Housing Market Regulations and Strategic Divorce Propensity in China

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Skyrocketing Housing Prices in China

- China's housing prices have been soaring for decades, leading to universal grievances among families
  - In 2009, TV series *"Dwelling Narrowness"* (蜗居) depicted hardships under the out-of-reach housing prices and received a historical rating

Figure: Working hard to afford snail-shell-like housing

Housing Market Regulations

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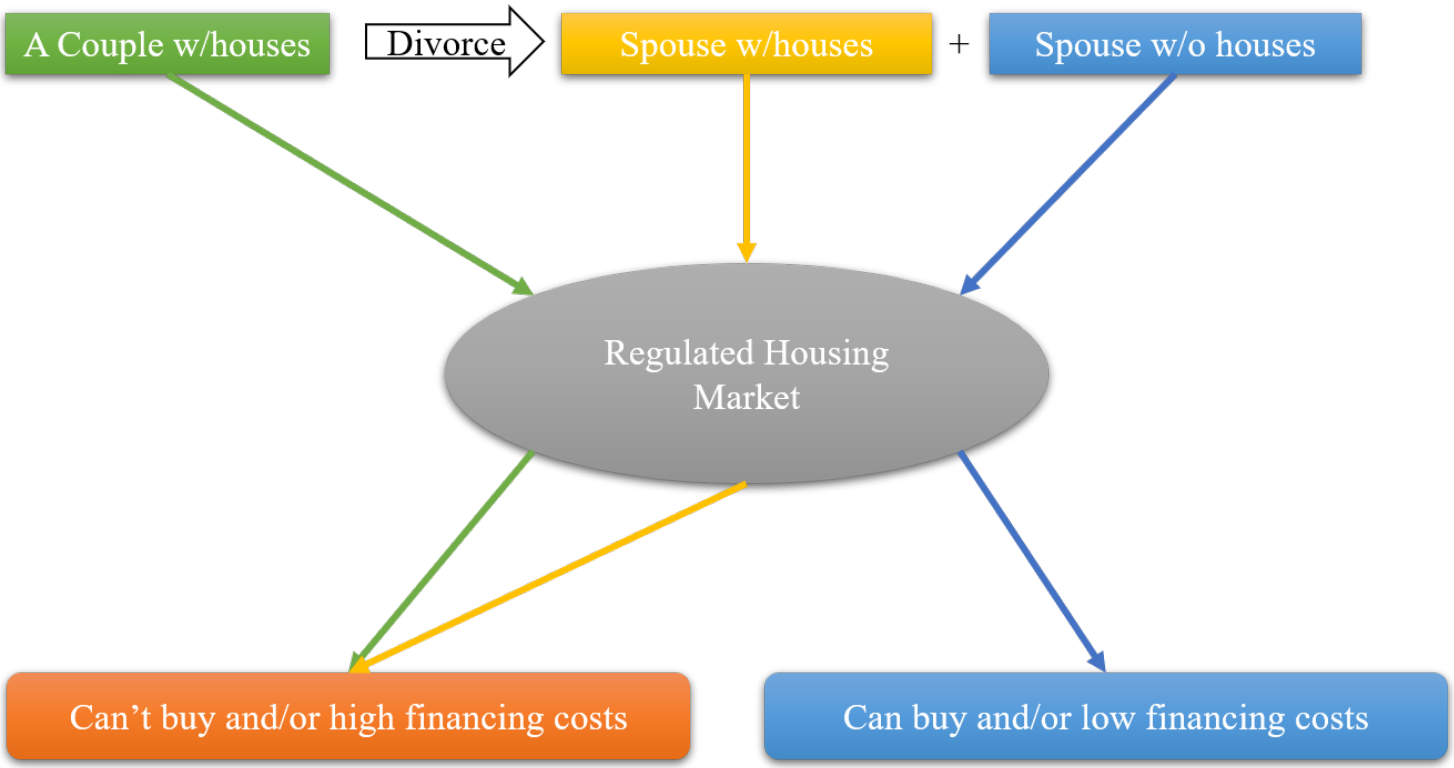
- *Quota restriction* (限购) and *credit restriction* (限贷)
  - A family that already owns one housing can't buy a second one, or it's way costly to do so (extremely high downpayments)
- Enforcement is based on **family** (1 married couple = 1 family)
- Obvious loophole: a restricted couple can get divorced, creating *two families* in the legal sense, one of which is eligible to buy a second house or to do so at lower expenses

Divorce Incentives



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  - Business cycle: Hellerstein et al. (2013); taxation: Alm and Whittington (1999), Alm and Whittington (2003), and Whittington and Alm (1997); ...

