Taxation like Predation -- The Case in China

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Predation in Wild Africa

- **Wildebeest** annual migration in east Africa
- Is it safer to be in **herds** than being **alone**?

Cicada Boom Every 17 Years

- **Brood17** (**periodical cicada** in north America)
- Year of emergence: 1961, 1978, 1995, 2012, 2029
- States: TN, VA, WVA

Crossing the Road – China Style

Predation in Economy

- **Kidnap** and **assaults** by pirates (Besley, Feltzer, and Mueller, 2015)
- **Corruption** of government officials (Shleifer and Vishny, 1993; Fisman and Svensson, 2007)
- **Theft**, **robbery**, and **other crimes** targeting firms (Besley, Mueller, 2016),
- **Extortions** by mafia (Bandiera, 2003)
- **Discretionary tax enforcement** (Moselle and Polak, 2001)
- **Informal taxes** (Olken and Singhal, 2011)

Question

- Can a firm pay lower tax by
  - locating in **jurisdiction with smaller government size**
  - or by residing with **more neighbouring firms**?
- Two players
  - **Tax administrator**: predator
  - **Firms**: prey
- Focus on very **local** region in **China**
  - County
  - Street and town
  - Grid

Preview of Main Findings

- **Geographic distribution** of firms and government size **matters** in tax administration
- Tax rate is lower if
  - **Government relative size** is smaller
  - **Firm density** is greater
  - There are **big firms** around
- The negative relationship between the tax rate and firm density **robustly** holds at various levels of locality
  - County
  - Town/street
  - Grid
- **Polarization** of firm geographical distribution

Conceptual Framework

- **Tax collection** is like **fishing**
  - **A firm** is like **a fish**
  - **A tax inspector** is like **a fisherman**
  - **A jurisdiction** is like **a lake**
  - **Tax rate** is like the **likelihood of fish being caught**
- Tax inspector's decision is based on **costs** and **befits** of inspection
  - **Fixed cost** irrelevant to **firm size**

Conceptual Framework

- **Assumptions**
  - The **density of the fish** is **random** across lakes
  - The **number of fishermen** is assigned in proportion to **lake size**
  - The **fishermen-fish ratio** is random
- **Predictions**
  - Prediction 1 (**Fishermen-fish ratio**)
    - Ceteris paribus, each fish is more likely to be caught if there are more fishermen working in the same lake
  - Prediction 2 (**Fish density**)
    - Fishermen do not need to catch fish everyday if there are more fish in the lake
  - Prediction 3 (**Big fish**)
    - Small fish are safer if there are big fish around

Hierarchy Structure

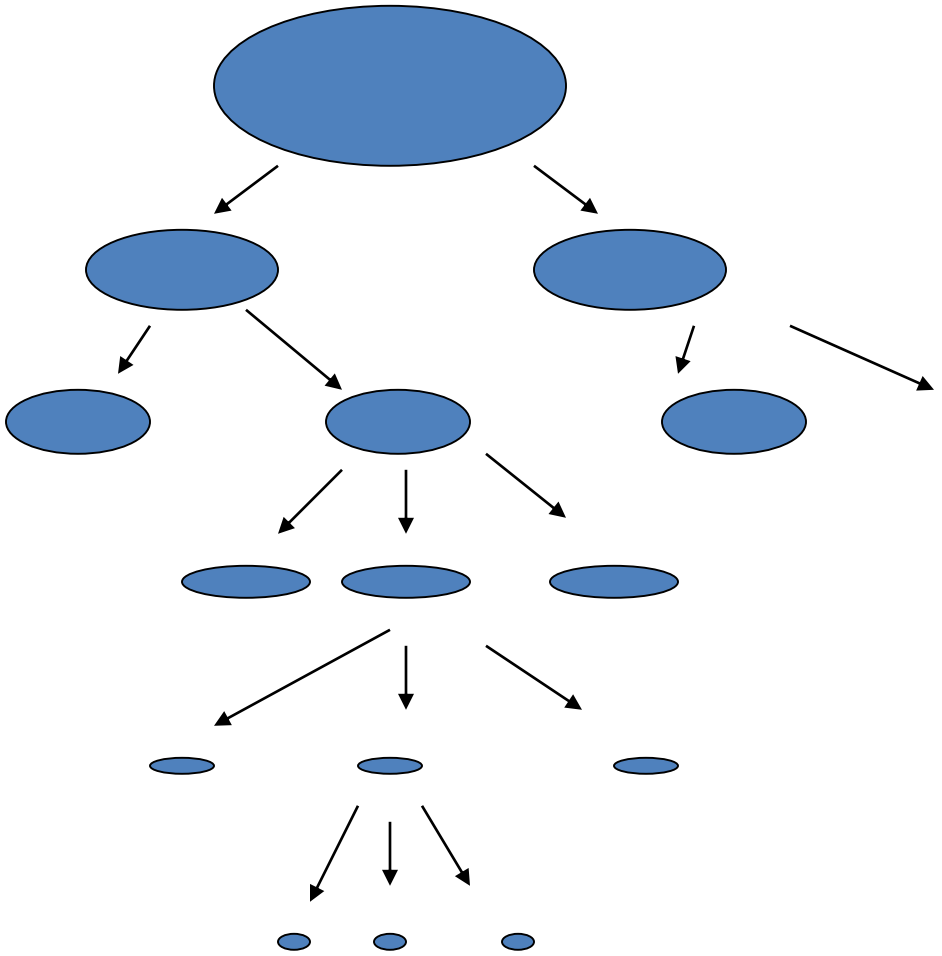
Central

Province (31)

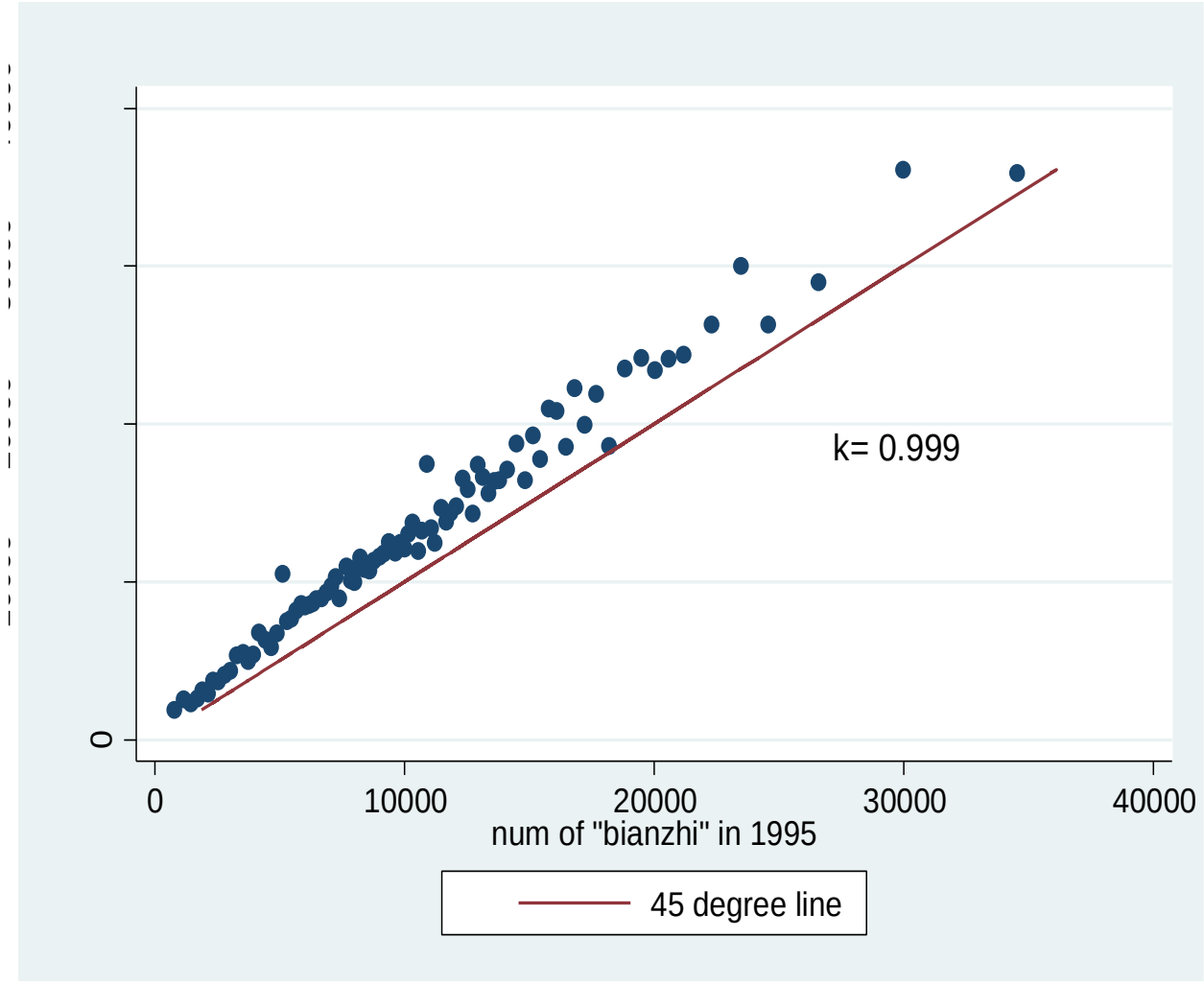
Prefecture (348)

