Fundamental versus Speculative Credit Booms? Anatomy of China's Mortgage Market

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Motivation

- Housing market boom after 2014 ▸ House Price
- Policies of relaxing housing market restrictions around 2014
  - Lower entry barrier for housing market (lower downpayment)
  - Mortgage credit boom ▸ Mortgage Amount ▸ Mortgage Number
- Mortgage credit boom channels
  - Fundamental (consumption/utility incentive)
  - Speculative (investment incentive)

Speculation in the housing market boom

- Measure of exposure to housing speculation: fraction of mortgage originations for the second (or more) homes in the total mortgage originations in the city level in 2013 (following Gao, Sockin and Xiong (2017))
- Policy changes around 2014 serve as an experiment
- Research design: difference-in-difference (exposure $\times$ $\mathscr{I}$(policy change))

Main Results

- We find that speculation played an important role in the Chinese housing market boom after the relaxation policies around 2014
- We provide evidence supporting the linkage between extrapolation of past house prices and non-fundamental speculation (Gao, Sockin and Xiong, 2017)

Outline

Outline

Literature

- Mortgage and house prices in the U.S.
  Liu et al. (2013); Mian and Sufi (2009, 2011, 2017); Demyanyk and Van Hemert (2009); Mian et al. (2013); Adelino et al. (2016, 2017); Favilukis et al. (2017); Kaplan et al. (2017)
- Mortgage and house prices in China
  Wu et al. (2012); Wei et al. (2012); Wu et al. (2014); Fang et al. (2016); Chen and Wen (2017)
- Speculation in the housing market
  Glaeser et al. (2008); Piazzesi and Schneider (2009); Glaeser (2013); Chen et al. (2017); Gao et al. (2017); Glaeser and Nathanson (2017)
- Policy and housing market
  Agarwal et al. (2015); Favara and Imbs (2015); Berger et al. (2016); Agarwal et al. (2017); Di Maggio and Kermani (2017); Rognlie et al. (Forthcoming); Best and Kleven (2018)

Outline

Housing Market Policies

A series of restrictive policies in 2010 and 2011

- Restriction on mortgage loans (nationwide; January 2011)
  - 1st house: downpayment higher than 30%
  - 2nd house: downpayment higher than 60%; mortgage rate 1.1 higher than the base interest rate
  - 3rd house: no mortgage loans
- Restriction on house purchases
  - 47 cities
  - city specific restrictions (e.g., location, hukou)

Housing Market Policies

Relaxation policies of housing market restrictions from 2014 to early 2016

- Relax restrictions on mortgage loans (nationwide; starting Sept. 30, 2014)
  - treat the second house as first one if first house mortgage is paid back
  - 1st house: lowest downpayment rate decreases from 30% to 25%
  - 2nd house: lowest downpayment rate decreases from 60% to 30% after paying back the first house mortgage
- Relax restrictions on house purchases
  - all cities canceled house purchase restriction except Beijing, Shanghai, Guangzhou, Shenzhen, and Sanya
  - times when city relaxation took place: from June 2014 to October 2014

Re-impose housing market restrictive policies from late 2016: city specific restrictions on mortgage loans and house purchases

Details of Relaxation Policies on Mortgage Loans

- In Sept 30, 2014, the new policy treated the second house mortgage with first house mortgage already paid off as the first house mortgage. This directly lowered the downpayment ratio of those second house mortgages satisfying this requirement to 30% (for the first house mortgage). Moreover, except for the five cities that still adopted purchase limits, this policy abolished the credit limit on mortgages for the third house, etc.
- In March 30, 2015, the downpayment ratio for second house mortgage, without paying off the first house mortgage, dropped further from 60-70% to 40%. Moreover, housing provident funds could be used to purchase the second house.
- In Aug. 27, 2015, the downpayment ratio for the first house mortgage further dropped from 30% to 25%. For the second house mortgage funded by provident funds in the first tier cities, the downpayment ratio was discretionary.
- In Feb. 2, 2016, for the second house mortgage without paying off the first house mortgage, the minimum downpayment ratio dropped from 40% to 30%.

Outline

Our Mortgage Origination Data from One Large Commercial Bank from 2011 to 2016

- Outstanding mortgage loans held by this bank account for around 14% of total outstanding mortgage loans in China, roughly constant across time
- About 2.5 million mortgage loans for new, residential properties
- 70 cities
- Detailed information
  - Home buyers' characteristics: age, gender, occupation, education, (reported) income, number of houses, city, zipcode
  - House price and size
  - Loans' characteristics: downpayment, mortgage loan, maturity, mortgage interest rate, credit score
- Aggregate data with the city-quarter sample: city-by-quarter panel

Additional Data

- House price: sales price indices of newly constructed residential buildings in 70 large- and medium-sized cities from National Bureau of Statistics of China (NBS)
- City-level characteristics: population, income, employment, ...

Summary Statistics

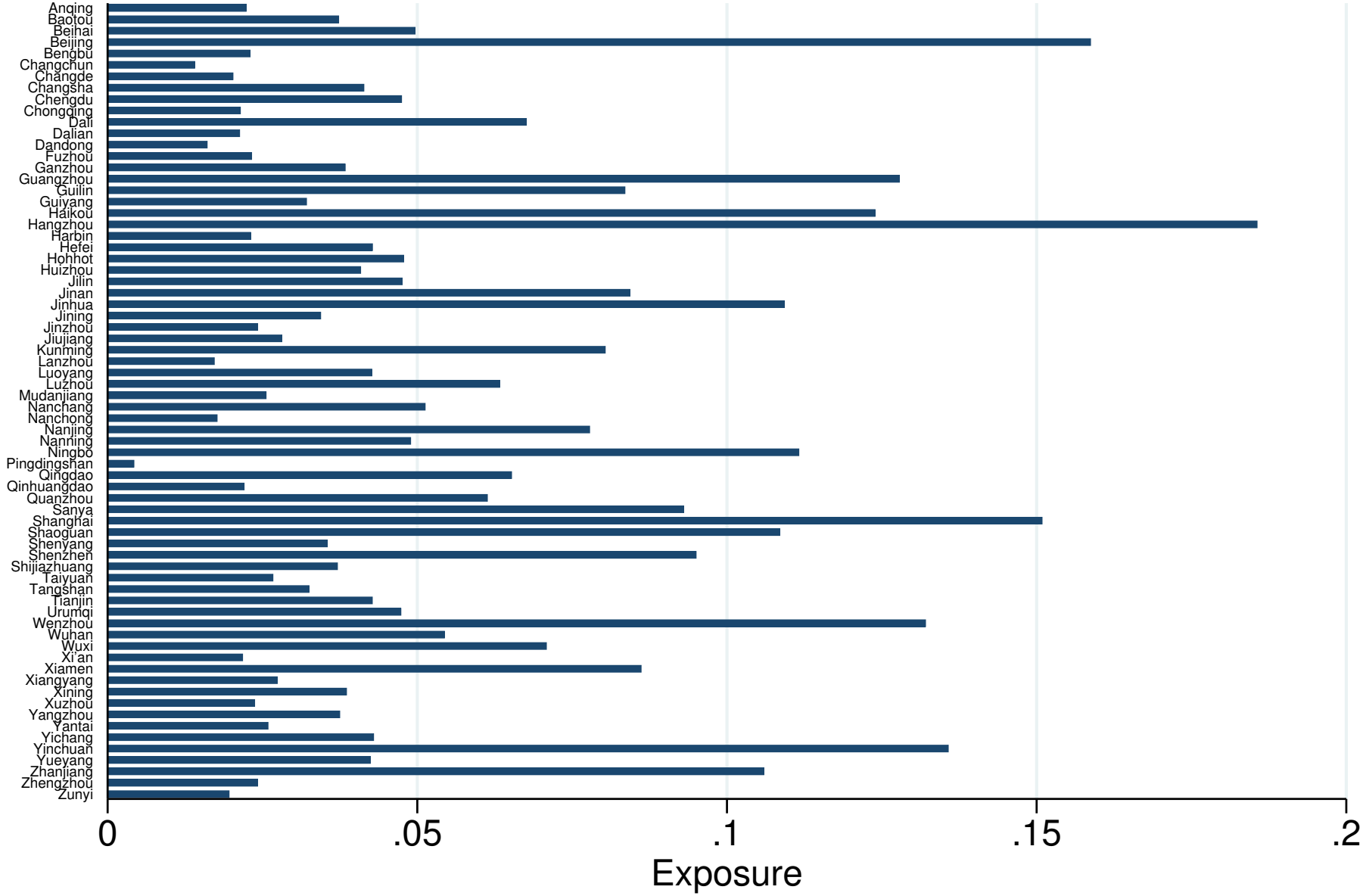
Table: Summary Statistics (City-Quarter Sample)

