

# The Innovation Cost of Short Political Horizons

*Evidence from Local Leaders' Promotion in China*

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# Research Question

*Does the political horizon of a local leader matter for policy choice?*

- **Government** can affect economic growth with policies in the short and long run
  - Financing science and other policies in support of **Innovation** translate into growth with a delay, while infrastructure projects may boost short-term growth
  - **Politicians** who chose policies take into account their **expected horizons**
- Hypothesis: politicians who expect fast promotion may underinvest in innovation

# Setting: Chinese City Leaders and Innovation Policies

- Can impact innovation through fiscal/financial/administrative tools ▶ policy framework
- Uncertain tenure
  - Make career progression if/when moved up in the hierarchy
  - Both economic performance and political connections matters for promotion

*What's the effect of tenure expectation on innovation policies?*

# Roadmap of Talk

Empirical Design

Data and Measurements

Results and Discussions

Conclusion

## Exploit Political Connection as Identifying Variation

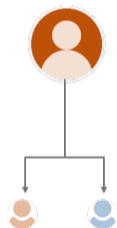
- Endogeneity problem: policies affect the length of tenure

## Exploit Political Connection as Identifying Variation

- Endogeneity problem: policies affect the length of tenure
- Use the fact that connected leaders tend to be on fast track

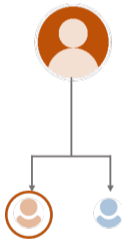
# Exploit Political Connection as Identifying Variation

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- **Source of variation:** pre-determined network  $\times$  turnover of provincial leaders



# Exploit Political Connection as Identifying Variation

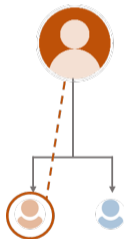
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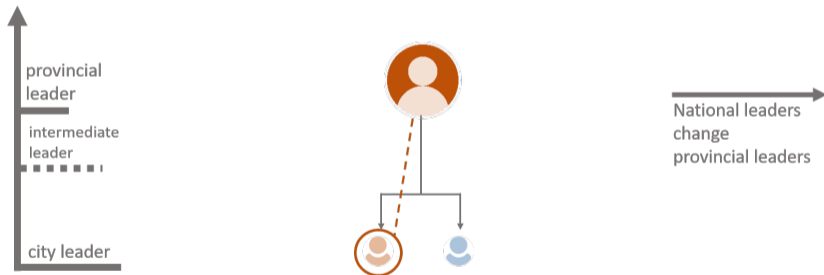
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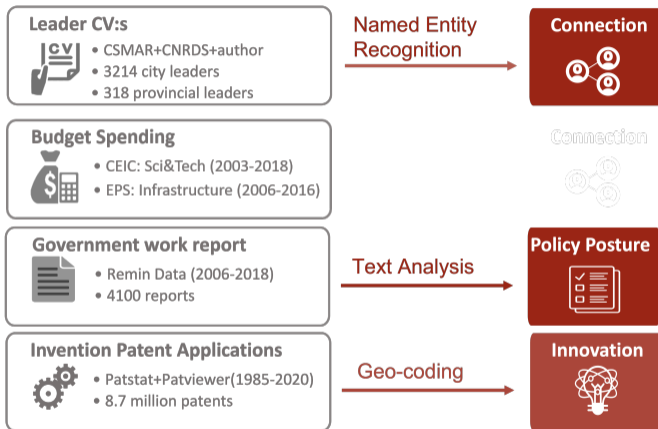
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- **Isolate selection from treatment** by controlling for the timing of switching connection

# Data



▶ CV example

▶ summary statistics of leader features

▶ summary statistics of outcomes

# Measurements: Political Connections and Policy Posture

## Subordinate-superior Ties in CV:s Network as Connection

- L is connected to H if L used to work as a **direct subordinate appointed** by H
  - **direct subordinate**: H's position supervised L's position directly
  - **appointed**: H arrived before L

▶ formula

▶ alternative functional form of valuing work connection

▶ other form of connections

## Policy Measures Using Government Work Report

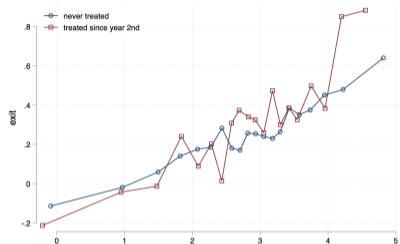
$$\text{Posture of policy} = \frac{\text{length of sentences on policy}}{\text{length of document}}$$

