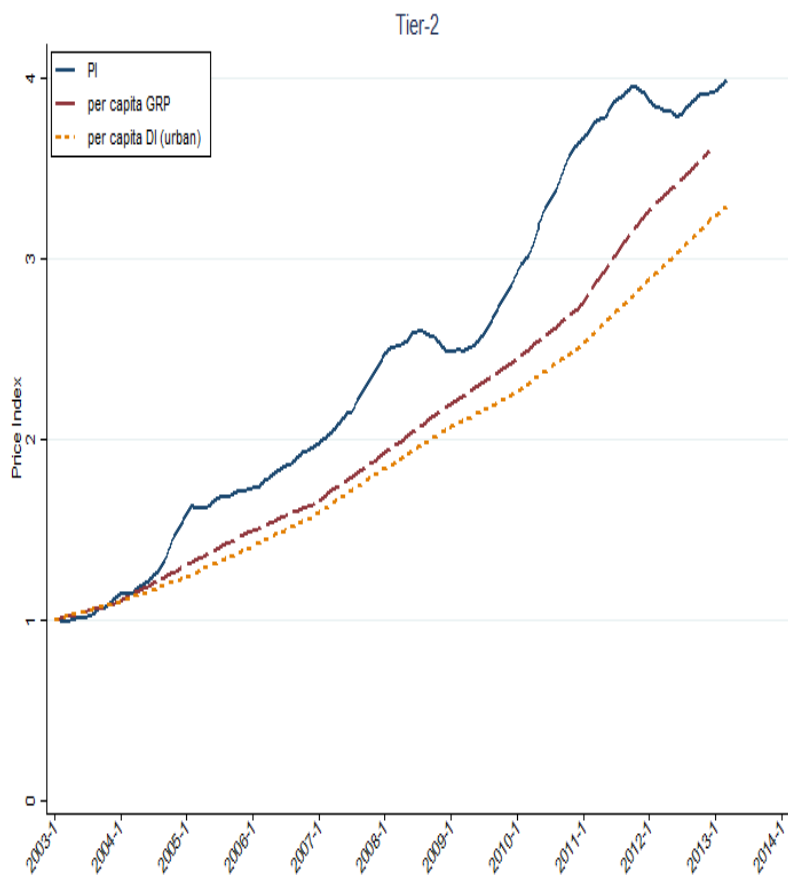| Nominal Growth	Obs	January 2003 - December 2007				January 2009 - March 2013				January 2003 - March 2013			
		Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Panel A: Tier 1 Cities													
Housing Price Index	4	.210	.027	.172	.230	.177	.033	.139	.219	.159	.031	.128	.200
Per 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	Obs	January 2003 - December 2007				January 2009 - March 2013				January 2003 - March 2013			
		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