County (2851)

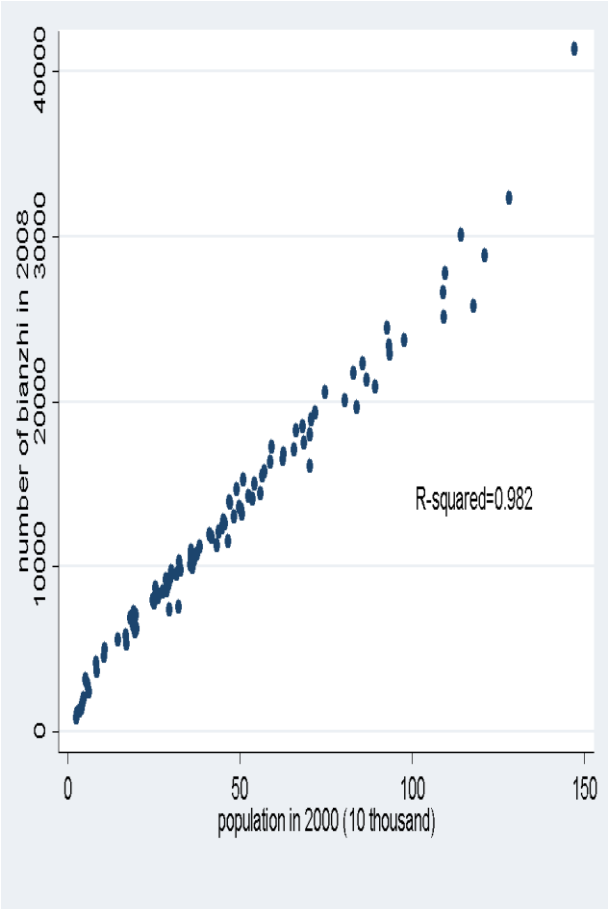
Township and village (40000+)