▶ topic classification

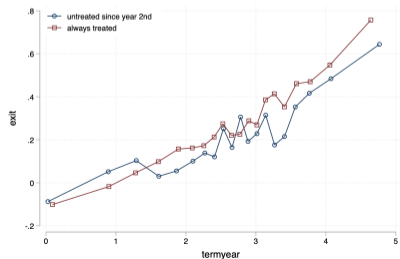
▶ correlation between policy posture and real outcomes

# Finding 1/3: Connected Leaders Have Shorter Expected Tenure

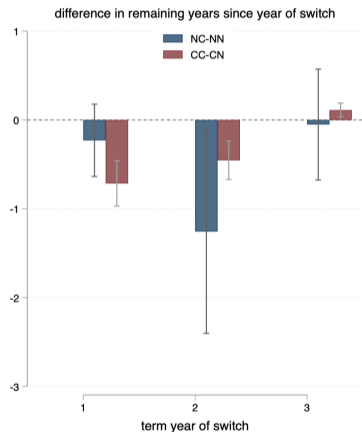
Exiting rate by term year, NC v.s. NN among T>1&switch at 1



Exiting rate by term year, CC v.s. CN among T>1&switch at 1



Remaining years at spell level



► specification for dynamic exiting

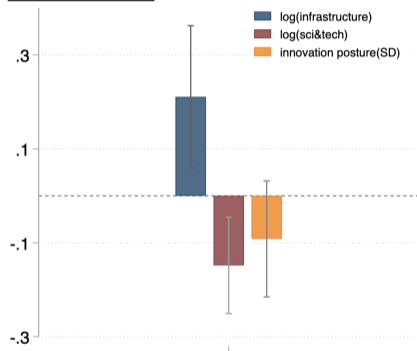
► other connections



# Findings 2/3: Fast-over-slow Policy Pursuit

↑ infrastructure, ↓ sci&tech spending and priority of innovation

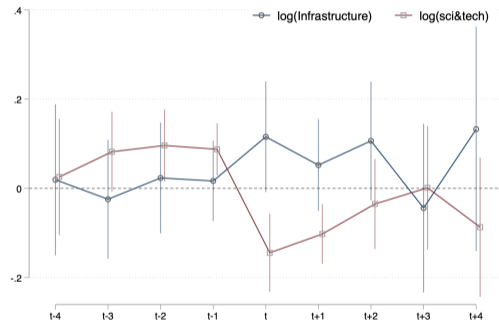
Reduced-form



▶ Reduced form specification

▶ Reregression table

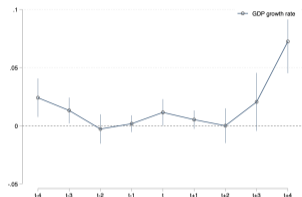
Event study: log(Gov.spending)



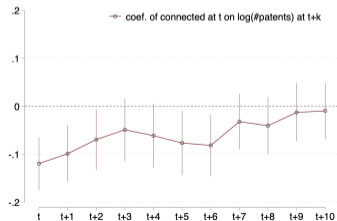
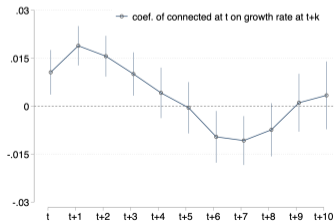
▶ Event study design

# Findings 3/3: Short-run Growth at the Cost of Future Innovation

Event study results: GDP growth rate v.s. log(# patents)



Dynamic effect from  $t$  till  $t+10$  (IRF)



# Interpretation and Discussions



## Exclusion restriction

- No Difference in resource transfer ▶ Fiscal resource
- Unlikely to be driven by promotion ▶ Placebo test

## Alternative mechanisms

- Rent-seeking or risk-seeking through infrastructure developments?