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- Methodologically, we use online search data to proxy for strategic divorce behavior, overcoming measurement difficulties even microdata can't solve
  - Growing literature using search data: Stephens-Davidowitz (2014), Kearney and Levine (2015), and Qin and Zhu (2018)

Preview of Results

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Preview of Results

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2. **Marriage-related** and **true divorce-related** searches didn't change
   - Suggest that divorce-related searches were driven by strategic intentions
3. Strategic divorce was more prevalent in cities with
   - a higher male-female ratio
   - stronger Confucian ideologies

Data: Regulation Policies

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  - 4 directly controlled municipalities + 5 self planned municipalities + 23 provincial capitals

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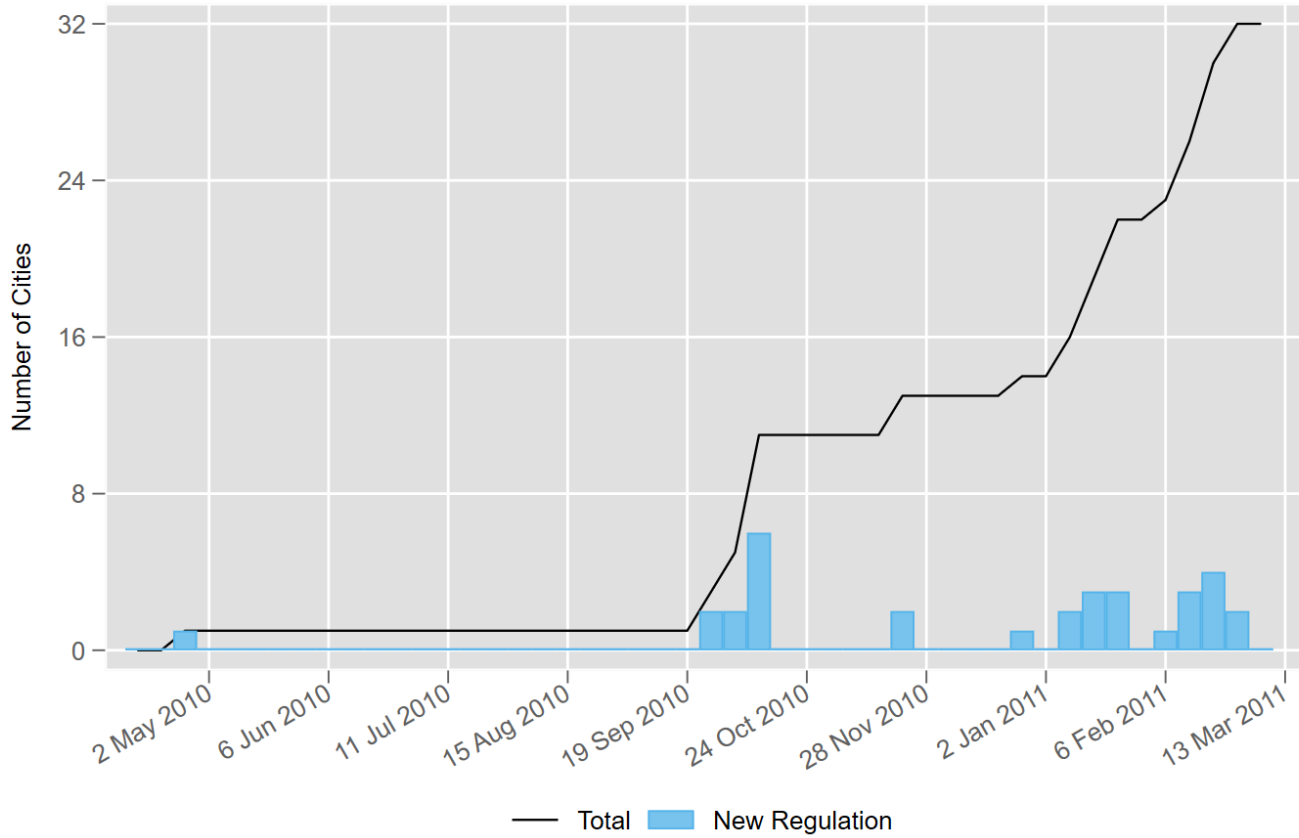
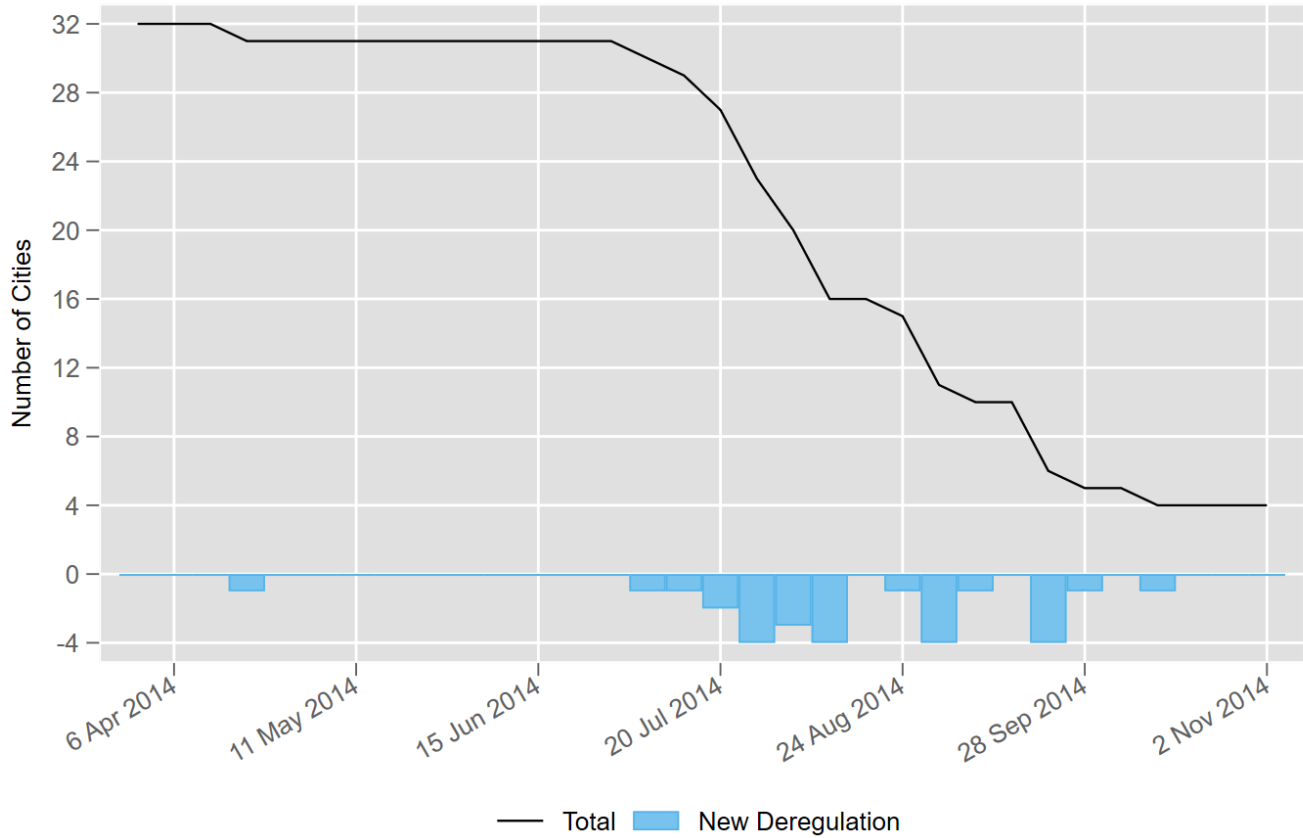
- Exact timing of housing market regulations/deregulations: substantial timing variations
- Three periods:
  1. Regulation (2010–2011): Beijing was the first on April 20, 2010; others followed up later
  2. Deregulation (2014): many cancelled regulations
  3. Re-regulations (2016): regulations were imposed again in some cities