Japan: Land PI and pcGDP
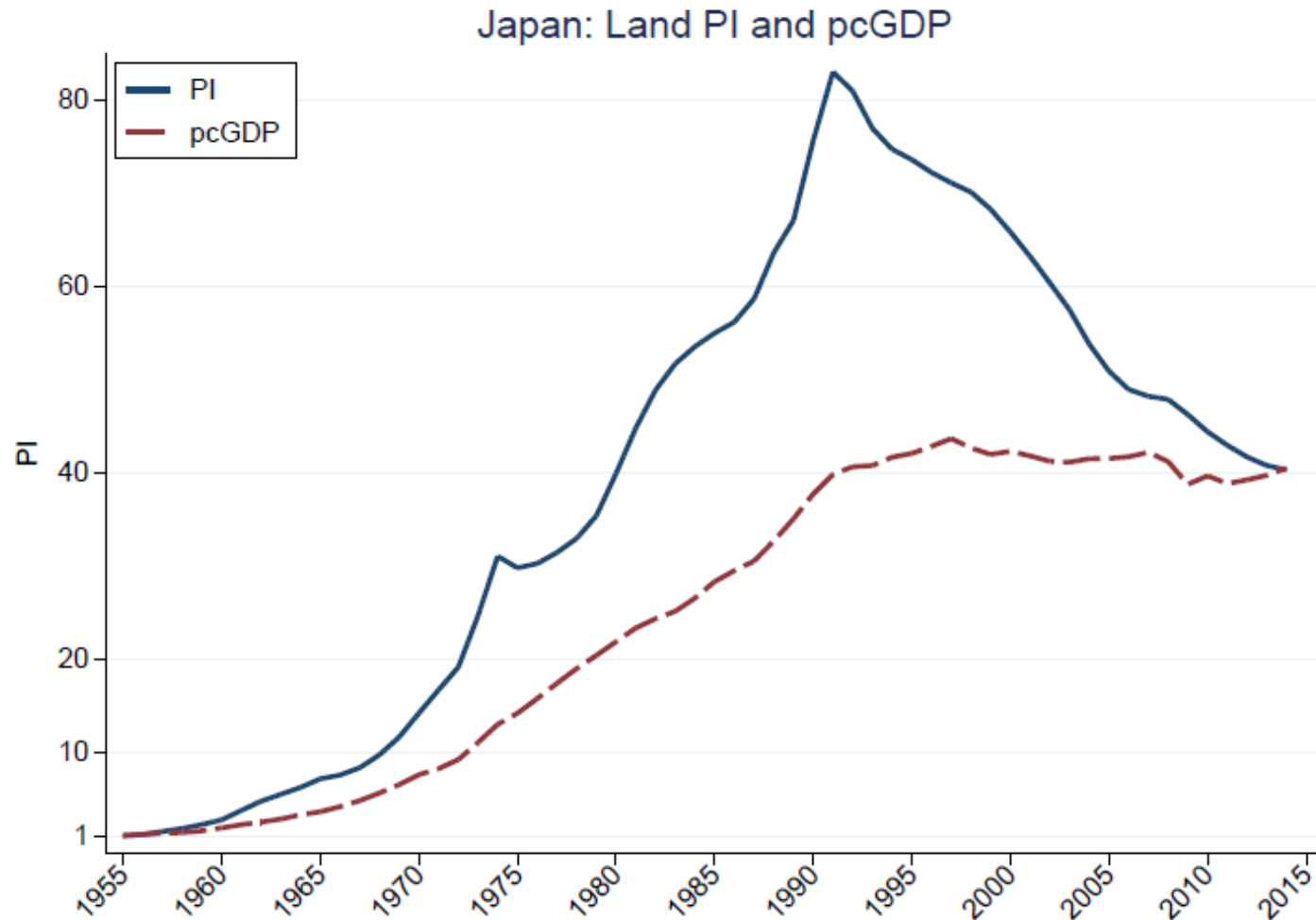
HOUSING PRICE AND GDP GROWTH IN SINGAPORE