## How policy impacts innovation?

- Both direct effect and indirect effects at play ▶ Heterogeneous effects: edu v.s. firm

# Conclusion and Implication

## To conclude

- With a novel exogenous variation in political connection as identifying variation
- Show that connected leaders have shorter expected tenure and invest in short-run growth-enhancing policies at the cost of longer-term innovation

## Implications for China's economic transition

- Bureaucratic incentives may erect an institutional barrier for the transition from “made-in-China” towards “innovated-in- China”
- Substituting innovation with infrastructure lowers future growth when China is approaching the technology frontier

# Appendix

# Local Government's Policies on Innovation [▶ back](#)

## [National Government Guide...](#)

- Five-year plans
- National Mid-to-long-term Plan for Science and Technology (2006-2020)

## [Local Governments Implement... with Discretion](#)

- Direct financing through budget spending and off-budget spending
- Indirect financing through tax refund, credit and public procurement
- Platforms/organizations to facilitate innovation

[▶ the example of Dongguan](#)

# The Example of Dongguan [▶ back](#)

## The Program of Technology Dongguan (2005-2010)

- 5 Billion RMB (1.8%) from city government's budget
- to subsidize firm's technology upgrade

## Dongguan Songshan Lake Science Park

- Indirect financial support+platform

2000: farmland



2002: first highway



2020: >1500 tech-firms



# CV Example [back](#)



周先旺

1980.12 湖北省建始县青花公社党委办公室干事

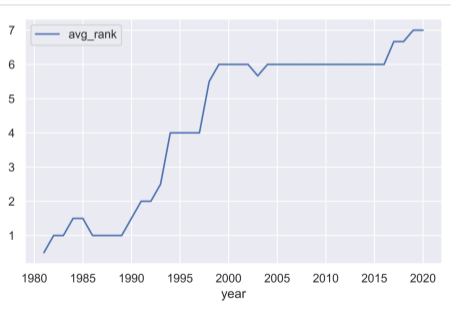
1981.09 湖北省建始县青花公社团委副书记、高坪区团委书记

1985.10 共青团湖北省建始县委副书记

NER  
method

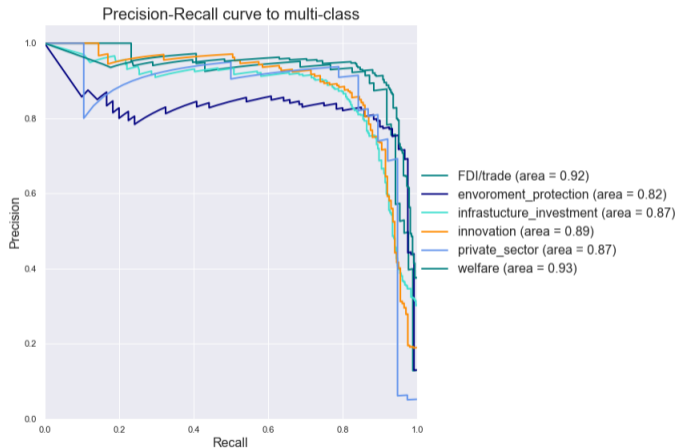
```
{'org_name': ('共青团县委',),  
'OfficeCls': 'cyl',  
'job_title': ('副书记',),  
'TitleCls': 'vice-head',  
'locID': '422822',  
'RankValue': '1-Deputy-Section-Head'}
```

- ...
- 2003.02 湖北省恩施州委副书记、州长 (其间: 2007.03-2008.1)
  - 2008.02 湖北省商务厅厅长、党组书记、省外资办主任
  - 2012.11 湖北省黄石市委书记
  - 2014.01 湖北省黄石市委书记、市人大常委会主任
  - 2017.03 湖北省副省长, 黄石市委书记、市人大常委会主任
  - 2017.04 湖北省副省长
  - 2018.05 湖北省武汉市委副书记、副市长、代市长
  - 2018.09 湖北省武汉市委副书记、市长
  - 2021.01 湖北省政协党组成员



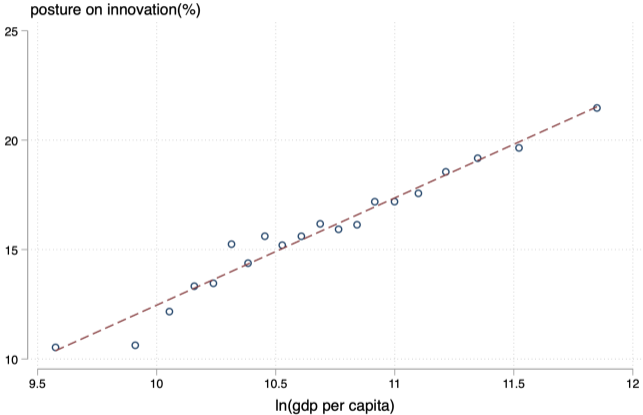


# Text Classification [▶ back](#)



# Correlation between Text Measurement and Real Outcomes

[▶ back](#)