	N	Mean	Std	p10	p50	p90
	2011Q1 to 2016Q4					
mortgage amount(million)	1,680	741.08	1,107.62	68.40	356.36	1,888.51
mortgage number	1,680	1,430.30	1,747.58	252.00	965.50	2,935.50
house price growth rate(qoq,NBS)	1,680	0.69	2.30	-1.39	0.30	2.83
	2011Q1 to 2014Q3					
mortgage amount(million)	1,050	537.29	680.84	58.18	295.28	1,323.28
mortgage number	1,050	1,214.72	1,516.50	229.00	808.50	2,413.50
house price growth rate(qoq,NBS)	1,050	0.55	1.74	-1.10	0.40	2.62
	2014Q4 to 2016Q4					
mortgage amount(million)	630	1,080.72	1,522.12	92.27	466.86	2,903.37
mortgage number	630	1,789.62	2,027.29	305.00	1,205.00	3,995.00
house price growth rate(qoq,NBS)	630	0.93	3.01	-1.49	0.30	3.95

Exposure to Housing Speculation

- Fraction of mortgage originations for the second (or more) homes in total mortgage originations at the city level in 2013
  - Alternatively, fraction of mortgage amount for the second (or more) homes in total mortgage amount at the city level in 2013
- Second vs first house: speculation vs consumption
- Why year 2013: close to policy changes; poor data quality in 2011
- Cross-sectional variations essential for econometric analysis
  - High exposures are not necessarily correlated with large cities

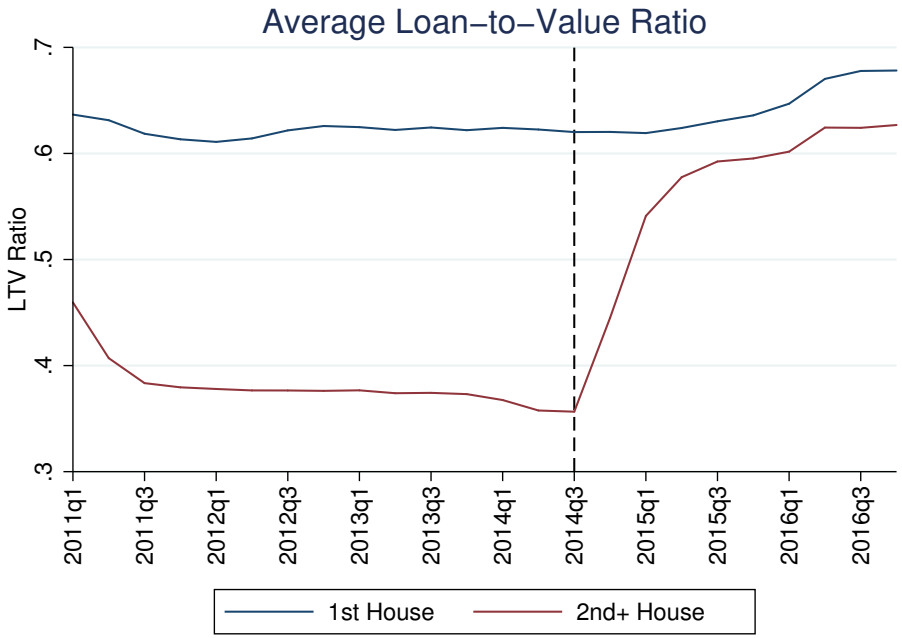
Exposure to Speculation

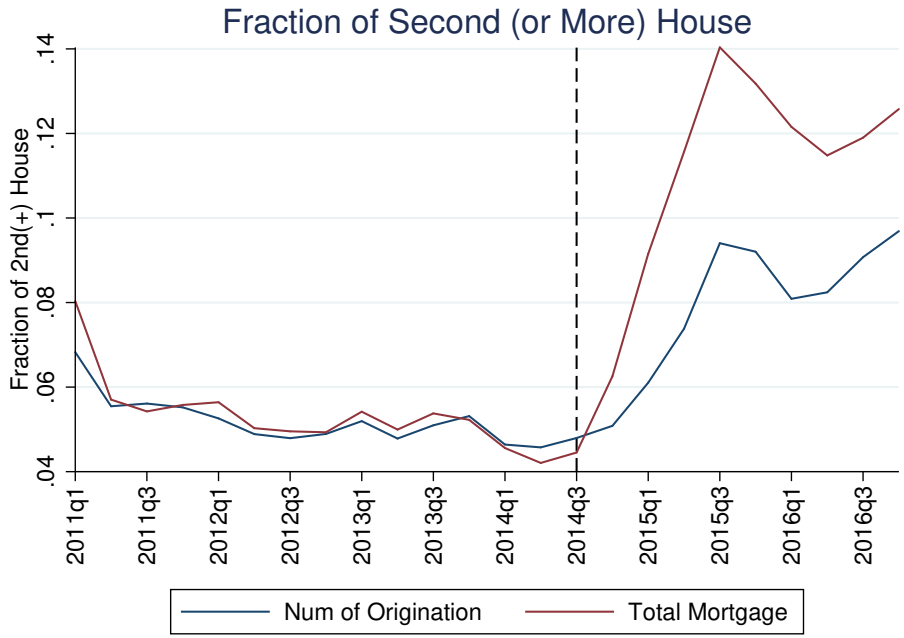


Outline

Policy Changes in 2014

- Relaxing purchase restrictions (city-specific)
  - Extensive margin
- Relaxing mortgage loan restrictions (nationwide)
  - Intensive and extensive margin
  - Lower downpayment ratio $\Rightarrow$ lower entry barrier for housing consumption and speculation demand
  - Downpayment ratio decreased more for the second house


Average Loan–to–Value Ratio
LTV Ratio
.3
.4
.5
.6
.7
2011q1
2011q3
2012q1
2012q3
2013q1
2013q3
2014q1
2014q3
2015q1
2015q3
2016q1
2016q3
1st House
2nd+ House


Fraction of Second (or More) House
Fraction of 2nd(+) House
.04
.06
.08
.1
.12
.14
2011q1
2011q3
2012q1
2012q3
2013q1
2013q3
2014q1
2014q3
2015q1
2015q3
2016q1
2016q3
Num of Origination
Total Mortgage

Empirical Strategy

- Exploit cross-sectional variation across cities in ex ante exposure to housing speculation to study the effects of housing market policy relaxation on mortgage credit boom and house price through speculation channel (following Mian and Sufi (2012), Chodorow-Reich et al. (2012), Berger et al. (2016))
- Advantage: counterfactual study by changing exposure values
- High- vs low-exposure cities: treatment vs control
- City-level: general equilibrium effects