Singapore: PI and pcGDP
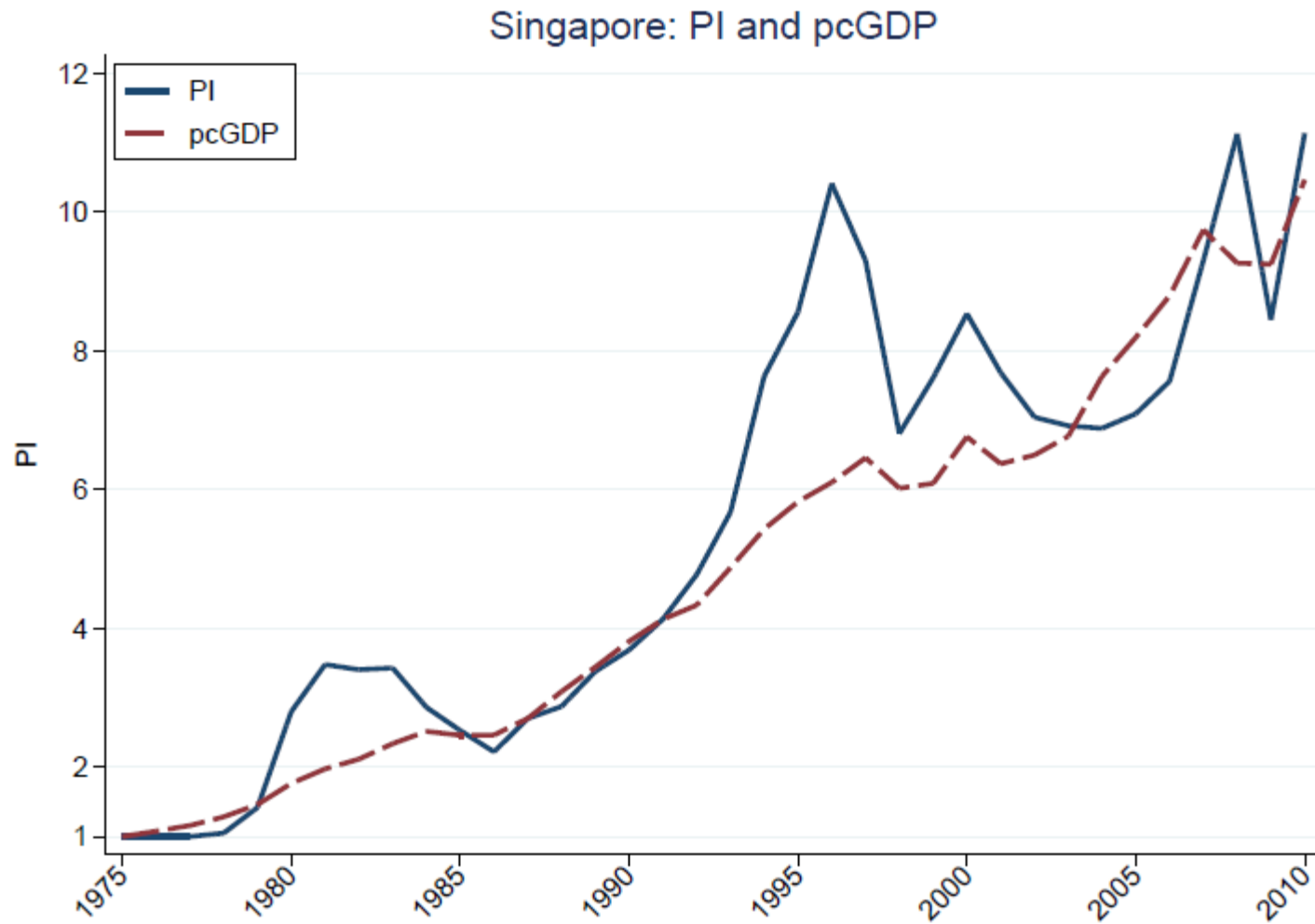
# Home Buyers' Income and Their Financial Burdens

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