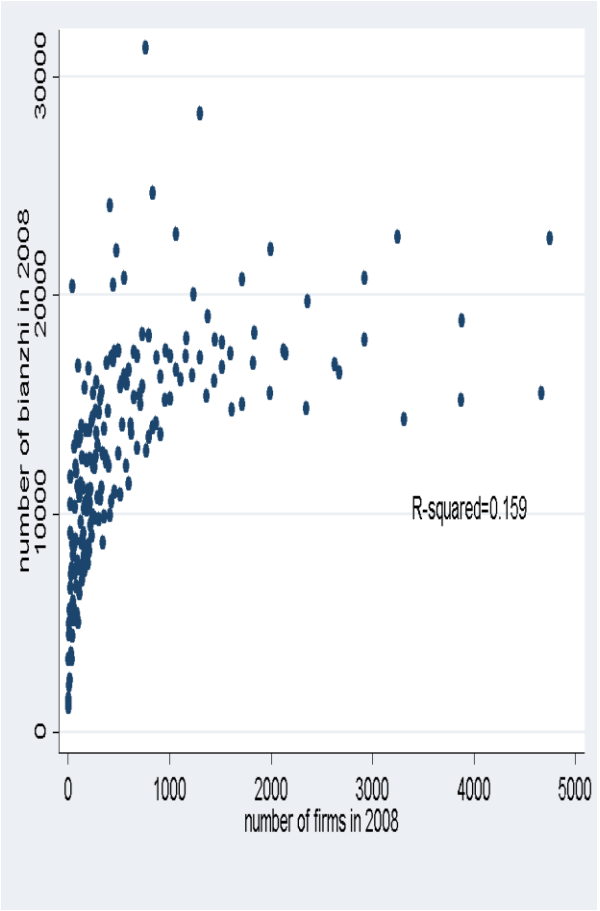


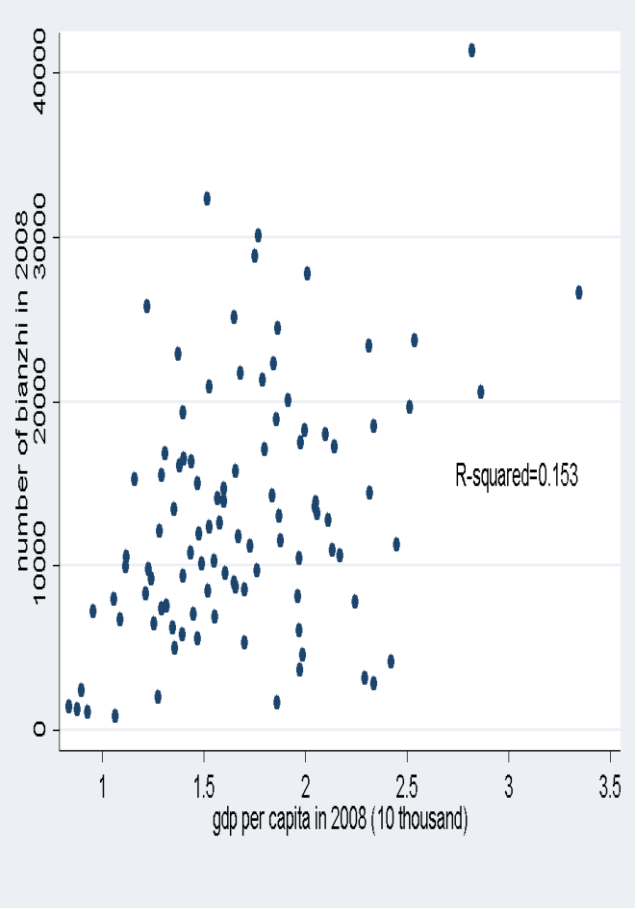
Persistence of *Bianzhi*



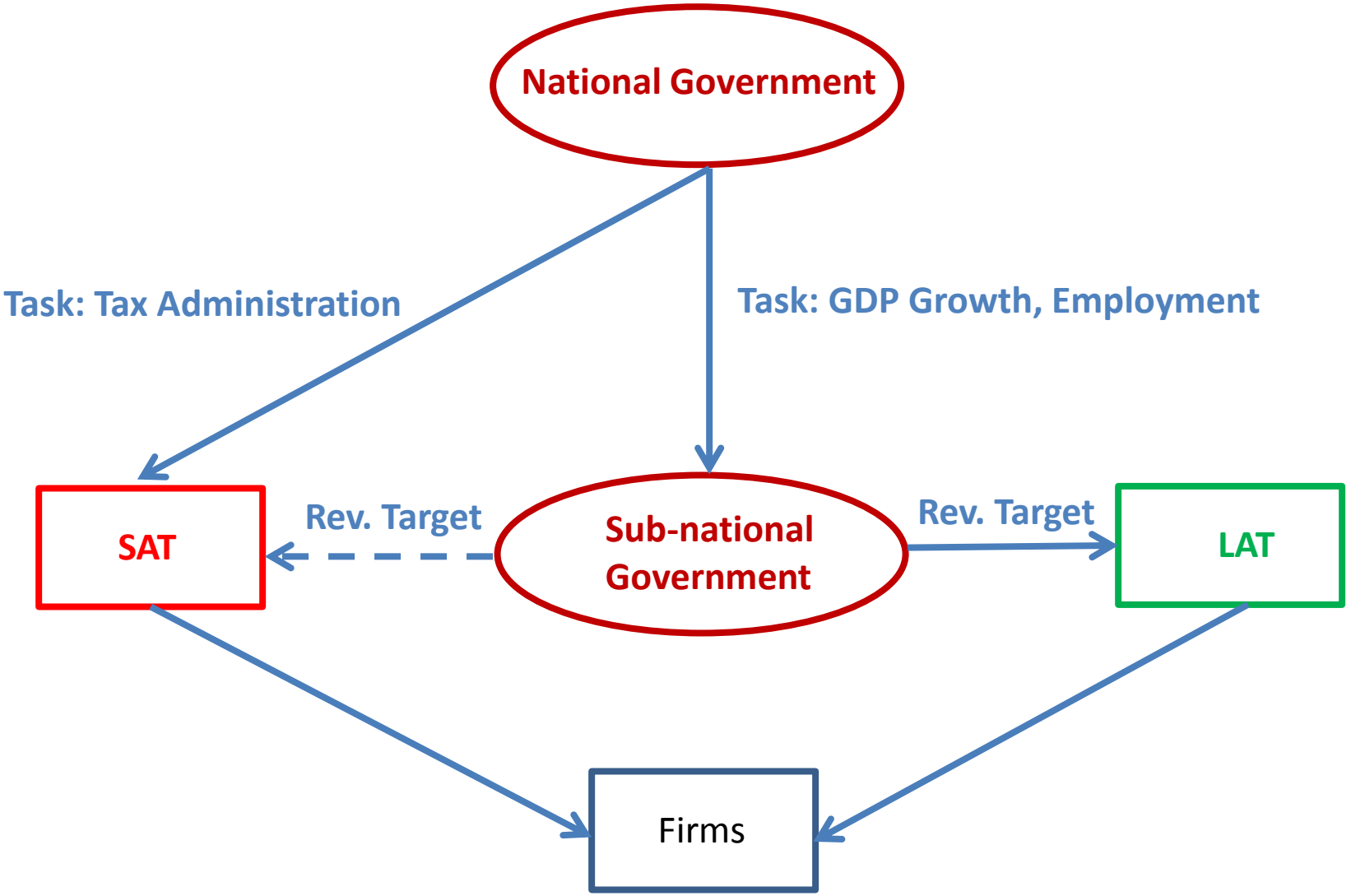
Bianzhi, Popuation, # of firms, and GDP







Tax Administration



Data

- **China Economic Census**
  - By National Bureau of Statistics
  - 2004, 2008, 2012
  - Variables: firm name, address, ownership, industry
- **Annual Inspection data**
  - by China Industrial and Commercial Bureau
  - Variables: **total payable tax**
- **OpenStreetMap**
  - Info: map shapefile of Guangdong province

Main Variables

- 1. $Effective\ Tax\ Rate_{it} = \frac{Total\ Tax\ Payment_{it}}{Main\ business\ sales_{it}}$
  - Total tax payment = VAT + Sales Tax and Extra Charge + Corporate Income Tax + the other taxes and surcharges
- 2. $Bianzhi - firm\ ratio_{ct} = \frac{Number\ of\ employees\ on\ public\ payroll_{ct}}{Number\ of\ firms_{ct}}$
- 3. $Firm\ Density_{c,t} = \frac{The\ num\ of\ firms\ within\ county\ c\ in\ year\ t}{Land\ area\ of\ county\ c}$

Summary Statistics

Empirical Methods

- Bianzhi-firm ratio, firm density and tax rate (County panel)

$$\tau_{c,t} = \alpha_c + \beta \times BF\_Ratio_{c,t-4} + \theta \times Density_{c,t-4} + \gamma \times X_{c,t} + \varepsilon_{c,t}$$

- Firm density and tax rate (street level)

$$\tau_{i,s,c,n} = \alpha_c + \rho_n + \beta \times Density_s + \gamma \times X_{i,s,c,n} + \varepsilon_{i,s,c,n}$$

- Firm density and tax rate (Grid level)

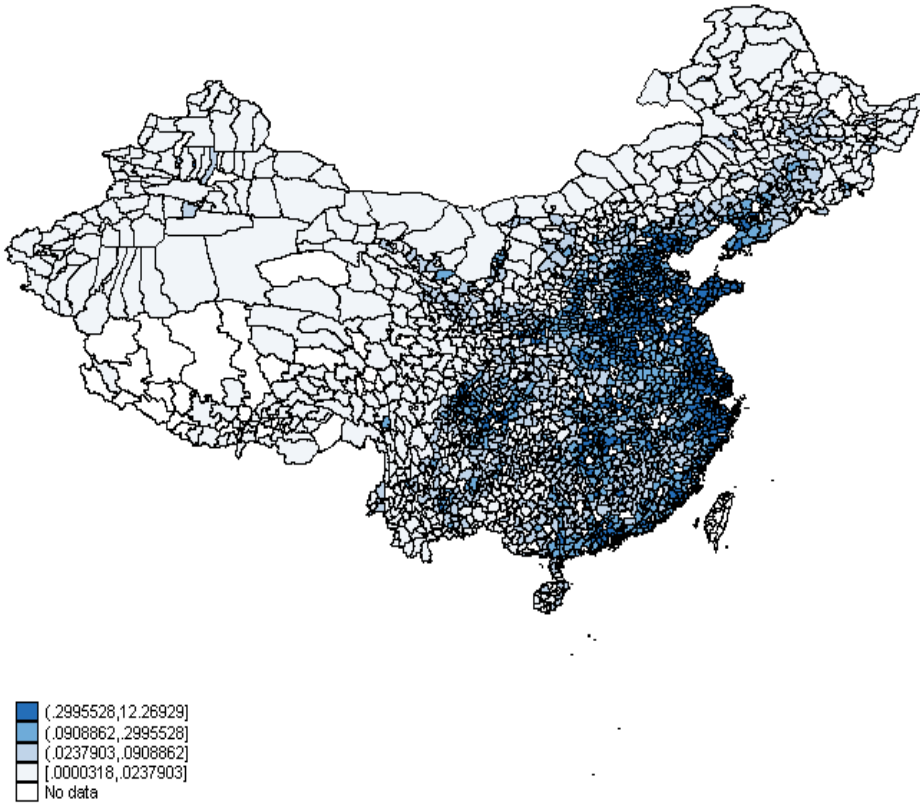
$$\tau_{i,g,c,n} = \alpha_c + \rho_n + \beta \times Density_g + \gamma \times X_{i,g,c,n} + \varepsilon_{i,g,c,n}$$

Bianzhi-firm Ratio and Tax Rate

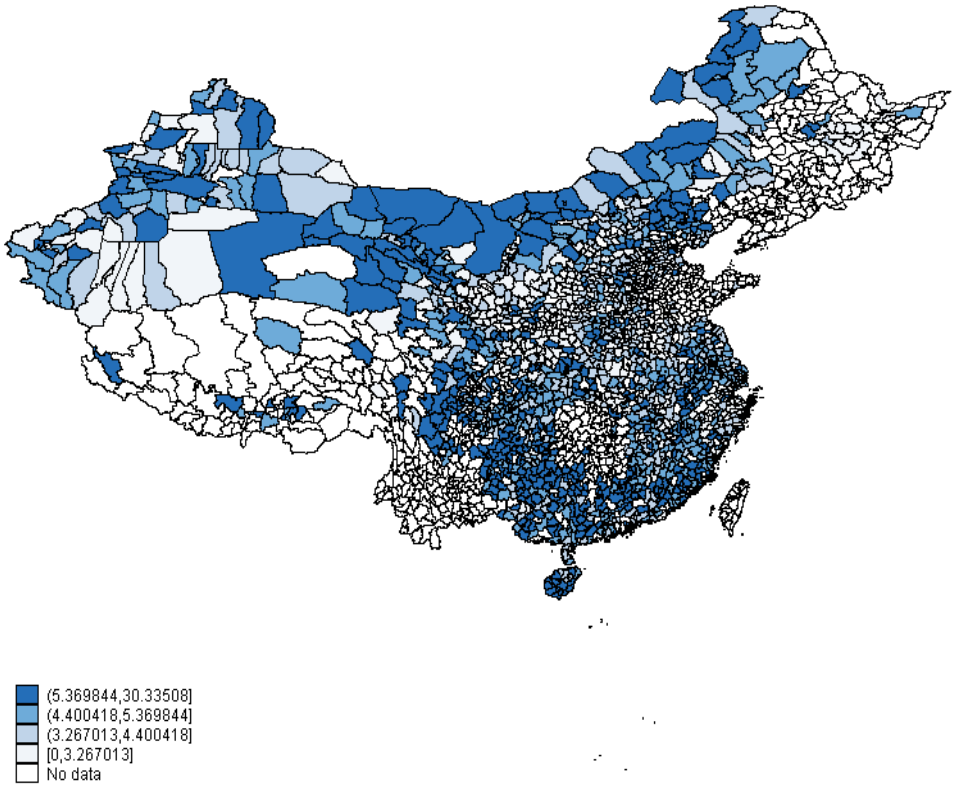
	Effective Tax Rate		
VARIABLES	(1)	(2)	(3)
lag4.bianzhi-firms ratio	0.194***	0.167***	0.130***
	(0.033)	(0.035)	(0.037)
log(population)		-6.934***	-3.527
		(2.225)	(2.375)
log(gdp per capita)			-0.983***
			(0.213)
Observations	4,162	3,026	2,940
Adjusted R-squared	0.212	0.23	0.239
County FE	YES	YES	YES