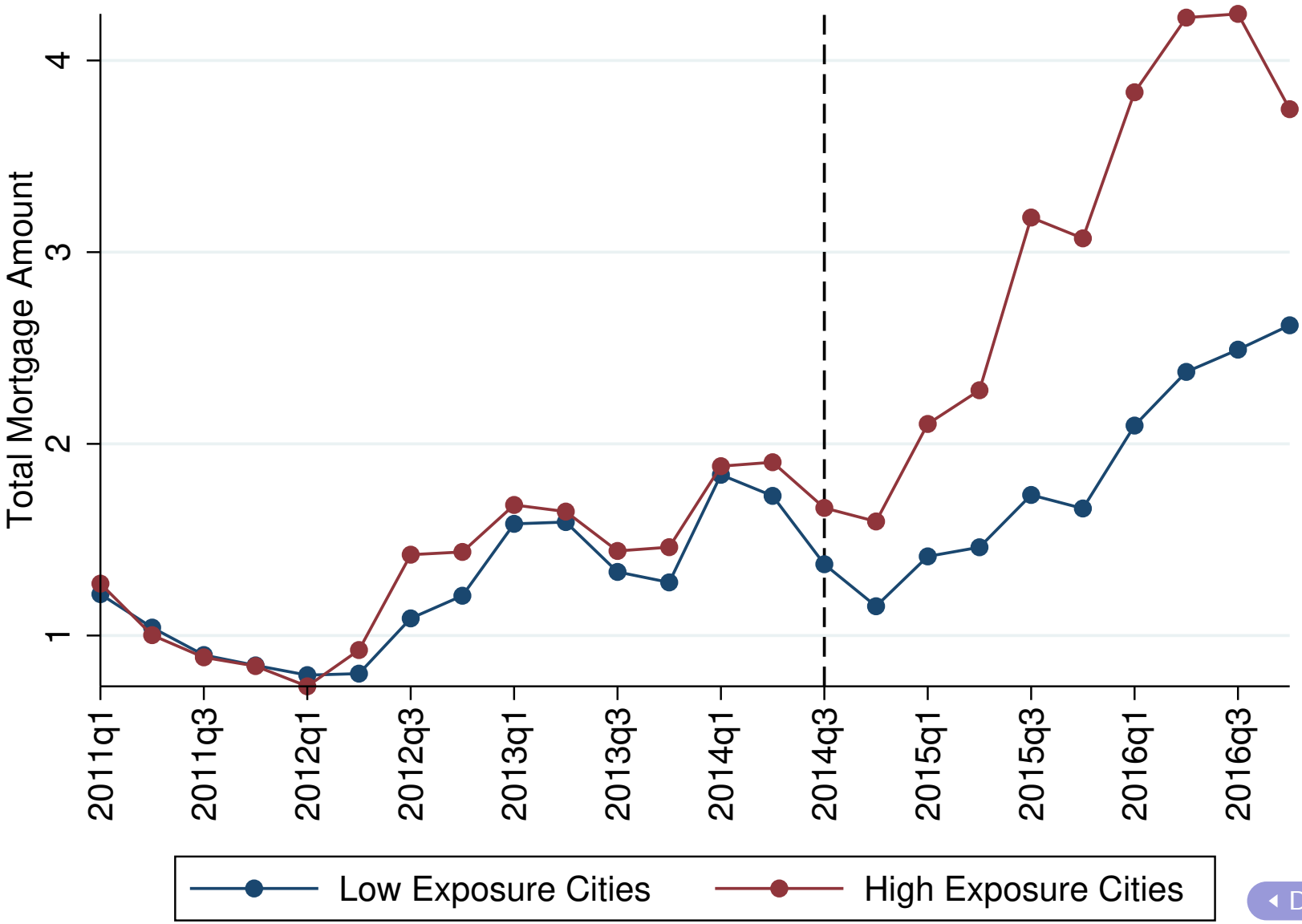
Patterns for Mortgage Credit and House Price

- Split 70 cities into two groups based on exposure to housing speculation
  - Low exposure group
  - High exposure group
- Patterns (before and after policy changes)
  - Total mortgage loan origination amount
  - Total mortgage loan origination number
  - Year-to-year house price growth rate

Exposure Groups

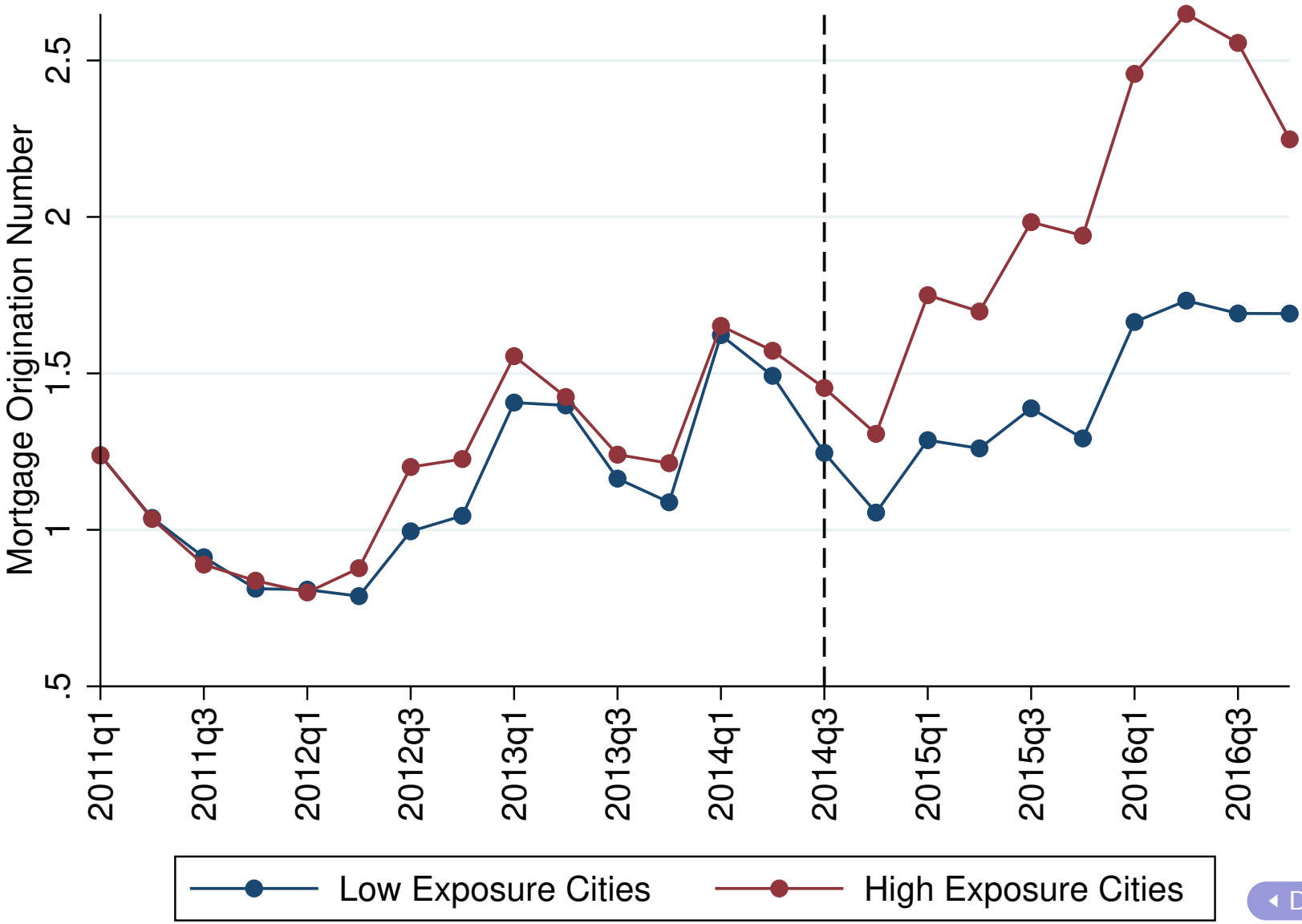
- Low exposure group
  - Anqing, Baotou, Bengbu, Changchun, Changde, Changsha, Chongqing, Dalian, Dandong, Fuzhou, Ganzhou, Guiyang, Harbin, Huizhou, Jining, Jinzhou, Jiujiang, Lanzhou, Mudanjiang, Nanchong, Pingdingshan, Qinhuangdao, Shenyang, Shijiazhuang, Taiyuan, Tangshan, Xi'an, Xiangyang, Xining, Xuzhou, Yangzhou, Yantai, Yueyang, Zhengzhou, Zunyi (安庆, 包头, 蚌埠, 长春, 承德, 长沙, 重庆, 大连, 丹东, 福州, 赣州, 贵阳, 哈尔滨, 惠州, 济宁, 锦州, 九江, 兰州, 牡丹江, 南充, 平顶山, 秦皇岛, 沈阳, 石家庄, 太原, 唐山, 西安, 襄阳, 西宁, 徐州, 扬州, 烟台, 岳阳, 郑州, 遵义)
- High exposure group
  - Beihai, Beijing, Chengdu, Dali, Guangzhou, Guilin, Haikou, Hangzhou, Hefei, Hohhot, Jilin, Jinan, Jinhua, Kunming, Luoyang, Luzhou, Nanchang, Nanjing, Nanning, Ningbo, Qingdao, Quanzhou, Sanya, Shanghai, Shaoguan, Shenzhen, Tianjin, Urumqi, Wenzhou, Wuhan, Wuxi, Xiamen, Yichang, Yinchuan, Zhanjiang (北海, 北京, 成都, 大理, 广州, 桂林, 海口, 杭州, 合肥, 呼和浩特, 吉林, 济南, 金华, 昆明, 洛阳, 泸州, 南昌, 南京, 南宁, 宁波, 青岛, 泉州, 三亚, 上海, 韶关, 深圳, 天津, 乌鲁木齐, 温州, 武汉, 无锡, 厦门, 宜昌, 银川, 湛江)