# Summary Statistics of Outcome Variables [▶ back](#)

Variables	Statistic					Share of Variation	
	Count	Mean	Std	5th Percentile	95th Percentile	Within	Between
<u>Innovation Outcome</u>							
# of Patents	6015	989.80	3664.48	4.00	4453.00	0.56	0.44
Firm	6015	589.58	2664.50	0.00	2415.00	0.54	0.46
University	6015	154.14	701.09	0.00	719.00	0.54	0.46
GDP Growth Rate(%)	5171	13.09	8.85	0.60	26.55	0.94	0.06
<u>Policy Outcome</u>							
<u>Budget Spending (million yuan)</u>							
Infrastructure	2575	1097.01	2320.50	50.49	4541.80	0.39	0.61
Sci &Tech	3658	533.27	1751.03	11.98	2064.90	0.47	0.53
Innovation Posture(%)	3824	12.28	6.49	3.62	24.61	0.74	0.26

# Summary Statistics of Leader Features [▶ back](#)

Variables	Statistic					Share of Variation	
	Count	Mean	Std	5th Percentile	95th Percentile	Within	Between
Leader Features (city-year panel)							
<i>Connected</i> <sup>start</sup>	6209	0.80	0.40	0.00	1.00	0.78	0.22
<i>Connected</i> <sup>start</sup> <i>psecretary</i>	6090	0.62	0.49	0.00	1.00	0.76	0.24
<i>Connected</i> <sup>start</sup> <i>mayor</i>	5935	0.57	0.50	0.00	1.00	0.75	0.25
<i>Connected</i>	6211	0.68	0.47	0.00	1.00	0.81	0.19
<i>Connected</i> <sup>psecretary</sup>	6086	0.47	0.50	0.00	1.00	0.82	0.18
<i>Connected</i> <sup>mayor</sup>	5959	0.50	0.50	0.00	1.00	0.80	0.20
<i>STEM</i> <sup>psecretary</sup>	6269	0.37	0.48	0.00	1.00	0.77	0.23
<i>STEM</i> <sup>mayor</sup>	6269	0.35	0.48	0.00	1.00	0.77	0.23
<i>FastTrack</i> <sup>psecretary</sup>	6229	0.32	0.47	0.00	1.00	0.79	0.21
<i>FastTrack</i> <sup>mayor</sup>	6133	0.29	0.46	0.00	1.00	0.79	0.21
<i>Age</i> <sup>psecretary</sup>	6086	52.20	3.79	45.00	58.00	0.77	0.23
<i>Age</i> <sup>mayor</sup>	5986	50.31	4.01	43.00	56.00	0.75	0.25
Turnover Outcome (finished city-leader spell)							
<i>TermLen</i> <sup>psecretary</sup>	1935	3.69	1.77	1.08	6.92	0.81	0.19
<i>TermLen</i> <sup>mayor</sup>	2078	3.42	1.66	1.08	6.25	0.74	0.26
<i>Promoted</i> <sup>psecretary</sup>	1953	0.39	0.49	0.00	1.00	0.76	0.24
<i>Promoted</i> <sup>mayor</sup>	1978	0.33	0.47	0.00	1.00	0.82	0.18

## Subordinate-superior Ties in CV:s Network as Connection [▶ back](#)

set of years when i-j work as subordinate-superior in the past

$$Connected_{i,t} = 1 \left\{ \left( \sum_{\underbrace{j \in sup(i,t)}_{\text{current superiors}}} \overbrace{\|T_{i,j,t-1}\|} \right) \geq 1 \right\}$$

A speedy method to search through the network of leaders' career trajectories

1. Parse CV as a list of job events using NLP-NER method
2. Define the matrix of position hierarchy  $H$  based on administration rules
3. Create the matrix of assignment status  $Position(t)$  for all politicians at time  $t$
4. Find subordinate-superior ties using  $Position(t) \cdot H \cdot (Position(t))'$

# Alternative Function forms of Connection Intensity [▶ back](#)

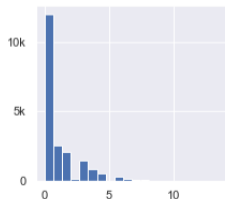
Denote  $\omega_{i,j,t}$  as the connection intensity between  $i$  and  $j$  at time  $t$