Regulations, 2010–2011



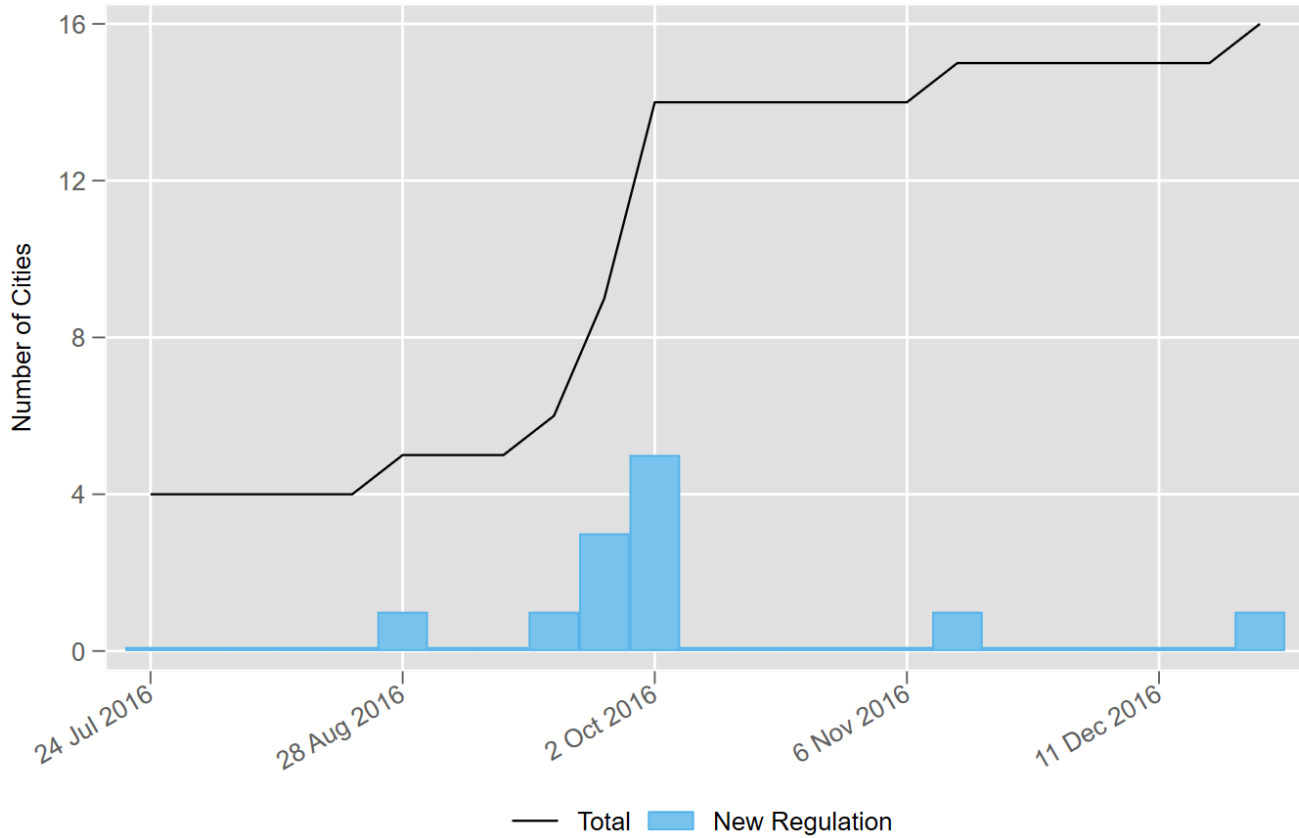
Deregulations, 2014

- Only Beijing, Shanghai, Guangzhou, and Shenzhen didn't deregulate



Re-regulation, 2016

- 12 cities imposed regulations again



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- Weekly searches for 2 **divorce-related** keywords on Baidu
  1. *Divorce Agreement* (**离婚协议**): main dependent
  2. *Divorce Process* (**离婚手续**)

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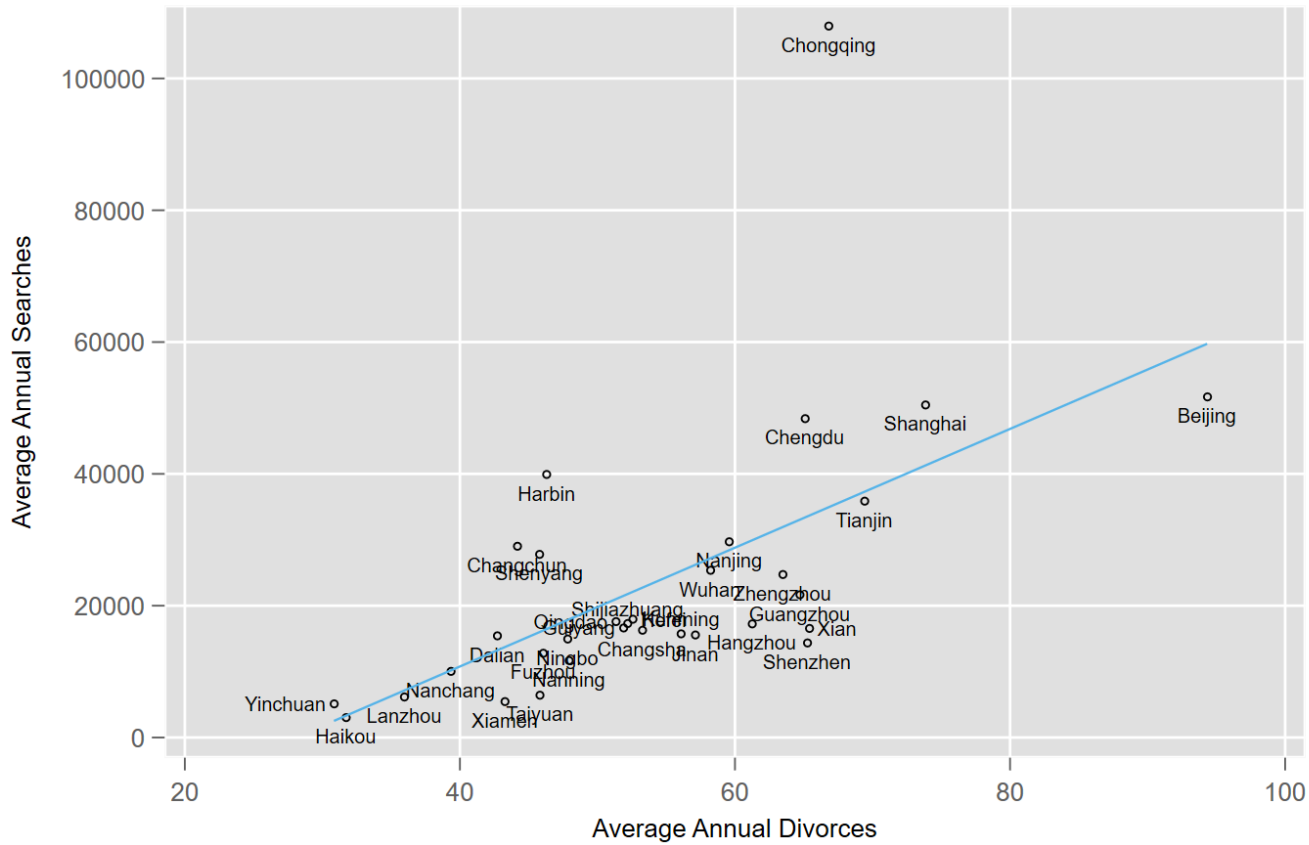
  1. *Divorce Agreement* (**离婚协议**): main dependent
  2. *Divorce Process* (**离婚手续**)
- By searching these term, people seek for information on how to get divorced, capturing restricted couples' strategic divorce propensity
  - Except for professionals, most people lack the knowledge