Figure: (Normalized) Total Mortgage Amount



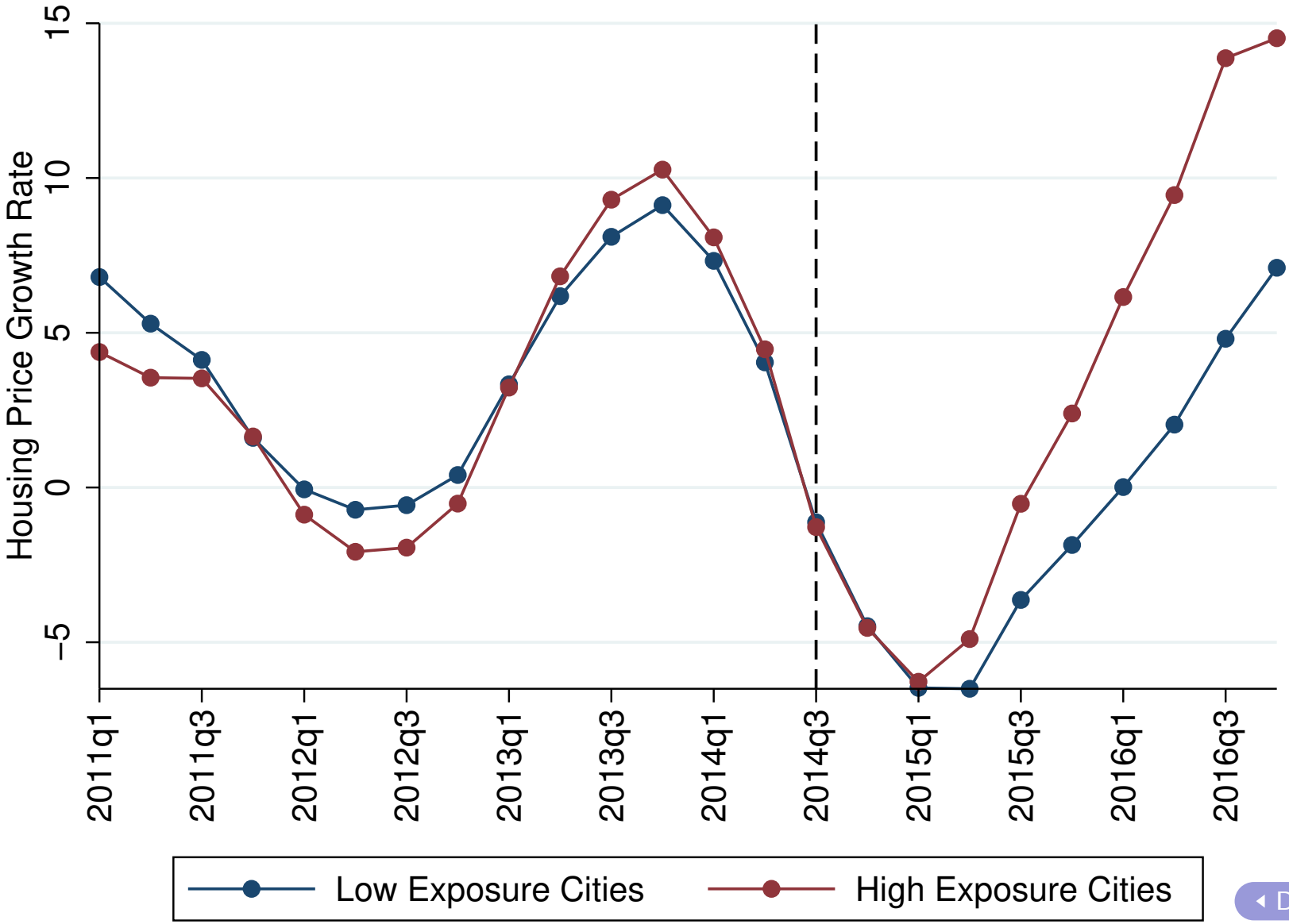
Drop Tier1

Figure: (Normalized) Mortgage Origination Number



Drop Tier1

Figure: Housing Price Growth Rate Y2Y (NBS)



Drop Tier1

Regression Specification

- Regression equation

$$
\begin{aligned}
Y_{i,t} = \alpha_i &+ \beta_1 \times \mathscr{I}(MP_{i,t}) + \beta_2 \times \mathscr{I}(MP_{i,t}) \times Exposure_i \\
&+ \beta_3 \times \mathscr{I}(MP_{i,t}) \times \mathscr{I}(PR_i) + \beta_4 \times \mathscr{I}(MP_{i,t}) \times \mathscr{I}(PR_i) \times Exposure_i \\
&+ \boldsymbol{\gamma} X_{i,t} + \eta_t + \varepsilon_{i,t}
\end{aligned}
$$

  where i denotes the city and t the quarter.