## Monotonicity Constraints

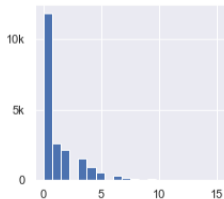
- $\omega_{i,j,t}$  is non-decreasing in  $\|T_{i,j,t}\|$ , conditional on  $\tau_{min}$  and  $\tau_{max}$
- $\omega_{i,j,t}$  is non-decreasing in  $\tau_{max}$ , conditional on  $\|T_{i,j,t}\|$  and  $\tau_{min}$
- $\omega_{i,j,t}$  is non-decreasing in  $\tau_{min}$ , conditional on  $\|T_{i,j,t}\|$  and  $\tau_{max}$

## Eligible Function Forms and Histogram of $\omega(T_{i,j,t})$

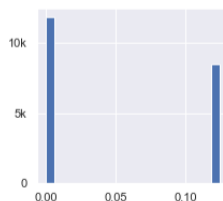
discounted maximum  
 $\max_{\tau \in T_{i,t}} \|T_{i,j,t}\| \times \delta^{t-\tau}$



constant count  
 $\|T_{i,j,t}\|$

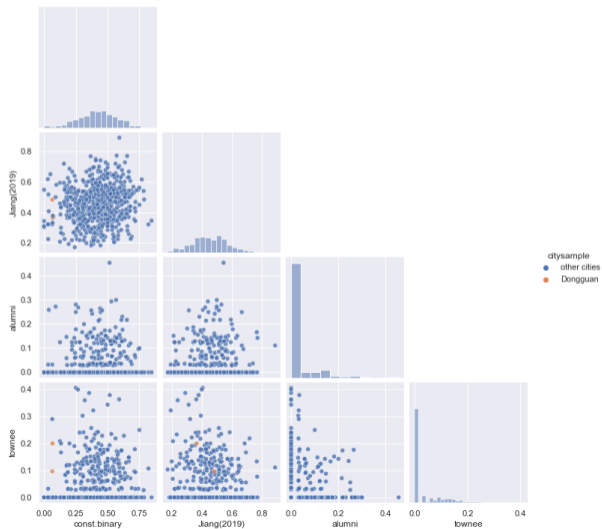


constant dummy  
 $1\{\|T_{i,j,t}\| > 1\}$



# Distribution and Correlation between Different Types of Connection

▶ back



# Identification: Within-city Shocks in Connection [▶ back](#)

To isolate selection from treatment

Start Status	0	<b>NN</b> control group 38% of spells	<b>NC</b> treatment effect 7% of spells
	1	<b>CN</b> selection effect 22% of spells	<b>CC</b> treatment effect + selection effect 56% of spells
		0	1
		Current Status	

## Assumption

- Conditional on selection, the timing of switching connection is exogenous to outcomes

▶ who becomes connected

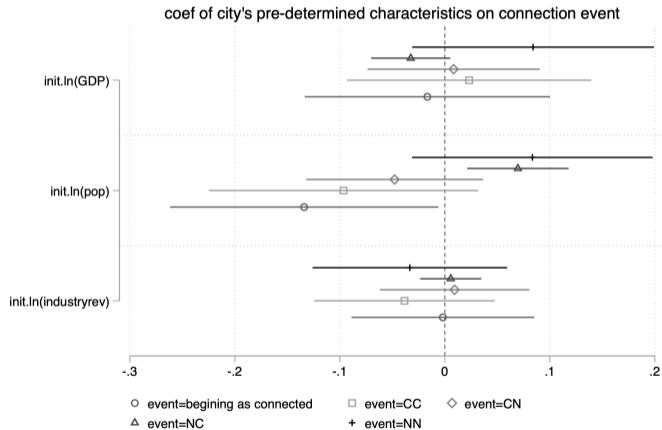
▶ Whether cities select into having connected leaders