Summary Statistics

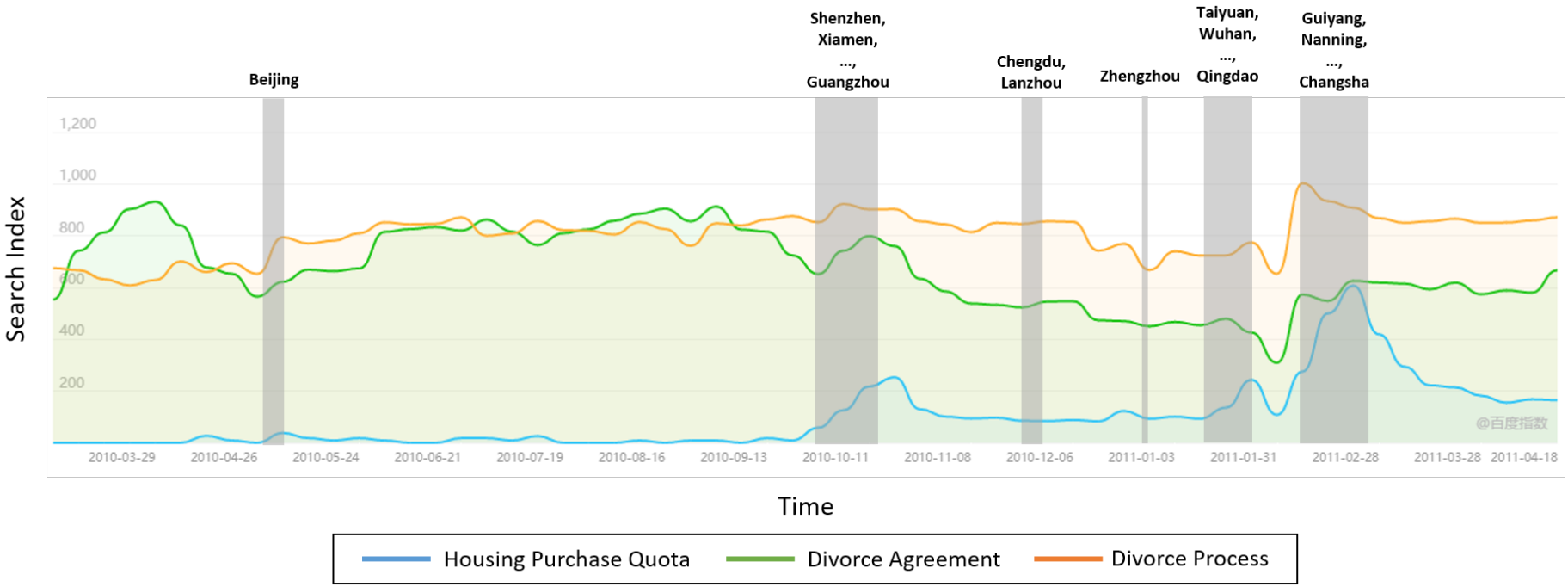
Are Search Data Informative?

- To the extent that divorce-related searches capture divorce intentions, they should be reflected in divorce statistics
- *Corr*(*Divorce Agreement*, *Divorces*) $= 0.6$ (0.7 if dropping outlier Chongqing)



Observational Evidence

- Once a regulation is implemented, searches for the policy and divorce information go up together



Staggered Diff in Diff

- In a city-week panel:

$$\ln(Y_{ct}) = \beta_0 + \beta_1 D_{ct} + x'_{ct}\gamma + \lambda_c + \mu_t + \delta_{ct} + \epsilon_{ct} \quad (1)$$

- c = city; t = time (in weeks)
- Y_{ct} = search volumes (main keyword: *Divorce Agreement*)
- $D_{ct} = 1$ if city c was under regulation at time t
  - Recall cities entered regulation at different times
- $\lambda_c, \mu_t, \delta_{ct}$ = city FE, time FE, city $\times$ month FE
- x_{ct}: time-varying city covariates List
- ϵ_{ct}: clustered at the city level

Identifying Assumption (for β_1)

$$\ln(Y_{ct}) = \beta_0 + \beta_1 D_{ct} + x'_{ct}\gamma + \lambda_c + \mu_t + \delta_{ct} + \epsilon_{ct}$$

- All cities were treated at certain times
- **Common trends:** the evolution of searches does not differ systematically between cities in the absence of regulations, conditional on FEs and controls
- It may hold due to quasi-random timing: there would be a regulation sooner or later, but starting from which week is idiosyncratic
  - Recall the large timing variations
- Event-study results show lack of pretrends

Interpretation: Strategic Divorce or Not?