- Variables
  - $Y_{i,t}$: log of total mortgage amount, log of total mortgage origination number, or house price growth rate for city i in quarter t
  - $Exposure_i$: exposure to housing speculation
  - $\mathscr{I}(MP_{i,t})$: dummy variable for relaxation of mortgage loan restriction for city i in quarter t; 1 with relaxation, and 0 without relaxation
  - $\mathscr{I}(PR_i)$: dummy variable for purchase restriction change for city i in 2014; 1 with change, and 0 without change
  - $X_{i,t}$: city characteristics for city i in quarter t

Regression Specification

- Regression equation

$$
\begin{aligned}
Y_{i,t} = \alpha_i &+ \beta_1 \times \mathscr{I}(MP_{i,t}) + \beta_2 \times \mathscr{I}(MP_{i,t}) \times Exposure_i \\
&+ \beta_3 \times \mathscr{I}(MP_{i,t}) \times \mathscr{I}(PR_i) + \beta_4 \times \mathscr{I}(MP_{i,t}) \times \mathscr{I}(PR_i) \times Exposure_i \\
&+ \boldsymbol{\gamma} X_{i,t} + \eta_t + \varepsilon_{i,t}
\end{aligned}
$$

where i denotes the city and t the quarter.

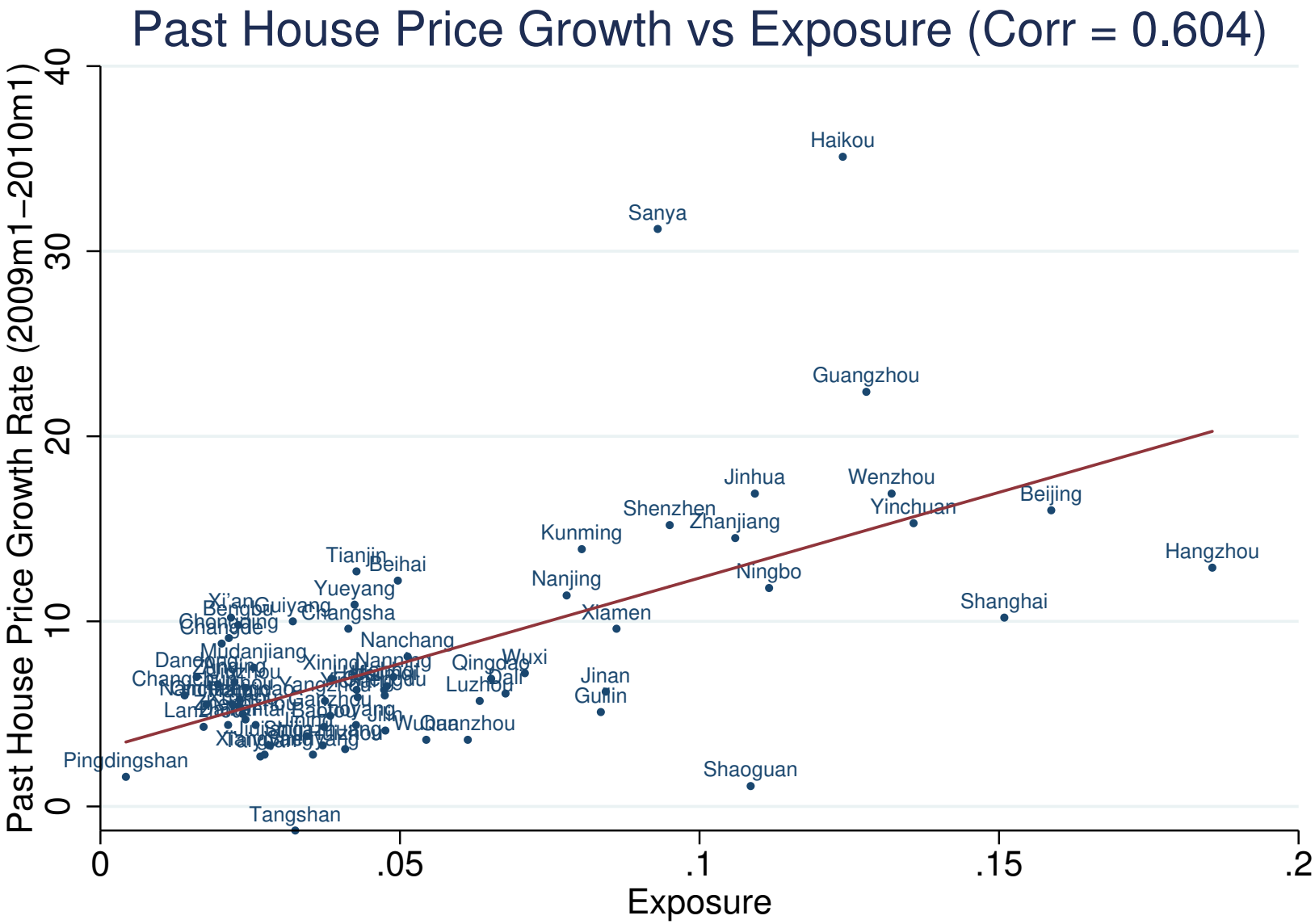
- Variables
  - $Y_{i,t}$: log of total first mortgage amount, log of total first mortgage origination number, log of total second or more mortgage amount, or log of total second or more mortgage origination number for city i in quarter t
  - $Exposure_i$: exposure to housing speculation
  - $\mathscr{I}(MP_{i,t})$: dummy variable for relaxation of mortgage loan restriction for city i in quarter t; 1 with relaxation, and 0 without relaxation
  - $\mathscr{I}(PR_i)$: dummy variable for purchase restriction change for city i in 2014; 1 with change, and 0 without change
  - $X_{i,t}$: city characteristics for city i in quarter t

Regression Results

- We are in the process of collecting data on city characteristics for 70 cities
- We need mortgage loan data at least in 2017 and preferably including 2018 to complete the regression analysis
- But the data analysis we perform so far is very informative and promising

More Analysis: Sources for Exposure to Housing Speculation

- Extrapolation of past housing prices as a source of non-fundamental demand in housing market (Gao et al., 2017; Glaeser et al., 2008; Piazzesi and Schneider, 2009; Glaeser, 2013; Glaeser and Nathanson, 2017)
- Relationship between past house price growth(2009m1-2010m1) and exposure to housing speculation (year 2013)