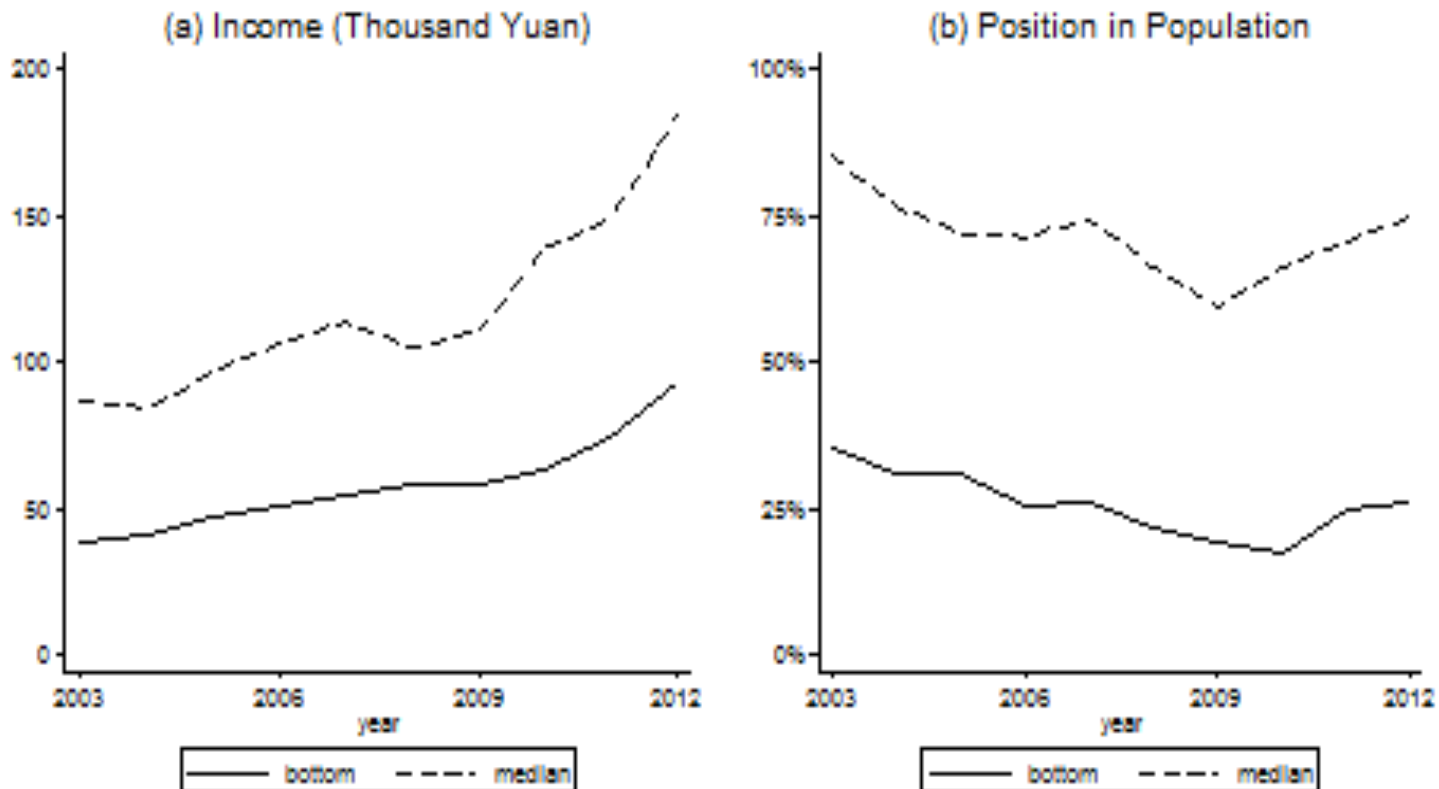
ANNUAL INCOME OF MORTGAGE BORROWERS IN TIER 2: LEVEL AND POSITION IN POPULATION