1. Divorce-related searches may be contaminated by **true divorce propensity**, on top of strategic divorce propensity
   - We look at changes in searches for *Child Custody After Divorce* (离婚抚养权) and *Property Division After Divorce* (离婚财产分割)
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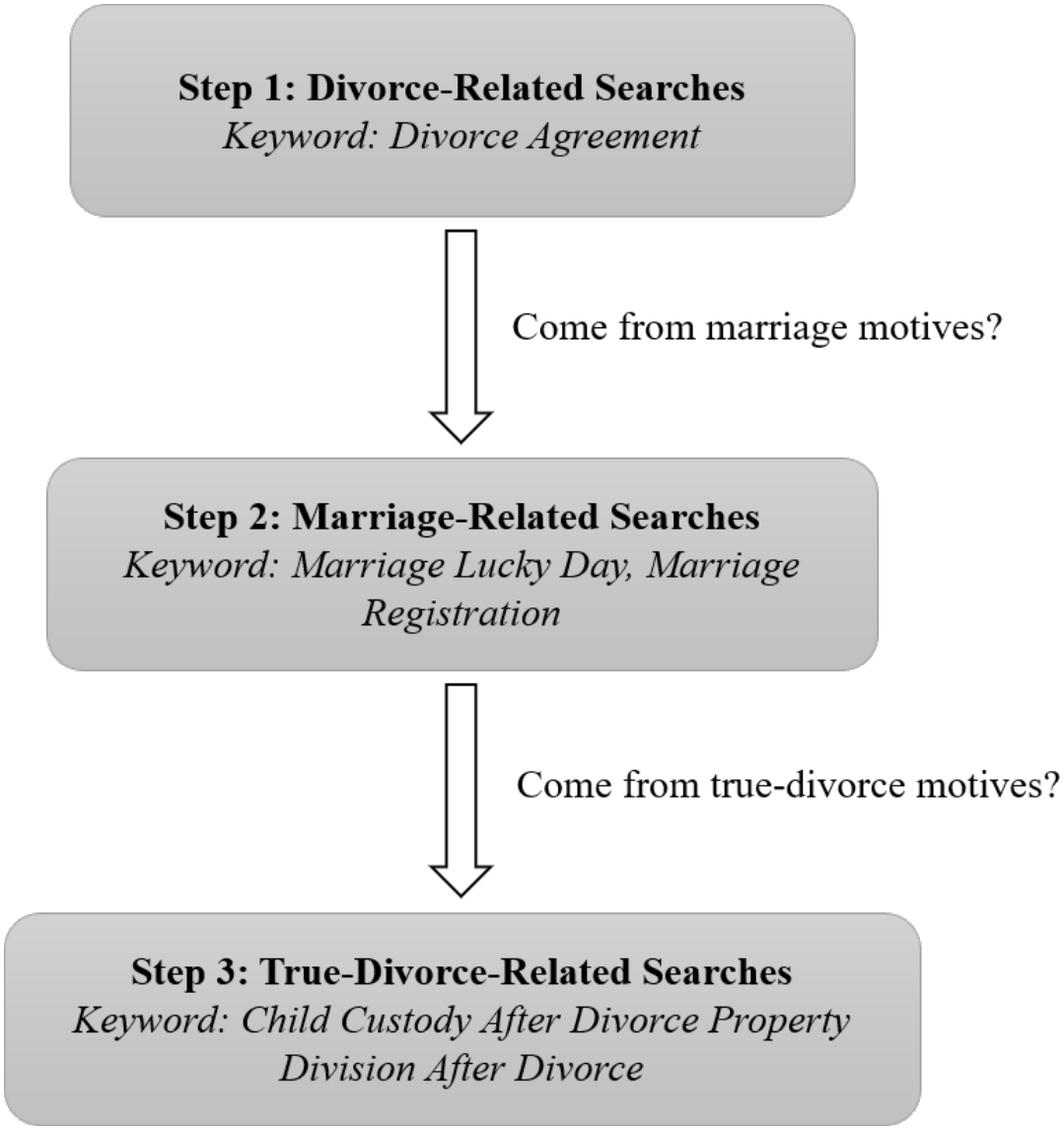
4. A reasoning framework helps rule out competing explanations