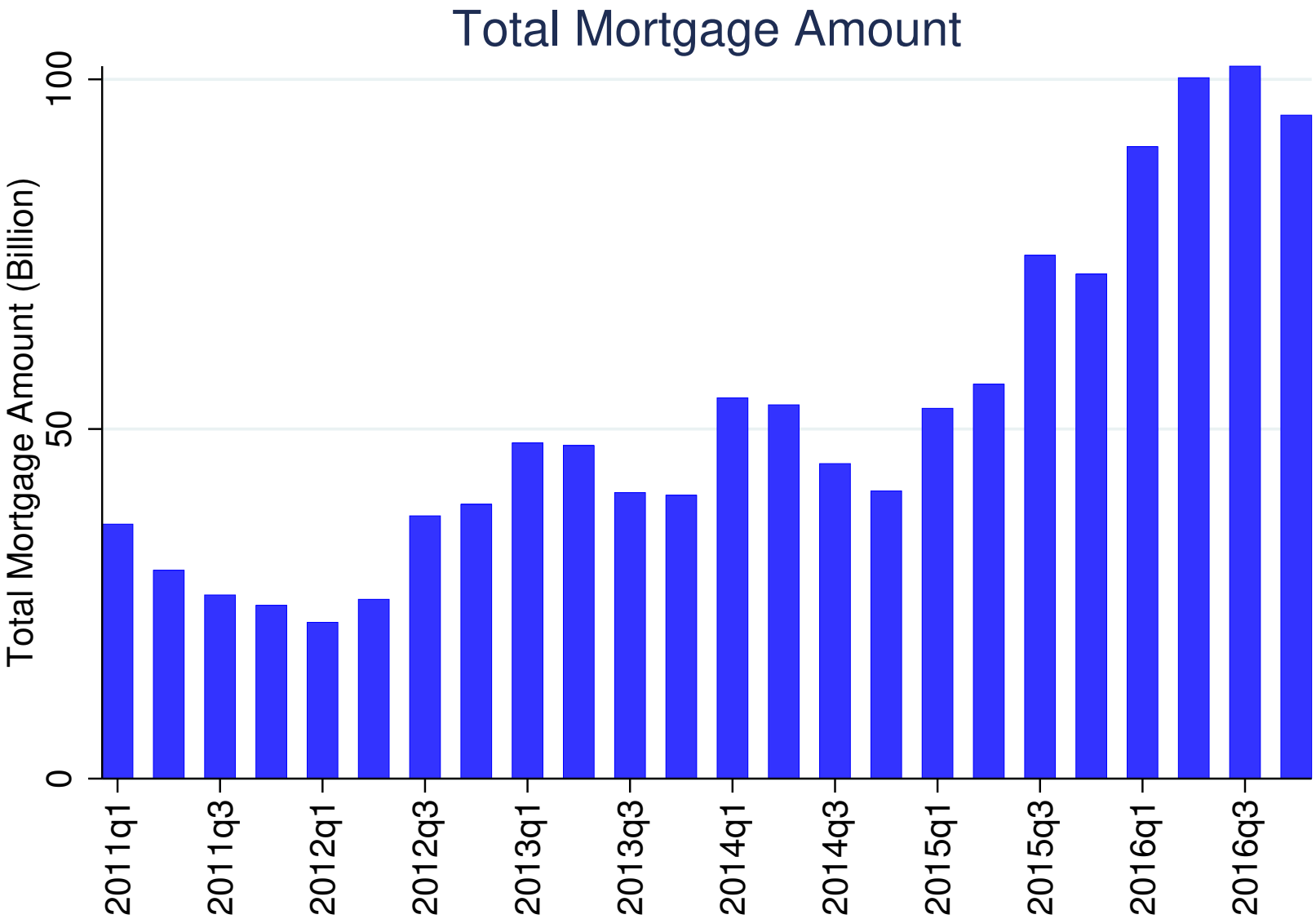

Past House Price Growth vs Exposure (Corr = 0.604)
Past House Price Growth Rate (2009m1–2010m1)
0
10
20
30
40
Exposure
0
.05
.1
.15
.2
Haikou
Sanya
Guangzhou
Jinhua
Wenzhou
Beijing
Shenzhen
Yinchuan
Zhanjiang
Kunming
Hangzhou
Tianjin
Beihai
Ningbo
Nanjing
Yueyang
Shanghai
Xiamen
Changsha
Nanchang
Wuxi
Qingdao
Jinan
Luzhou
Dali
Guilin
Pingdingshan
Shaoguan
Tangshan

Outline

Conclusion

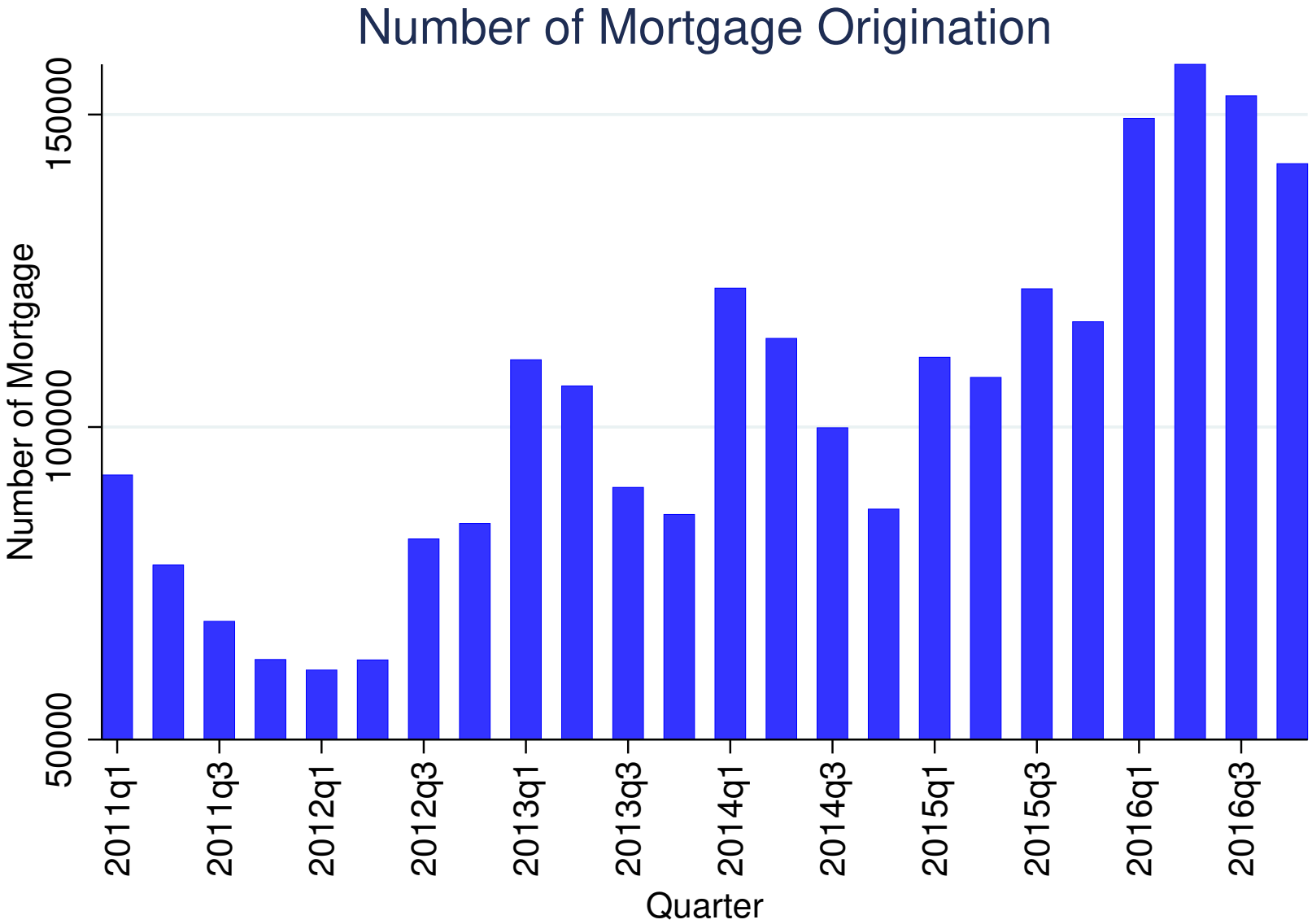
- Summary
  - Our preliminary data analysis shows that relaxation policies of housing market restrictions help fuel booms in the housing market
    - The speculation channel seems important
  - There exists a clear linkage between extrapolation of past housing prices and exposure to housing speculation
- Possible future extensions
  - Extend our analysis to the district level controlling city-time fixed effects (comparison within city)
  - Construct house price indices for the 70 cities by following Fang, Gu, Xiong and Zhou (2016)
  - Study the effects of housing market booms on consumption

Appendix



Back

Source: our constructed data of 70 cities from one large commercial bank.