Nationwide -- 2004

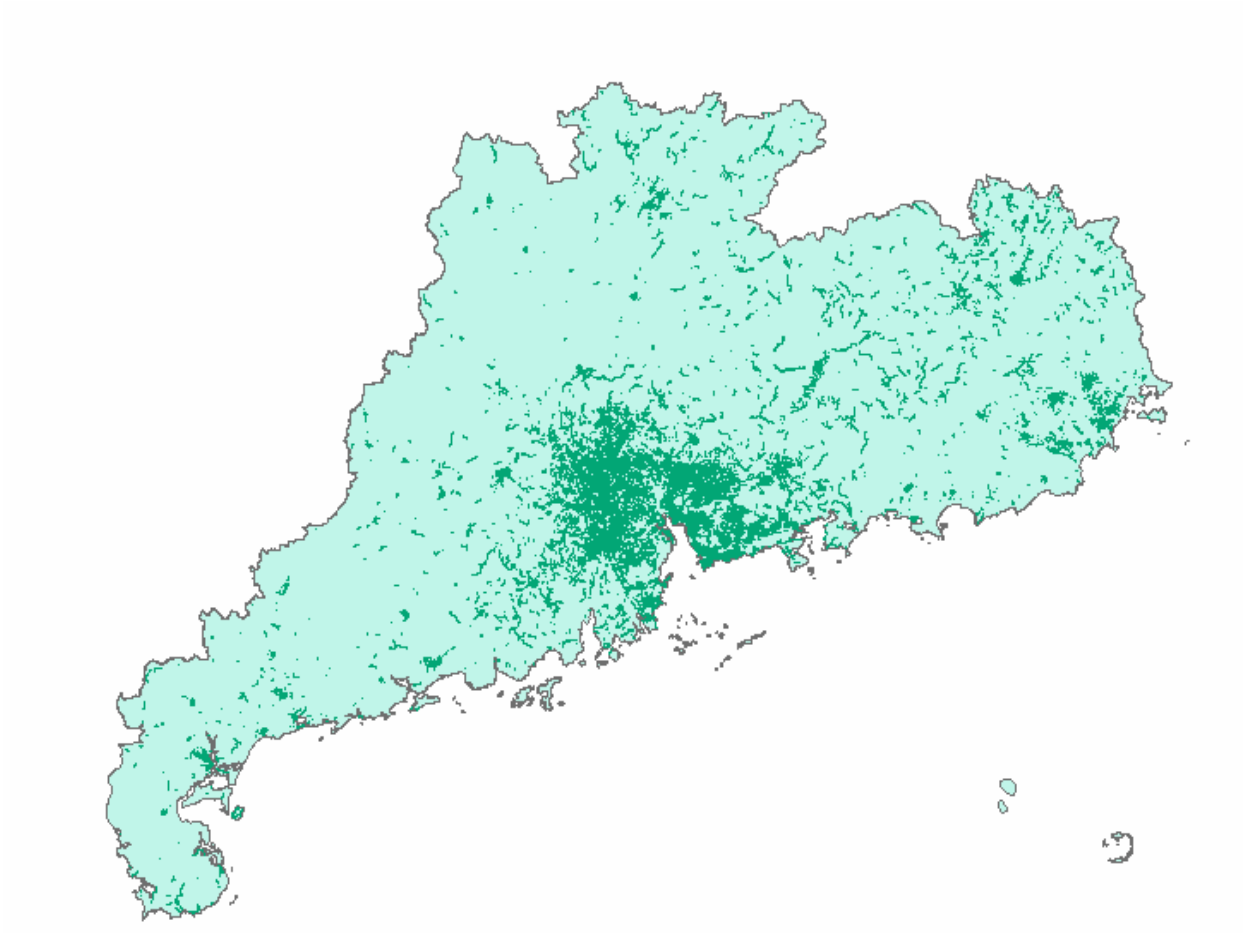
Firm Density



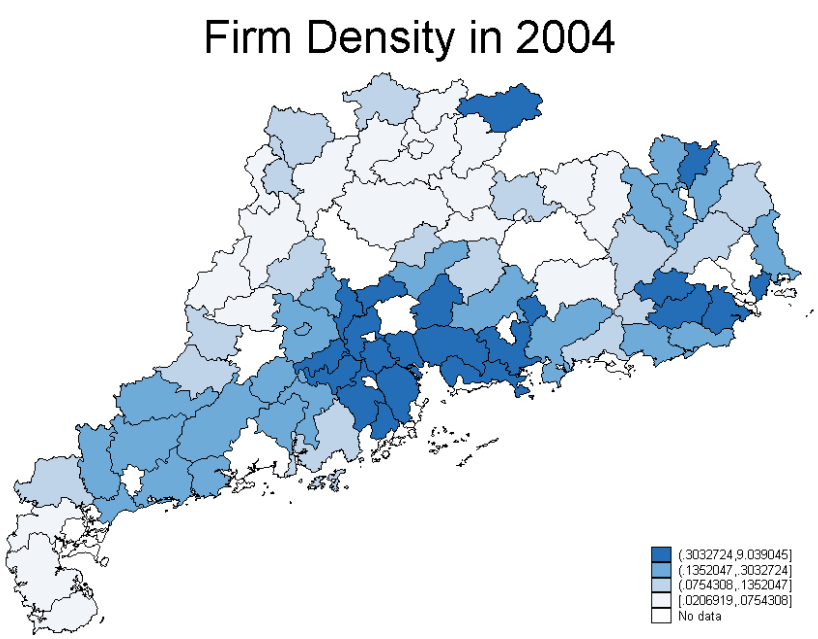
Effective Tax Rate

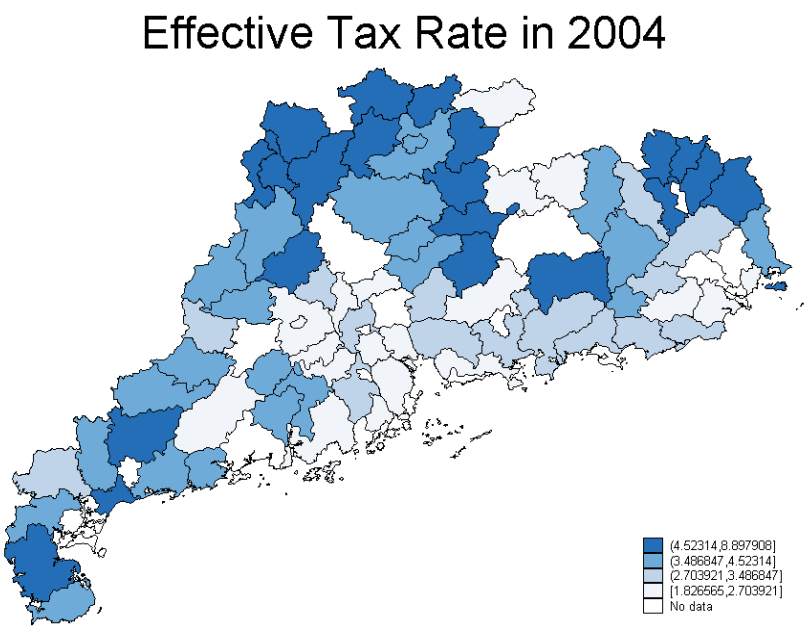


Guangdong Province -- 2004



Guangdong Province -- 2004

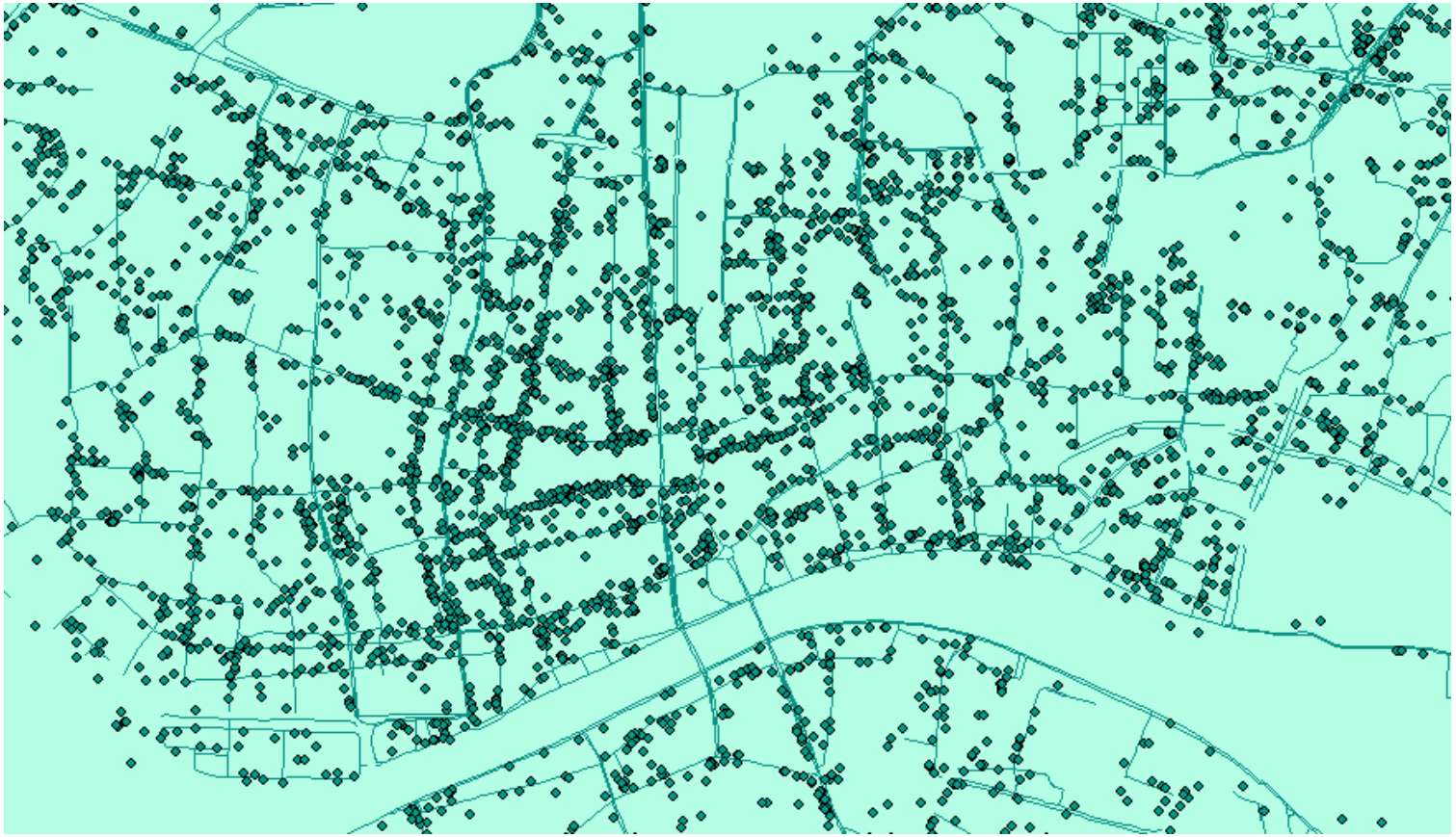




Firm Density and Tax Rate

	Effective Tax Rate			
VARIABLES	(1)	(2)	(3)	(4)
log(Lag4.firm density)	-0.434***	-0.508***	-0.367***	-0.396***
	(0.068)	(0.103)	（0.073）	（0.109）
log(population)		-4.714***		-3.905
		(2.352)		(2.368)
Lag4.Bianzhi-firm ratio			0.001***	0.001***
			(0.000)	(0.000)
Observations	4,230	3,048	4,162	3,026
Adjusted R-squared	0.214	0.231	0.221	0.236
County FE	YES	YES	YES	YES

Street Level – Guangzhou



$$Firm\ Density_{s,2008} = \frac{the\ num\ of\ firms\ along\ street\ s\ in\ year\ 2008}{the\ length\ of\ street\ s}$$

Street Level (Guangdong Province)

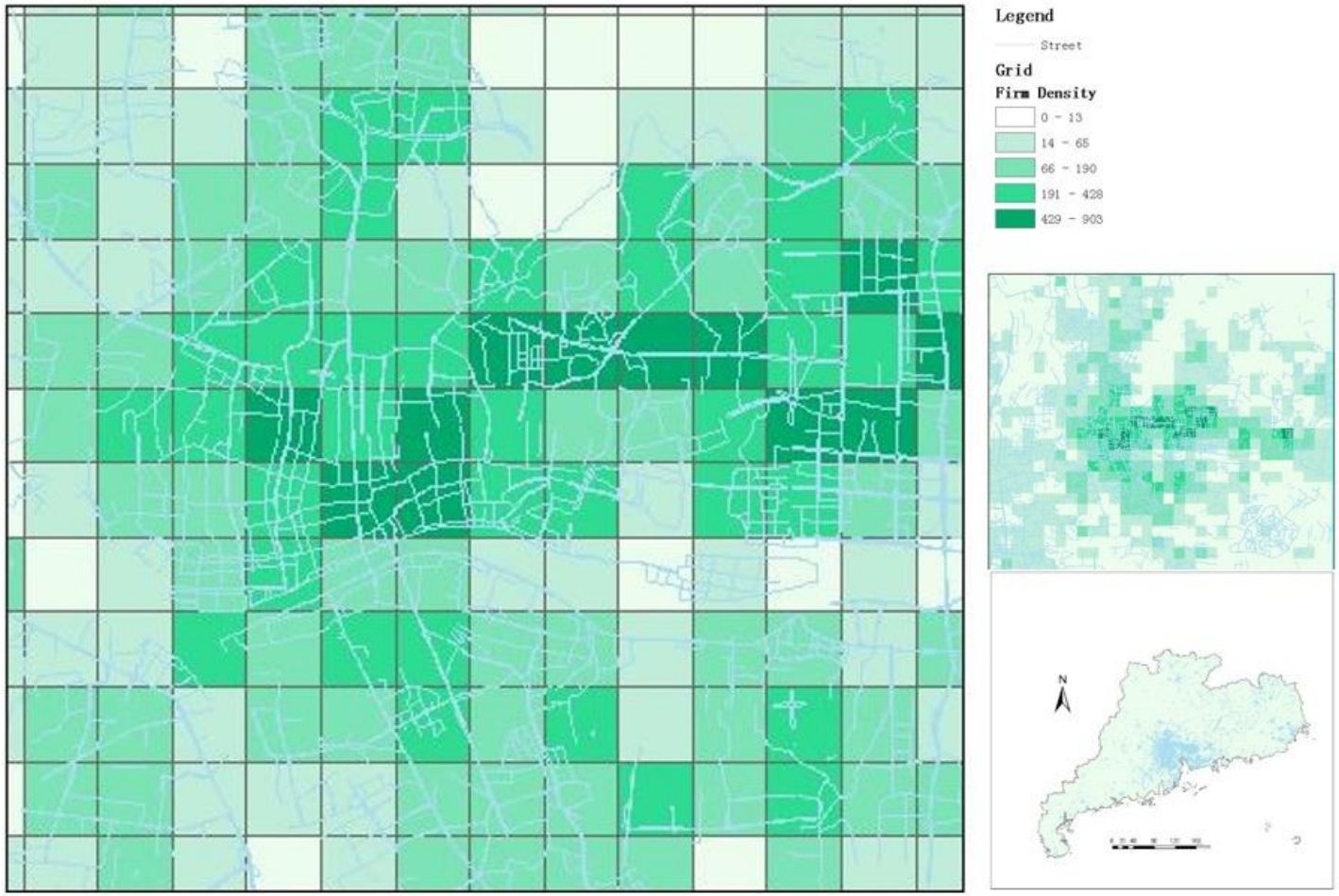
	Dependent variable: Effective Tax Rate		
VARIABLES	(1)	(2)	(3)
Firm density	-0.113*	-0.166**	-0.138**