Reasoning Framework



Increased Divorce-Related Searches

- Regulations increased searches for *"Divorce Agreement"* by 10%

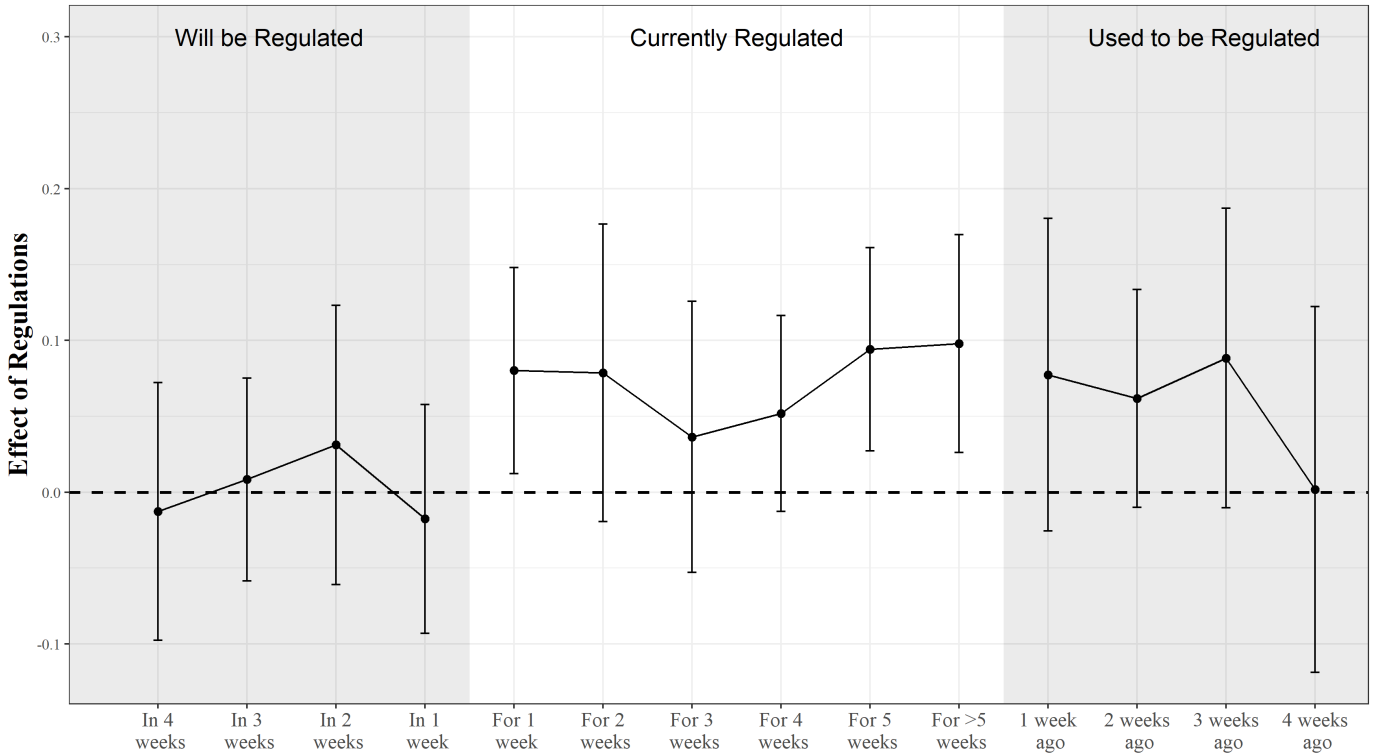
Table: Impact of Housing Market Regulations on Divorce-Related Searches

	(1) $\ln Y_{ct}$	(2) $\ln Y_{ct}$	(3) $\ln Y_{ct}$	(4) Y_{ct}
Regulation	0.124***	0.114***	0.105***	0.084***
	(0.031)	(0.028)	(0.028)	(0.023)
Wild Bootstrap t/z-statistic	4.063	4.020	3.649	3.124
Wild Bootstrap p-value	0.000	0.000	0.001	0.002
City FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
City-Month FE	N	N	Y	Y
Controls	N	Y	Y	Y
Method	OLS	OLS	OLS	PPML
Adj. R squared	0.523	0.528	0.537	0.332
Observations	13344	13344	13344	13344

Note: Standard errors clustered at city level are reported in the parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$

Event Study Results

- Regulations have been turned on and off in our sample period
- No pretrends prior a regulation
- Searches surged (dropped) as regulations came (left)



Robustness

Not Driven by Other Search Intentions

- For marriage and true divorce related searches, only data after 2011

Table: Impacts of Housing Market Regulations on Other Searches

	Replication	Marriage-Related		True-Divorce-Related	
	(1)	(2)	(3)	(4)	(5)
	$\ln Y_{ct}$	Lucky Day	Registration	Child Custody	Property Division
Regulation	0.049**				
	(0.024)				
Wild Bootstrap *t*-statistic	2.011				
Wild Bootstrap *p*-value	0.054				
City FE	Y				
Time FE	Y				
City-Month FE	Y				
Controls	Y				
Adj. R squared	0.498				
Observations	8764				

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Regulation	0.049**	-0.321	0.011		
	(0.024)	(0.325)	(0.236)		
Wild Bootstrap *t*-statistic	2.011	-0.966	0.044		
Wild Bootstrap *p*-value	0.054	0.343	0.965		
City FE	Y	Y	Y		
Time FE	Y	Y	Y		
City-Month FE	Y	Y	Y		
Controls	Y	Y	Y		
Adj. R squared	0.498	0.483	0.488		
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Regulation	0.049**	-0.321	0.011	-0.003	-0.045
	(0.024)	(0.325)	(0.236)	(0.098)	(0.320)
Wild Bootstrap *t*-statistic	2.011	-0.966	0.044	-0.031	-0.139
Wild Bootstrap *p*-value	0.054	0.343	0.965	0.976	0.890
City FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
City-Month FE	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y
Adj. R squared	0.498	0.483	0.488	0.182	0.409
Observations	8764	8764	8764	8764	8764