Income of Bottom and Median Mortgage Borrowers: Tier 2
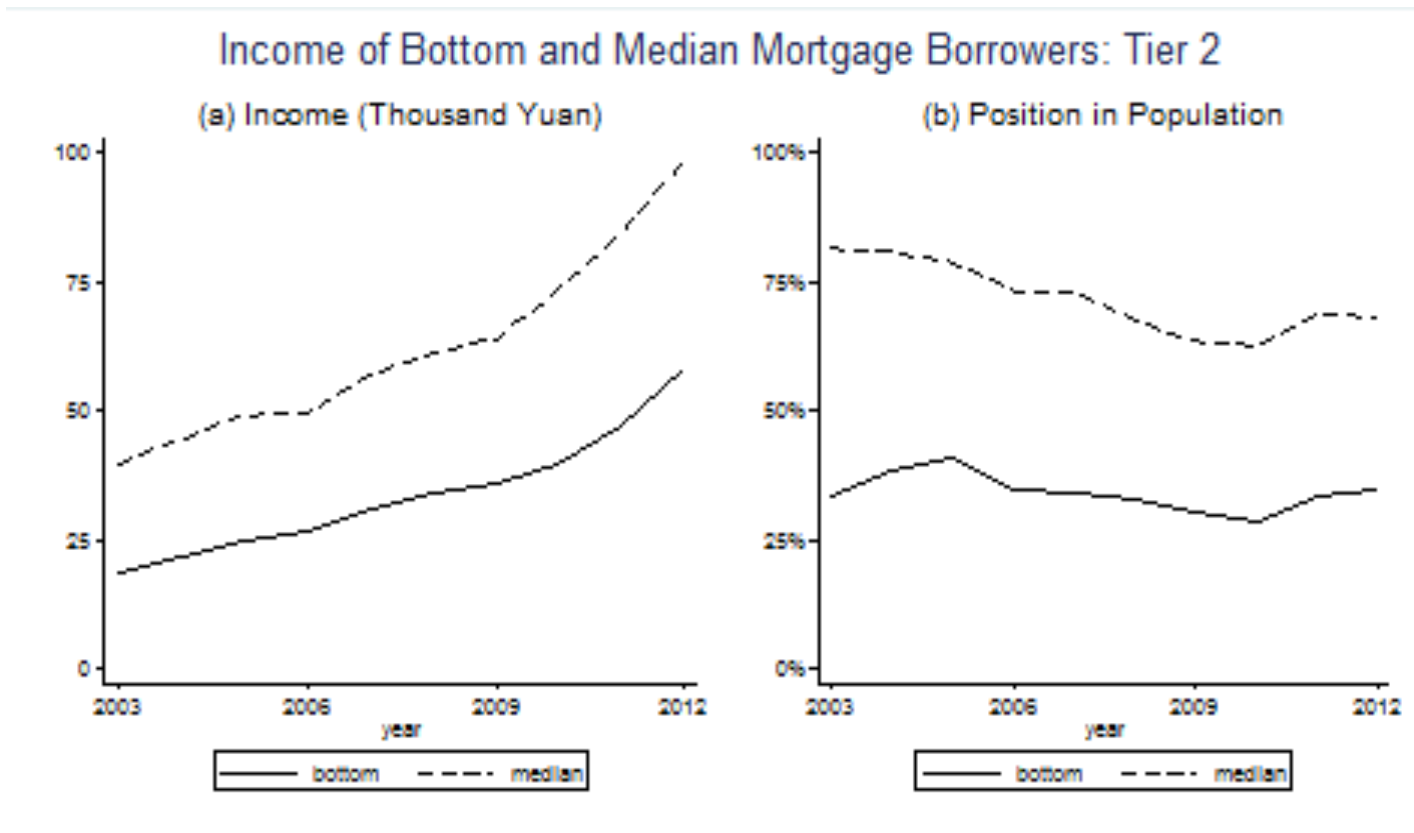
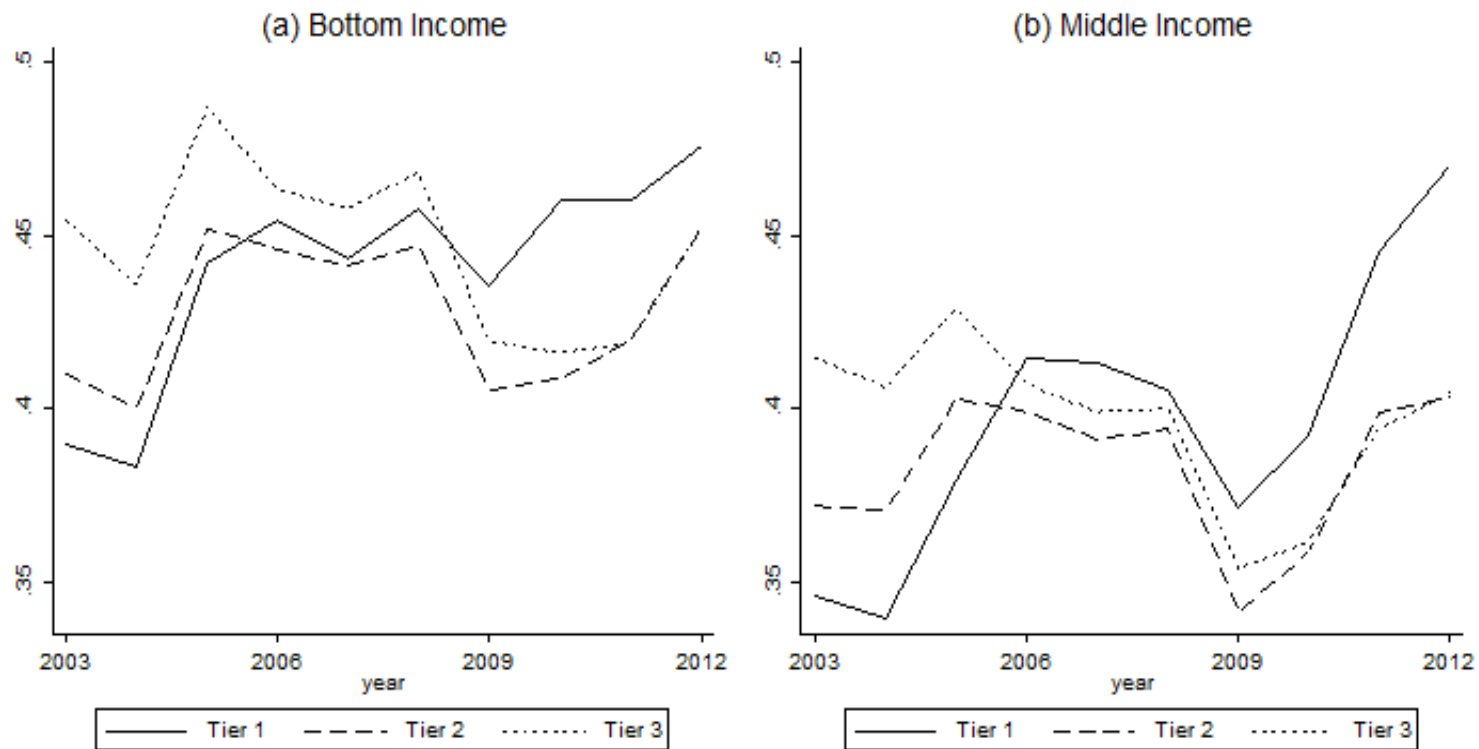# MORTGAGE DOWN PAYMENT: HIGH 35%-45%