	(0.064)	(0.074)	(0.064)
Log(main business sales)		-0.863***	-1.782***
		(0.146)	(0.360)
Log(capital)			1.286***
			(0.319)
Observations	57,623	57,623	57,623
Adjusted R-squared	0.016	0.021	0.025
Industry FE	YES	YES	YES
County FE	YES	YES	YES

Neighbouring with Big Firms (Town Level, Zhongshan Prefecture)

VARIABLES	Dependent variable: Effective Tax Rate					
	S1	S2	S3	I1	I2	I3
	non-top10% firm (small firms)			top 10% firms (big firm)		
Distance to top10% big firms centre	0.066**	0.064**	0.064**	0.109	0.109	0.068
	(0.027)	(0.027)	(0.027)	(0.070)	(0.070)	(0.067)
Area (hundred km2)	-0.354***	-0.342***	-0.325***	-0.258	-0.258	-0.303
	(0.102)	(0.101)	(0.101)	(0.231)	(0.232)	(0.223)
Log (main business sales)		-0.323***	-0.245***		0.004	-0.958***
		(0.024)	(0.033)		(0.117)	(0.169)
Log (capital)			-0.135***			0.991***
			(0.039)			(0.130)
Observations	8,865	8,865	8,865	884	884	884
Adjusted R-squared	0.081	0.101	0.103	0.253	0.252	0.312
County FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES

Grid Level – Haizhu District, Guangzhou

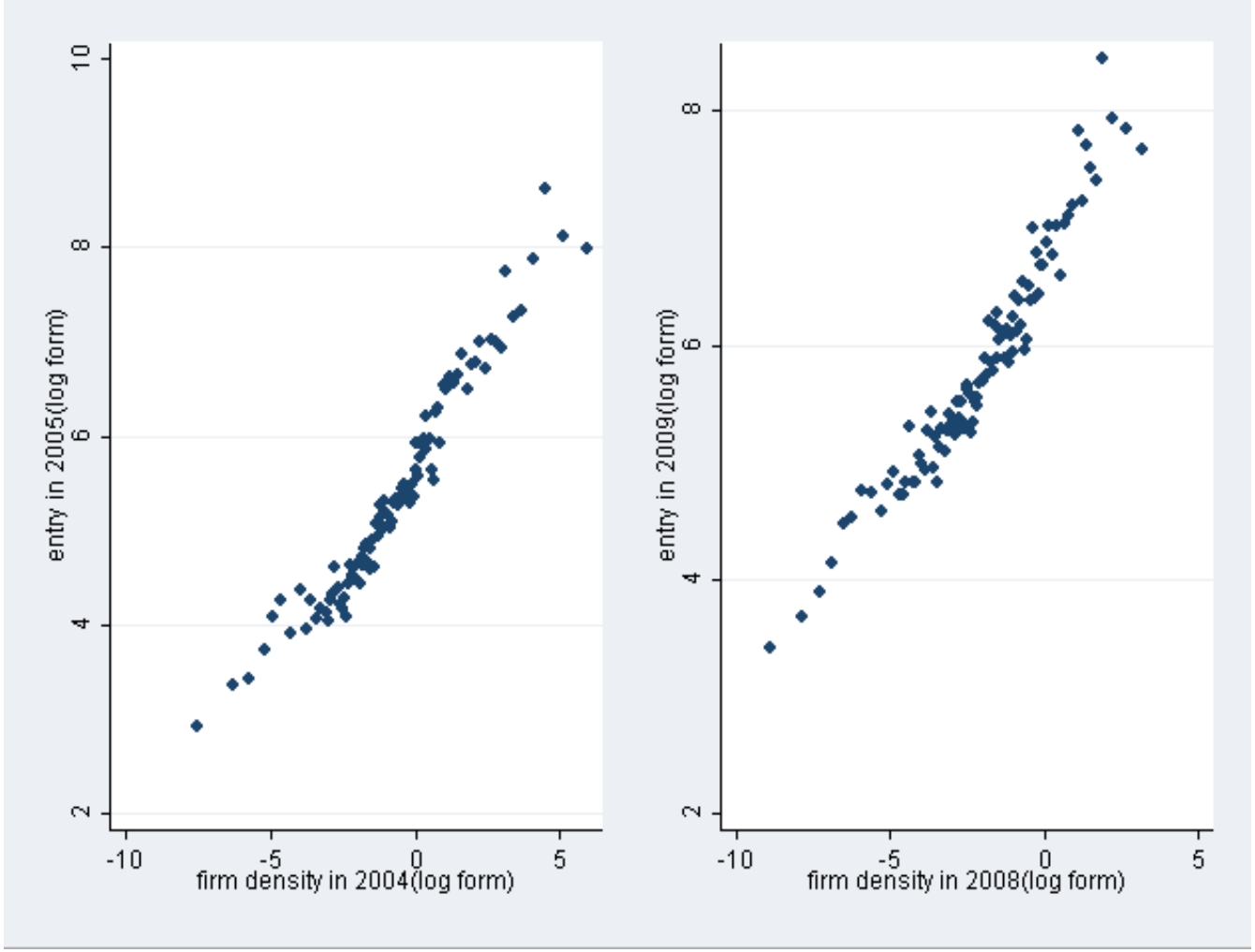
- Grid = 1 square km



Grid Level (Guangdong)

	Effective Tax Rate		
VARIABLES	(1)	(2)	(3)
Firm density	-0.147***	-0.133***	0.130***
	(0.049)	(0.048)	(0.046)
log(sales)		-0.395***	-0.398***
		(0.015)	(0.024)
log(asset)			0.003
			(0.027)
Observations	85,399	85,394	82,922
Adjusted R-squared	0.087	0.101	0.101
Industry FE	YES	YES	YES
County FE	YES	YES	YES

Polarization of Firm Density

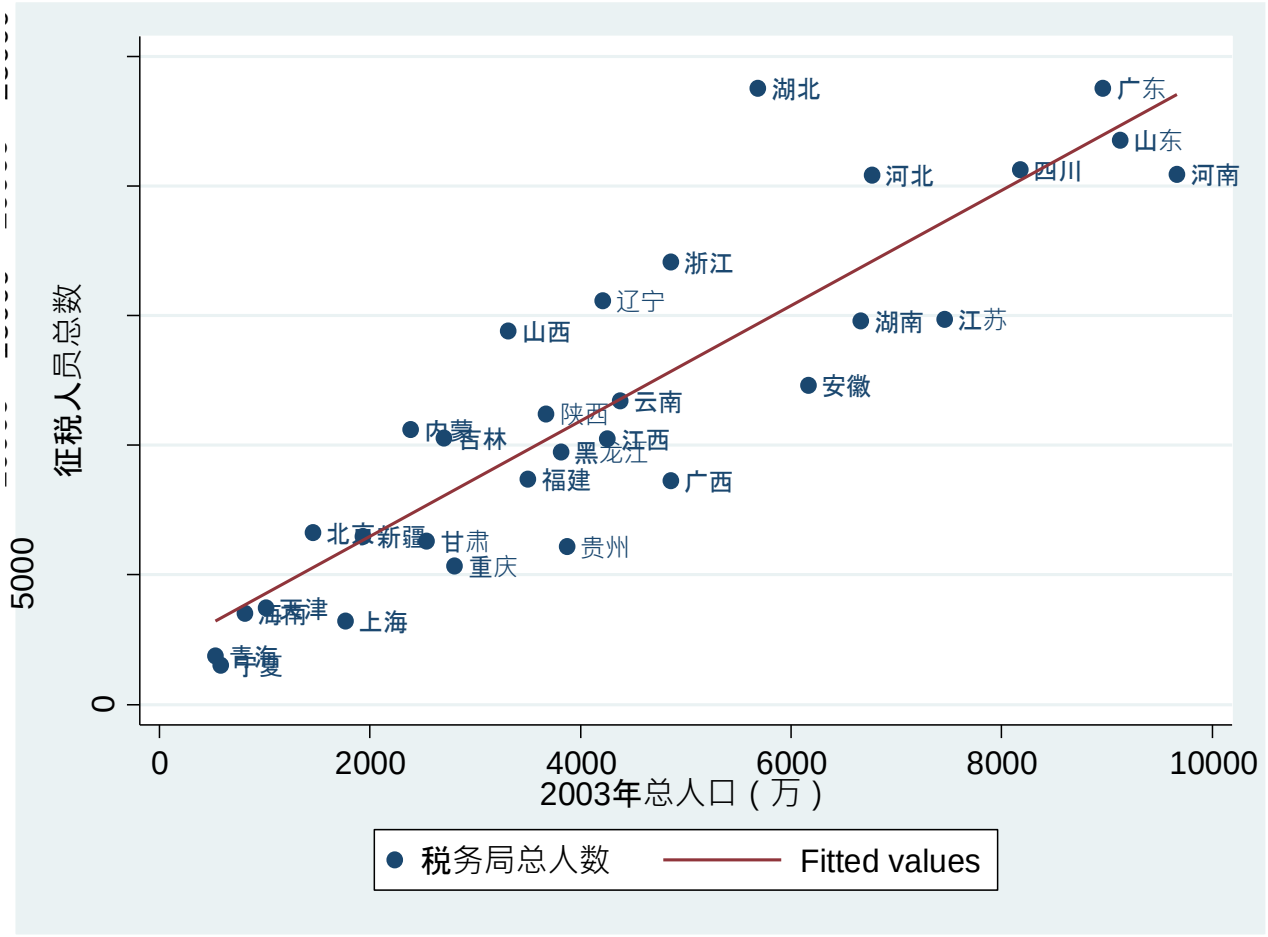


Conclusion

- To reduce tax burden, you may set up your firm where
  - **Firm density** is greater
  - **Government relative size** is smaller
  - There are **big firms** around
- This may **polarize** the geographic distribution of firms
  - Additional mechanism of **firm clustering**
  - Potential cause of **state instability** and **internal conflicts**