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- Increased divorce-related searches should solely come from strategic divorce

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Heterogeneous Effects

Table: Heterogeneous Impacts of Housing Market Regulations

	Dependent Variable: $\ln Y_{ct}$			
	(1) Regulated 2010 [Mean = 0.438]	(2) Sex Ratio [Mean = 0.029]	(3) Pop. Density [Mean = 0.072]	(4) Confucian [Mean = 547]
Regulation	0.100***	0.123***	0.109***	0.100***
	(0.027)	(0.031)	(0.036)	(0.029)
Regulation × Z	0.009	-0.824**	-0.046	-3.22e-5**
	(0.029)	(0.355)	(0.361)	(1.22e−5)
WB *t*-statistic for Regulation	3.658	3.842	2.882	3.277
WB *p*-value for Regulation	0.001	0.001	0.007	0.003
WB *t*-statistic for interaction	0.320	-2.245	-0.124	-2.551
WB *p*-value for interaction	0.763	0.016	0.911	0.015
City FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
City-Month FE	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Adj. R squared	0.537	0.538	0.537	0.573
Observations	13344	13344	13344	11259

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Heterogeneous Effects

- Higher sex ratio: husbands are more concerned about moral hazards
- Stronger Confucianism: emphasis on family stability

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- Online search data can be a useful tool for detecting behavioral response, evaluating policies, ...
- It's crucial for the govt to consider unintended effects on the marriage market when designing regulations
  - Some govts are already aware of this, e.g., starting from January 21, 2021, Shanghai's regulations considered a divorced couple as married in the first three years of a divorce
  - An open question whether such "one-size-fits-all" policy would backfire: reasonable housing demand is still there; it might harm truly divorced couples

Thanks!

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Web: laiwz.github.io

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Summary Statistics

Table: Summary Statistics

	Frequency	Obs.	Mean	Std. Dev.	Min.	Max.
Panel A: Policy and Baidu Indices						
Regulation	Weekly	13344	0.507	0.500	0	1
Baidu Index on *Divorce Agreement*	Weekly	13344	54.043	23.116	0	950.303
Baidu Index on *Divorce Process*	Weekly	13344	49.833	26.187	0	188.788
Baidu Index on *Child Custody After Divorce*	Weekly	10016	9.424	29.048	0	289
Baidu Index on *Property Division After Divorce*	Weekly	10016	82.607	113.877	0	523
Baidu Index on *Marriage Lucky Day*	Weekly	10016	189.361	220.055	0	1440
Baidu Index on *Marriage Registration*	Weekly	10016	106.540	145.475	0	822
Panel B: City Covariates						
Population	Yearly	13344	768.503	554.287	155.550	3392
Population density	Yearly	13344	0.072	0.044	0.016	0.276
Sex ratio (male/female)	Yearly	13344	1.029	0.036	0.836	1.135
GDP per capita (10,000 RMB)	Yearly	13344	7.392	3.886	2.195	46.775
Average savings (10,000 RMB)	Yearly	13344	13.654	12.340	3.182	116.118
Change of HPI (%)	Monthly	13344	0.413	1.031	-5.200	19.100
Unemployment rate (%)	Yearly	13344	2.953	0.785	0.900	5.700
Confucian academies during Ming-Qing	Invariant	11259	546.556	694.481	10	2175

Data sources: Regulation policies are collected from government documents and media reports. Baidu Indices are scarped from the website http://index.baidu.com. City covariates are from China City Yearbooks, National Bureau of Statistics, and Chen et al., 2020.

Covariates

- Population density, average deposits, GDP per capita, growth rate of the housing price index, sex ratio (males relative to females), and unemployment rate

Robustness Checks

- Col 1: searches for *Divorce Process* as dependent
- Col 2: drop HPI from controls (bad control problem)
- Col 3 & 4: drop special cities
- Col 5: case study for Beijing; trends might not be fully controlled by FEs given the high-frequency data

Table: Robustness Checks

	(1) Alt. Keyword	(2) Drop HPI	(3) No DCM	(4) No BSGS	(5) Beijing Treated
Regulation	0.438***	0.122***	0.078**	0.046*	0.039**
	(0.098)	(0.031)	(0.028)	(0.025)	(0.015)
Wild Bootstrap *t*-statistic	4.321	3.744	2.709	1.838	2.382
Wild Bootstrap *p*-value	0.000	0.001	0.012	0.077	0.024
City FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
City-Month FE	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y
Method	0.762	0.532	0.490	0.489	0.572
Adj. R squared	13344	13344	11676	11676	2880

Note: Standard errors clustered at city level are reported in the parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$