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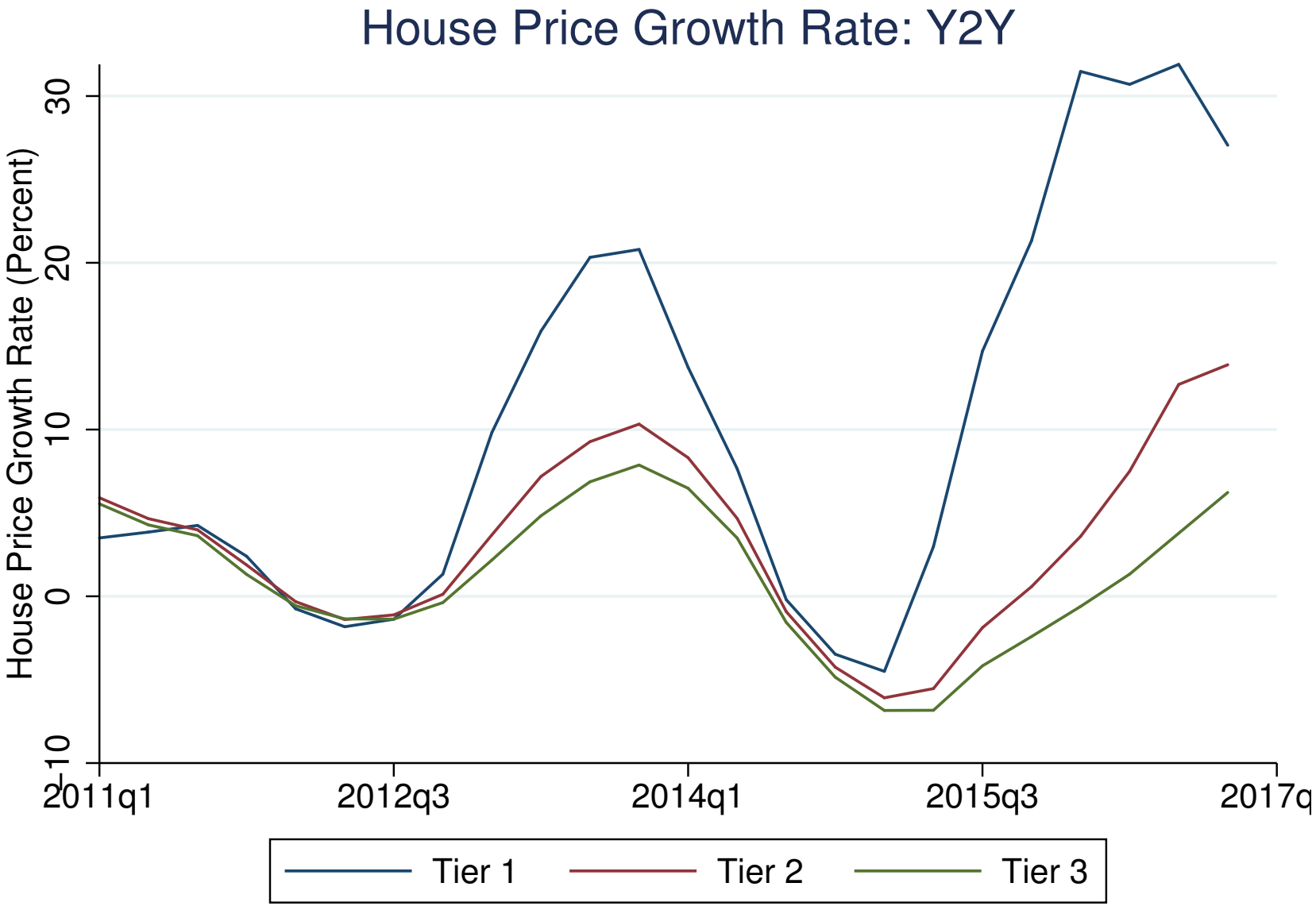
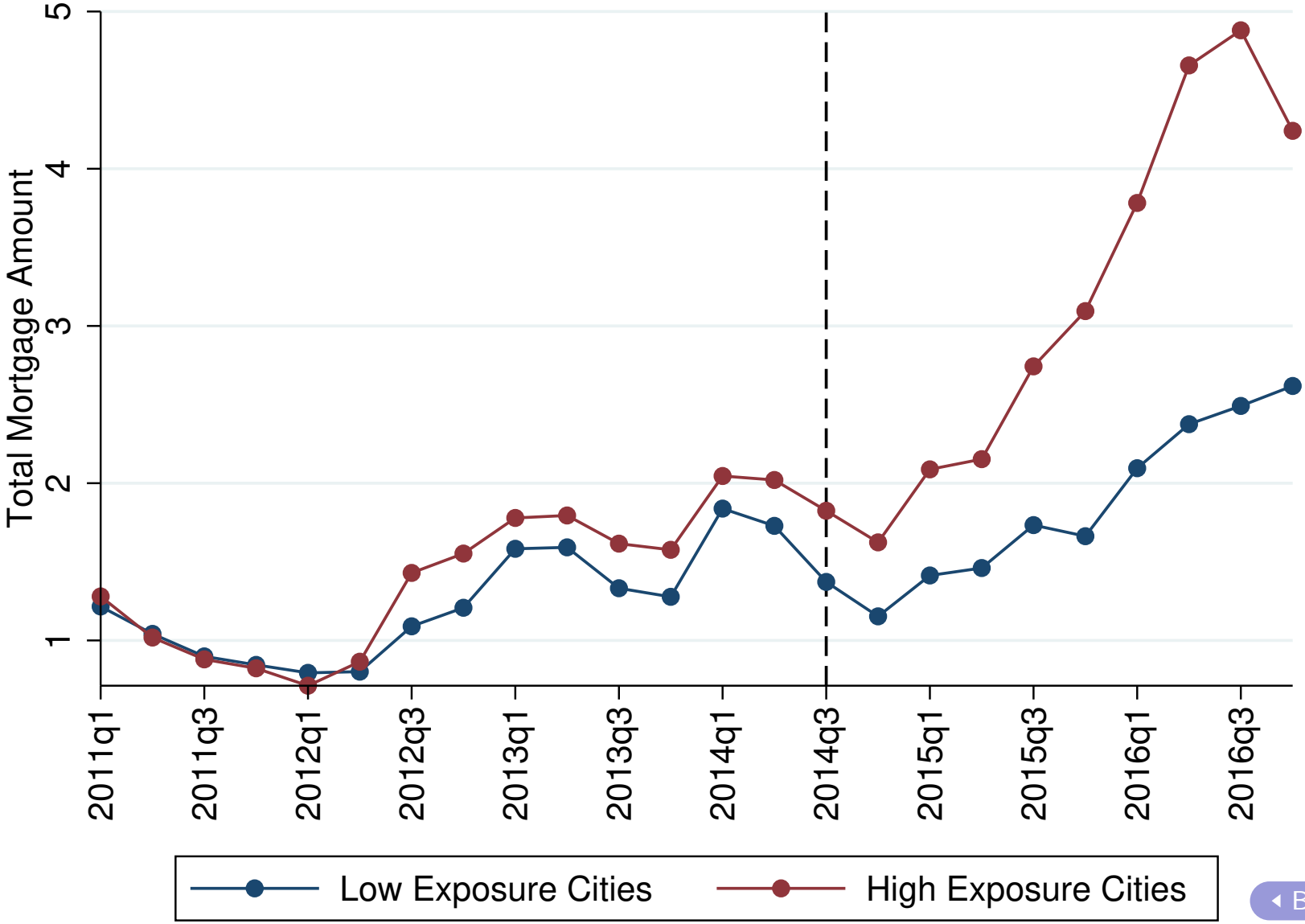