Downpayment Ratio, Mortgage Data

(a) Bottom Income ⋅ (b) Middle Income

Tier 1 — Tier 2 — — Tier 3 ⋯⋯

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

Price-to-Income Ratio, Mortgage Data
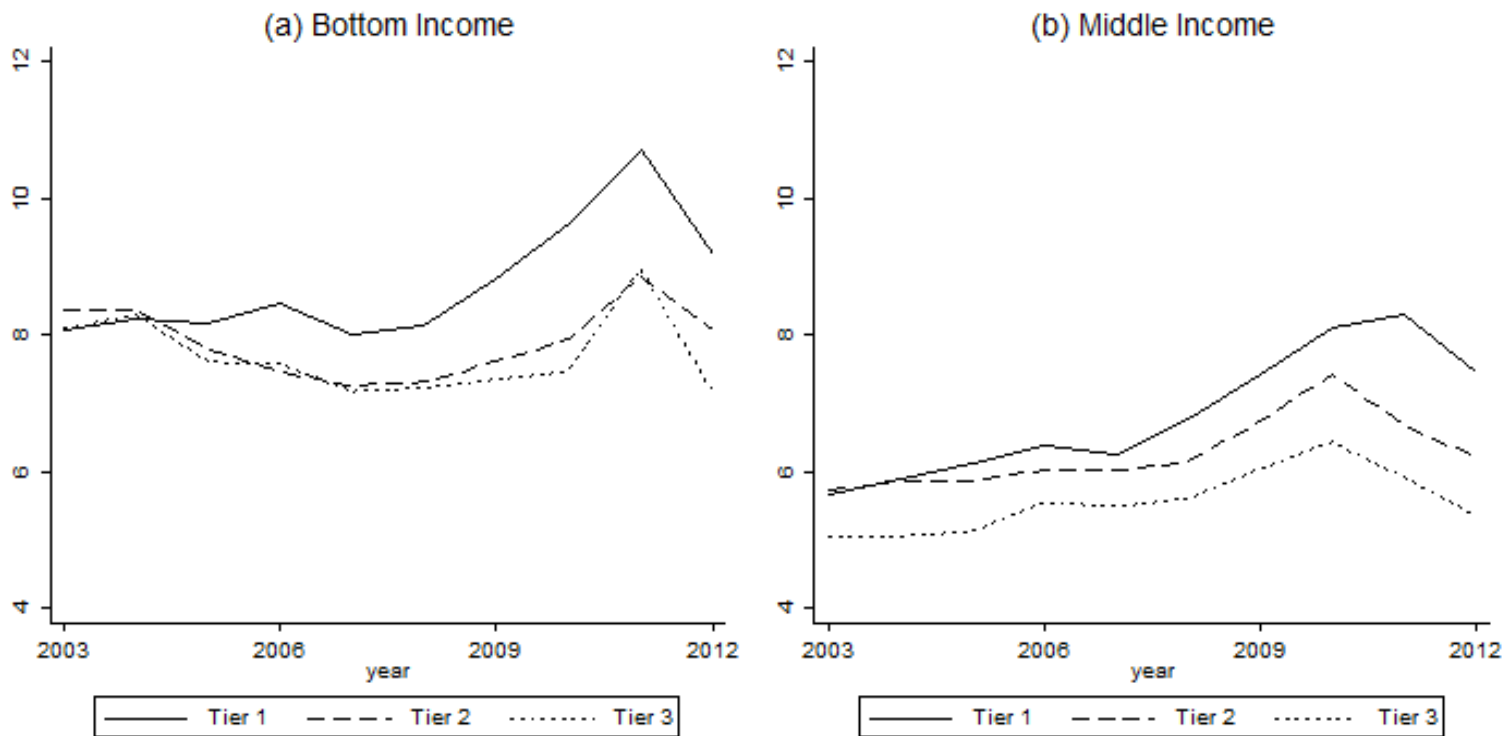
FINANCIAL BURDEN OF MORTGAGE BORROWERS

- 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

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

- High housing prices across Chinese cities build on high growth expectation.
  - It may crash with an economic downturn and amplify the downturn

29

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

31

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.