Appendix

Number of Tax Administrators



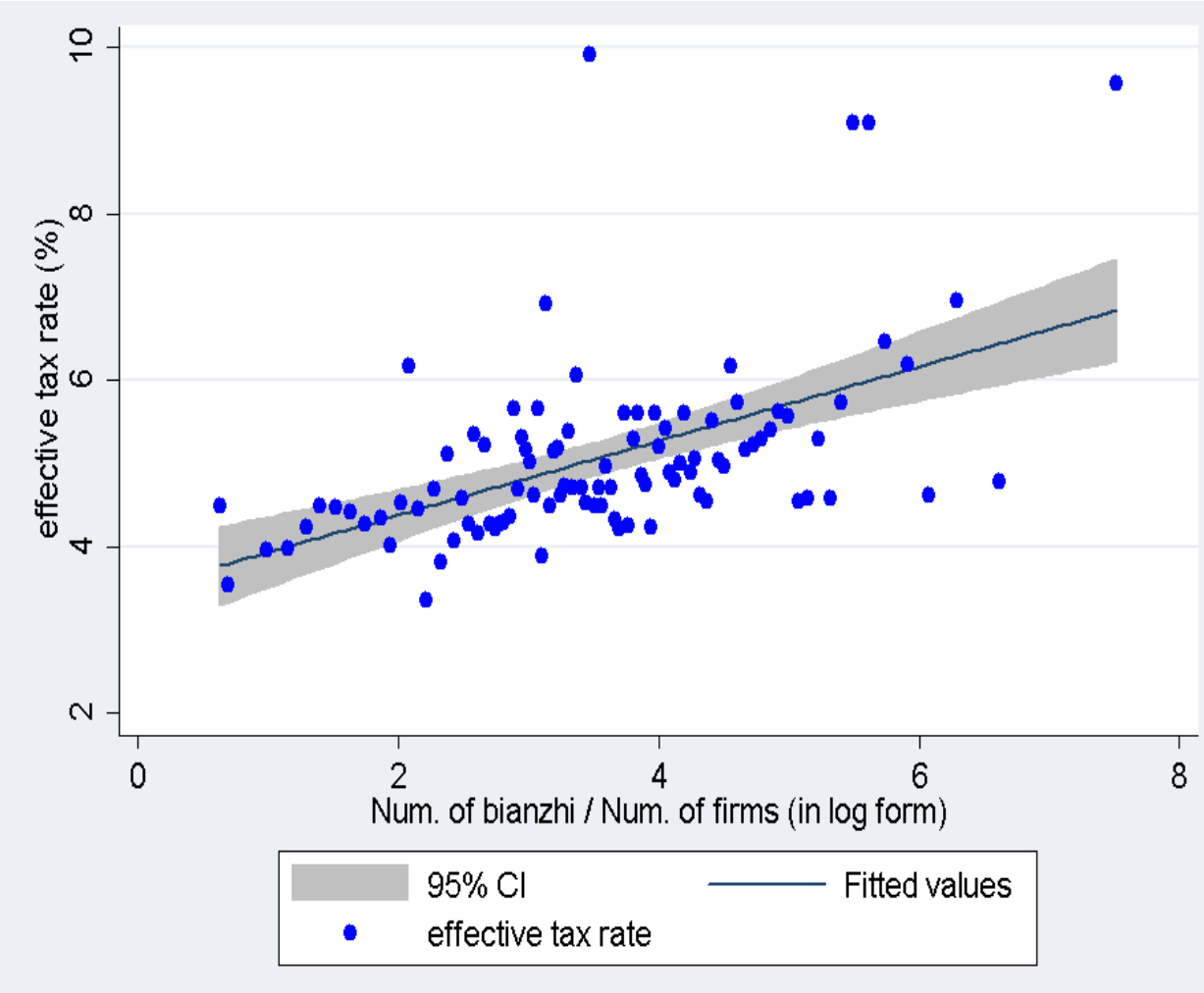
Summary Statistics

Go Back

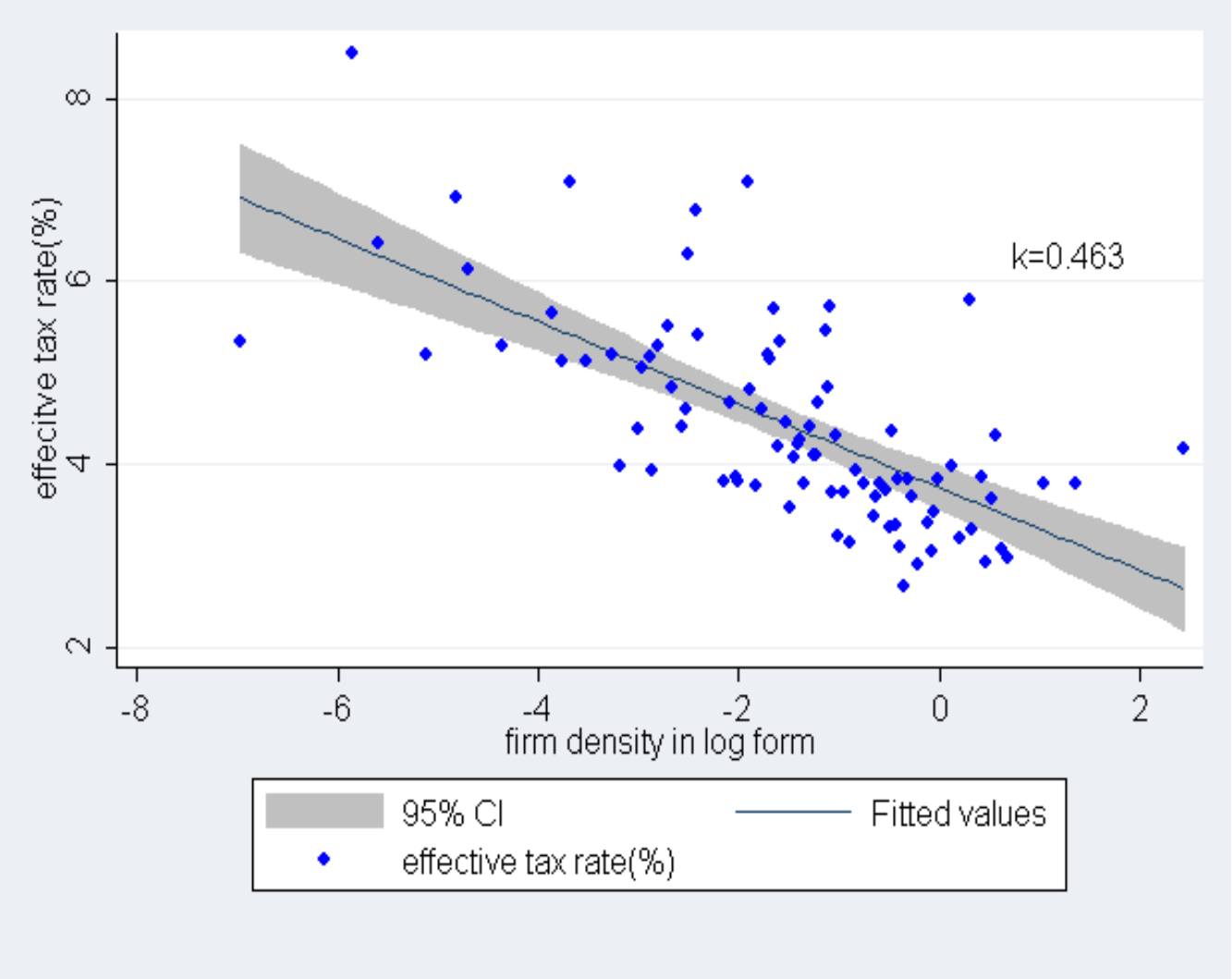
	County Level: PANEL			
	Sample Size	Mean	St. Dev.	Median
Effective Tax Rate	7203	4.67	3.21	4.33
Bianzhi over Num. of Firms	5518	90.19	290.72	30.46
Firm Density (per km^2)	5572	4.76	30.82	0.26
Fiscal Burden (per 10 thousand yuan)	7969	1.21	1.77	0.58
Population (10 thousand)	6180	47.37	35.02	39.09
Gdp per capita (10 thousand yuan)	6169	1.82	2.41	1.16
	Grid Sample			
Effective Tax Rate	85461	4.91	7.37	3.73
Firm Density (num of firm per 100 m^2)	92655	0.42	0.72	0.22
LOG(Sales)	86363	1.16	2.44	1.14
LOG(Asset)	89847	0.97	2.02	0.84
	Street Sample			
Effective Tax Rate	57682	172.97	40539.9	2.17
LOG(Main Business Income)	60845	5.82	2.14	5.82
LOG(Capital)	62887	5.63	2.03	5.46
Firm Density	64103	2.14	8.8	0.57
	Town Sample			
Effective Tax Rate	9749	3.69	4.13	3.07
Distance to Nearest Top10% Big Firms Center	13076	3.03	1.72	2.67
LOG(Main Business Income)	10646	1.2	2.34	1.34
LOG(Capital)	10944	1.03	2.04	0.93
LOG(Area)	13076	85.23	46.2	84.52