Source: NBS

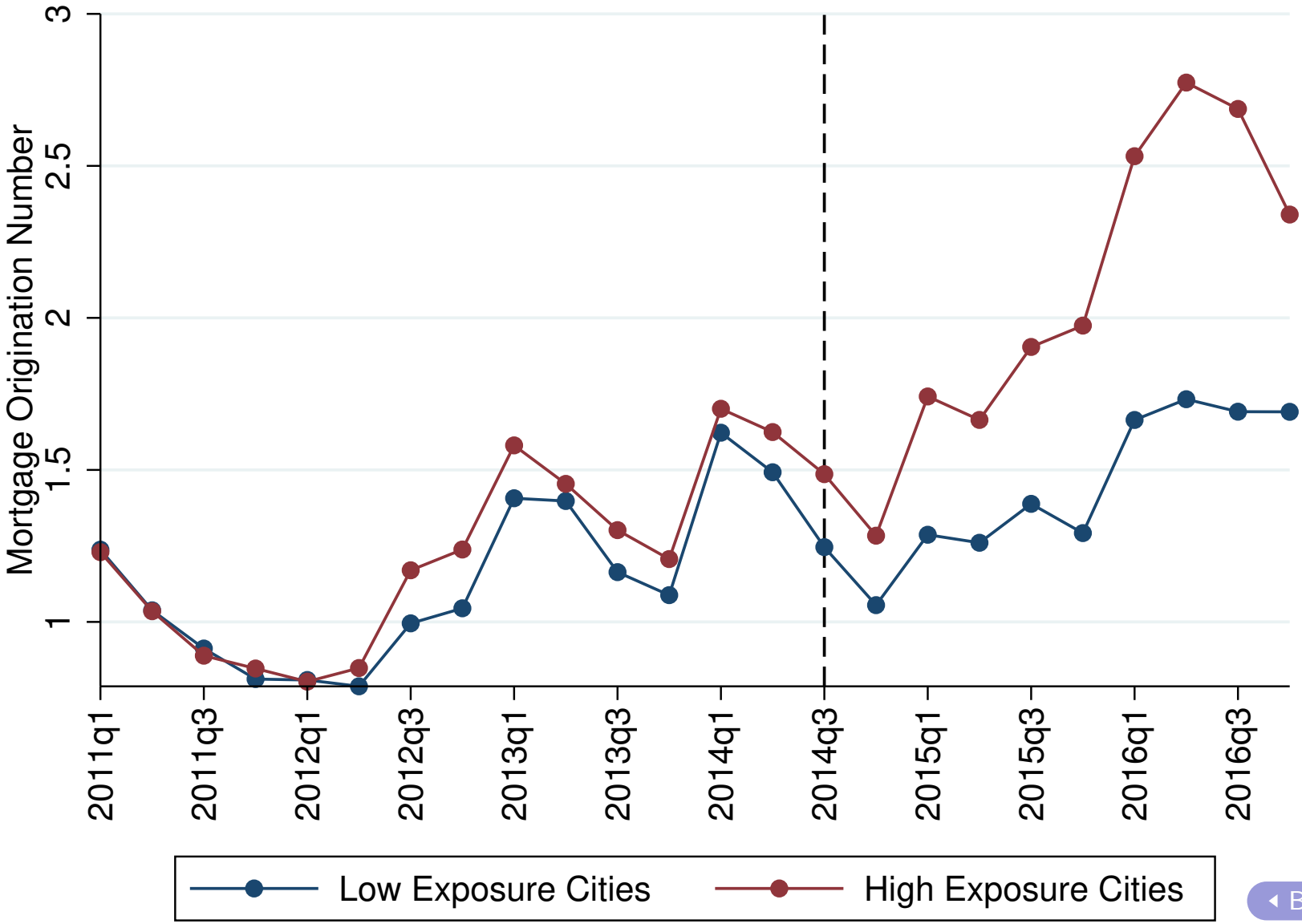
Back

Figure: (Normalized) Total Mortgage Amount: Drop Tier 1 Cities



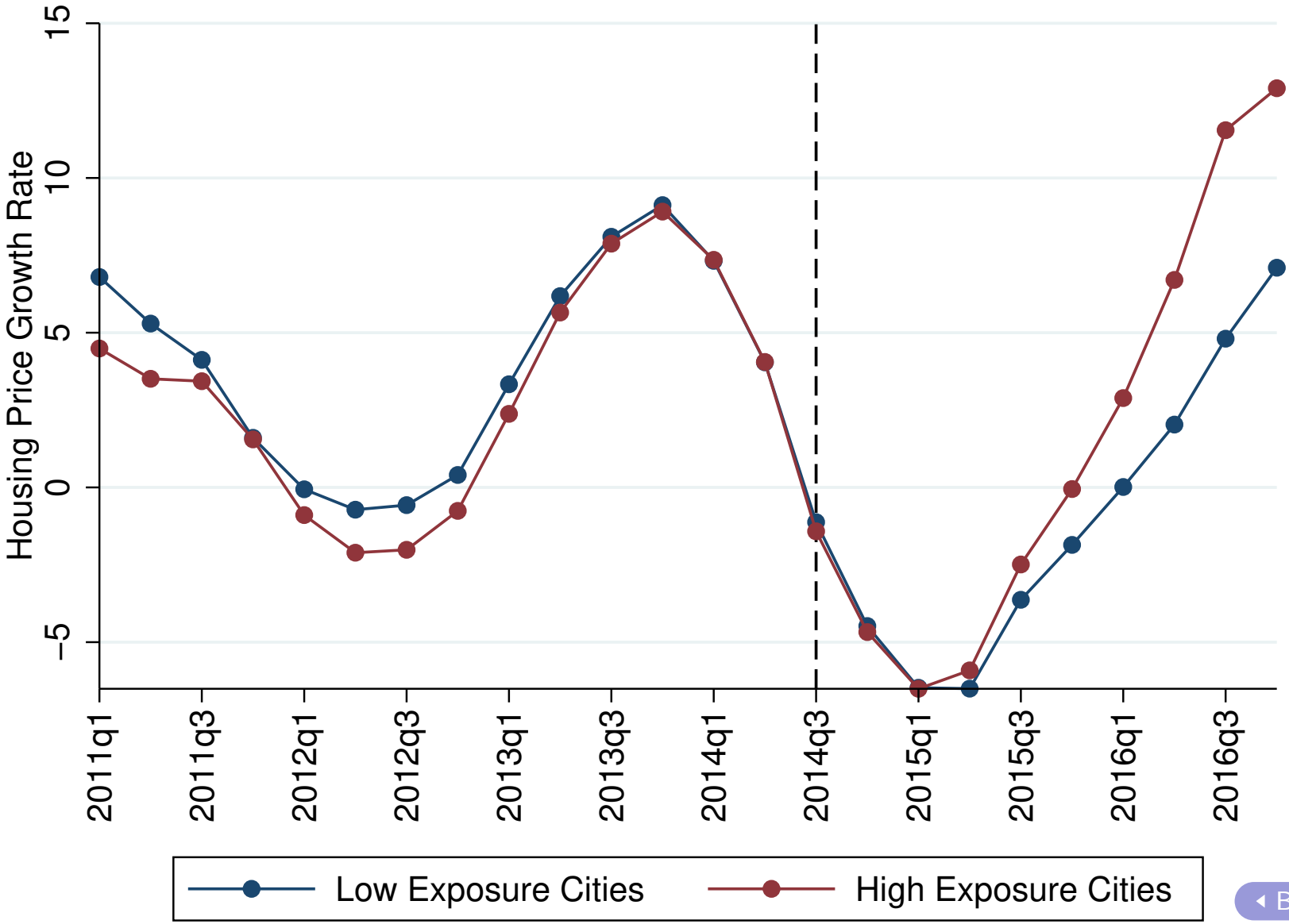
Back

Figure: (Normalized) Mortgage Origination Number: Drop Tier 1 Cities



Back

Figure: Housing Price Growth Rate Y2Y (NBS): Drop Tier 1 Cities



Back