32

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.

33

SHARE OF LAND REVENUE IN CITY BUDGET
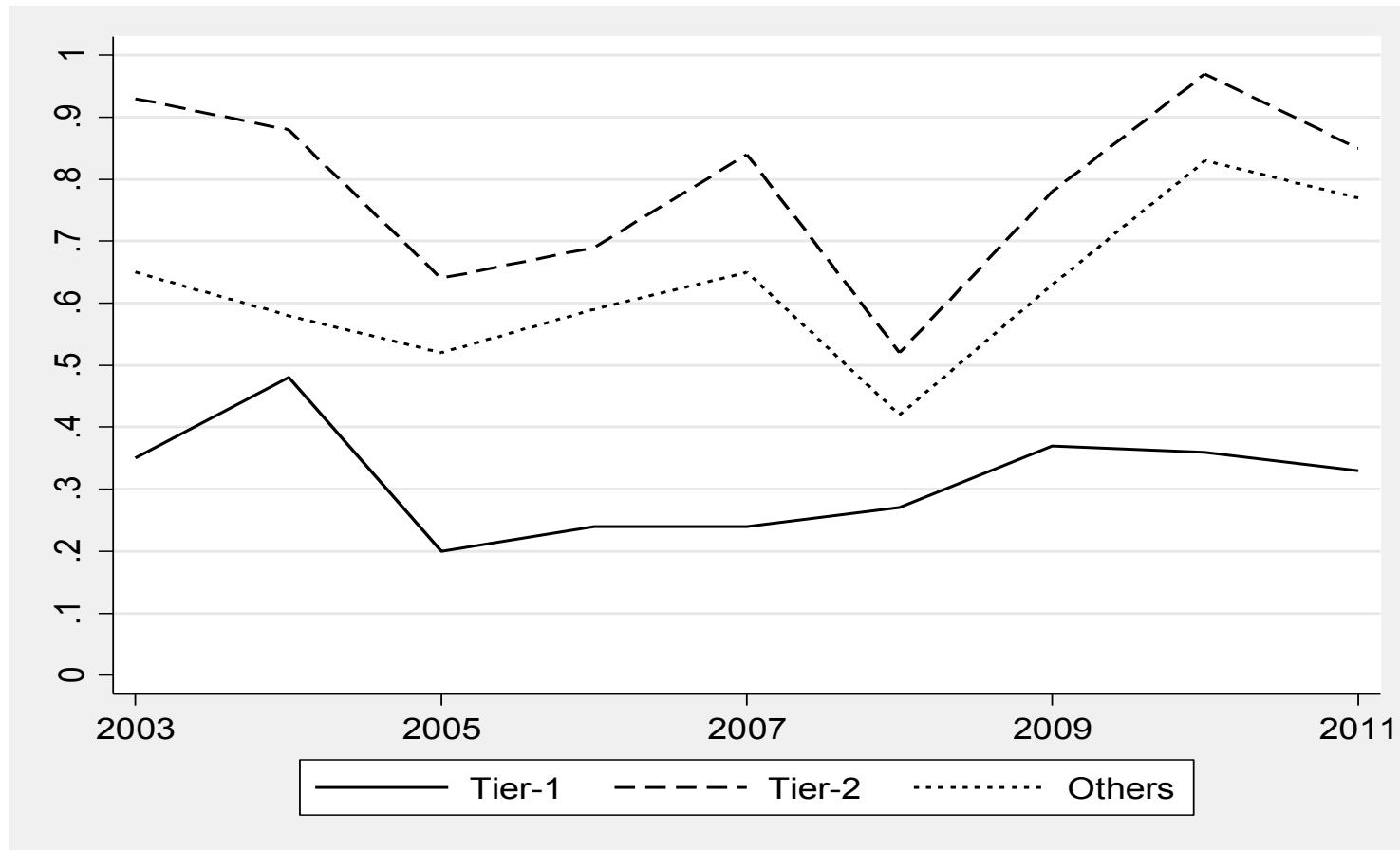
FISCAL REFORM

○ 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.