Fiscal Burden and Tax Rate

	Effective Tax Rate		
VARIABLES	(1)	(2)	(3)
Lag4.fiscal burden	0.087***	0.128***	0.128***
	(0.033)	(0.046)	(0.046)
log(population)			-0.009
			(1.228)
log(gdp per capita)		0.217**	0.218***
		（0. 095）	(0.104)
Observations	5,652	4,360	4,360
Adjusted R-squared	0.179	0.169	0.169
County FE	YES	YES	YES


effective tax rate (%)
2
4
6
8
10
0
2
4
6
8
Num. of bianzhi / Num. of firms (in log form)
95% CI
Fitted values
effective tax rate

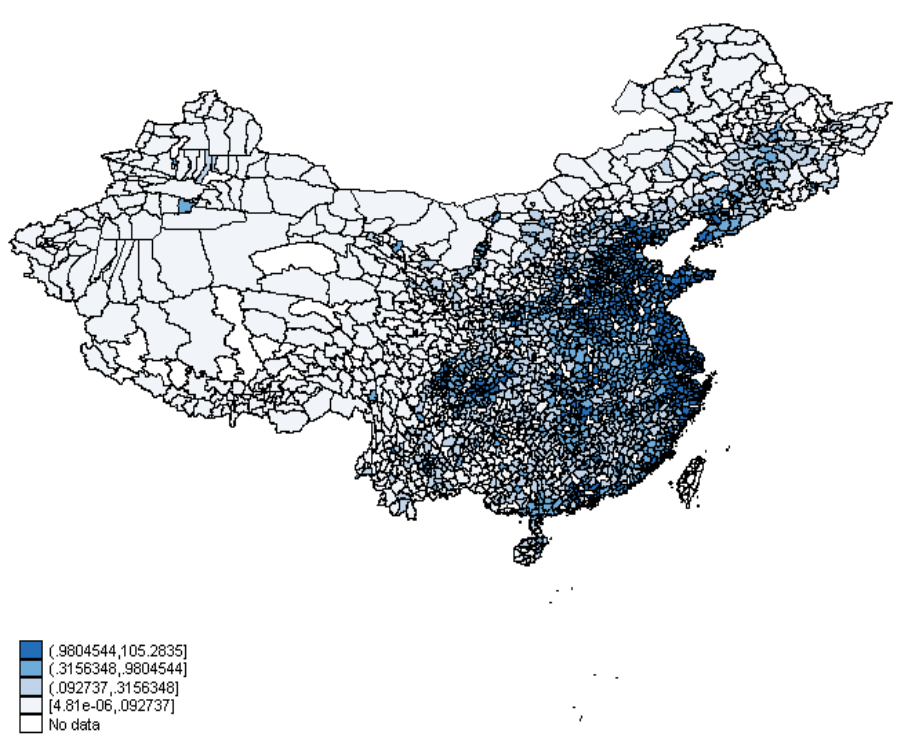
Firm Density and Tax Rate across Counties, 2008



Neighbouring with Big Firms

VARIABLES	Dependent variable: Effective Tax Rate					
	S1	S2	S3	I1	I2	I3
	Below median firms			Above median firms		
Distance to top10% big firms center	0.113***	0.113***	0.114***	0.030	0.024	0.026
	(0.043)	(0.043)	(0.043)	(0.027)	(0.027)	(0.027)
Area (hundred km2)	-0.369**	-0.374**	-0.369**	-0.313***	-0.239**	-0.297***
	(0.162)	(0.162)	(0.162)	(0.099)	(0.099)	(0.098)
Log (main business sales)		-0.120***	-0.046		-0.364***	-0.735***
		(0.042)	(0.049)		(0.036)	(0.058)
Log (capital)			-0.189***			0.416***
			(0.058)			(0.051)
Observations	4,773	4,773	4,771	4,743	4,743	4,743
Adjusted R-squared	0.052	0.053	0.056	0.148	0.167	0.179
County FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES

2008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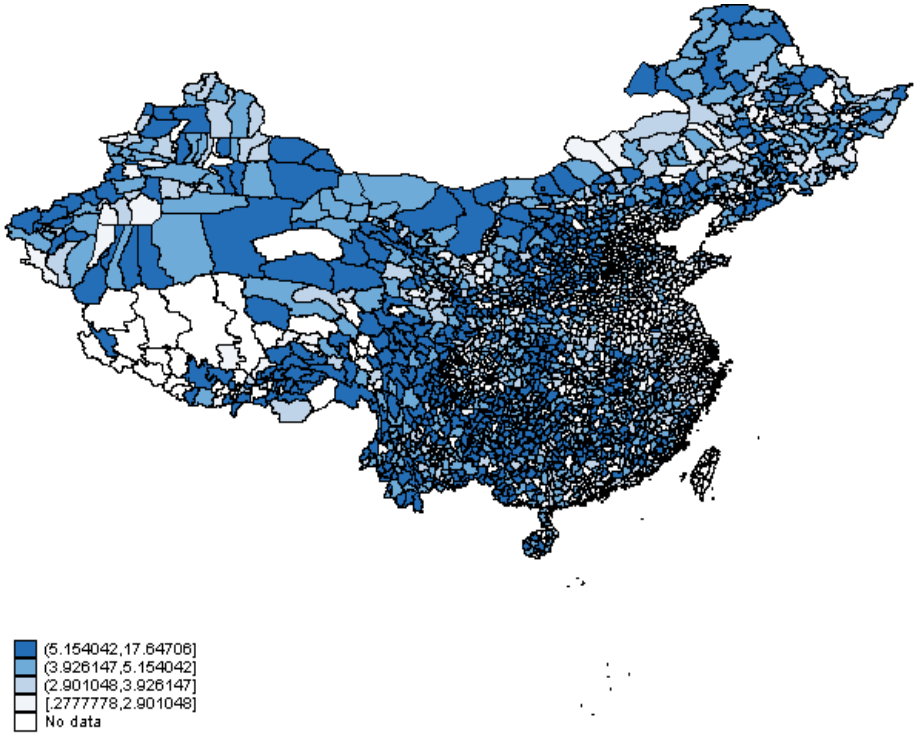
No data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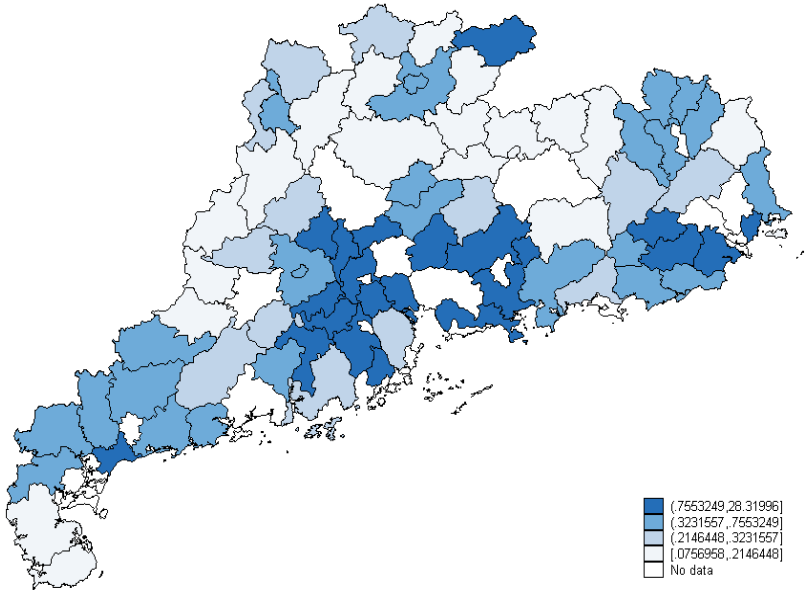
(3.926147,5.154042]
(2.901048,3.926147]
[.2777778,2.901048]
No data

Firm Density in 2008



Effective Tax Rate in 2008