▶ when do superiors change



# Which Cities Receive Connected Leaders? [▶ back](#)

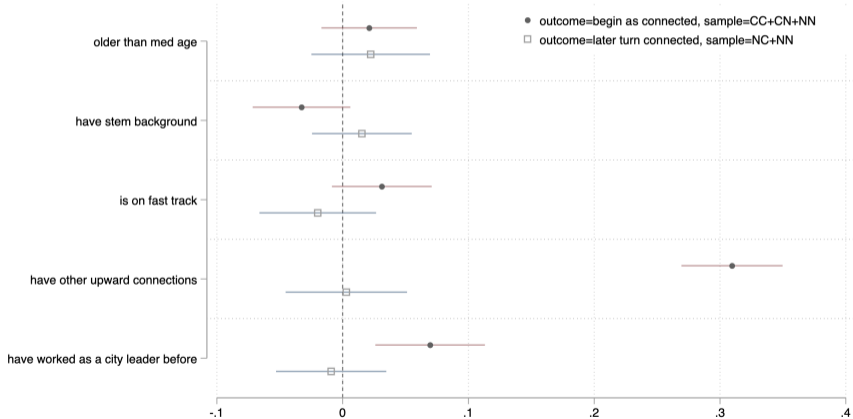
$$ConnEvent_{c,s} = \eta_1' X_{c,s}^0 + \eta_2' \Delta y_{c,s}^0 + CityFE + TrendFE + unobservable$$



# Who Starts as Connected

▶ back

$$ConnEvent_{i,c} = X_i\Omega + \tau_{i,c} + \delta_c + \varepsilon_{i,c}$$



# When do Superiors Changes [▶ back](#)



# Specification for Dynamic Exiting [▶ back](#)

## Tenure and Promotion

$$\pi_{i,c,t} = \gamma * \underset{\substack{\text{leader} \\ \text{city}}}{\text{Connected}}_{i,c,t} + \gamma^{start} * \underbrace{\text{Connected}_{i,c}^{start}}_{\text{whether starting as connected}} + \gamma_s * \overbrace{S_{i,c,t}}^{\text{whether } i \text{ has stayed for } S \text{ years in office}} + X_{i,c,t} \Gamma + \delta_c + \tau_t + u_{i,c}$$

- $\gamma$  = the contemporaneous effect of connection on turnover outcome, holding constant selection

[▶ Connection status over years in term](#)

## Alternative Specification for city outcome [▶ back](#)

### Policies, Growth and Innovation

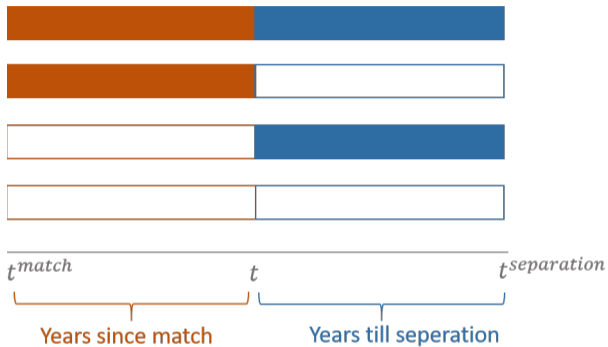
$$y_{c,t} = \theta * Connected_{c,t} + \theta^{start} * Connected_{c,t}^{start} + \theta_s * S_{c,t} + X_{c,t} \Theta + \eta_c + \xi_t + \varepsilon_{c,t}$$

- $\theta$  = the contemporaneous effect of connection on city outcome

[▶ Connection status over years at city level](#)

[▶ Alternative Event Study Design for City Outcomes](#)

# Main Specification: an Event Study Design for City Outcomes [▶ back](#)

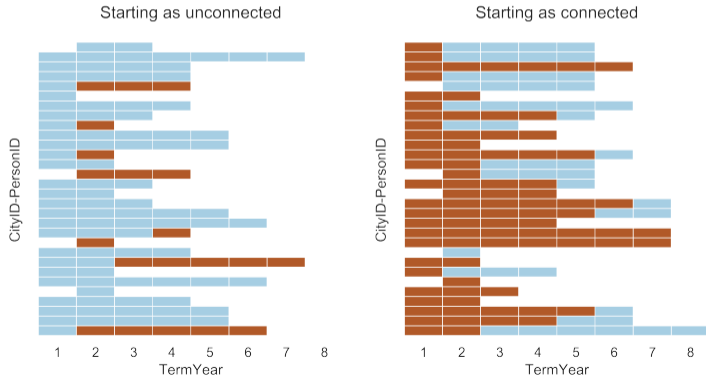


$$y_{c,t} = \sum_{k=1}^{k=5} \theta_{-k} \mathbf{1}\{k \text{ Yrs before } SupArrival^{next}\} * Connected_{c,t}^{next} + \sum_{k=1}^{k=5} \theta_k \mathbf{1}\{k \text{ Yrs after } SupArrival\} * Connected_{c,t} + Controls + FEs + u_{c,t}$$

# Connection Status over Years in Term at Spell Level [▶ back](#)

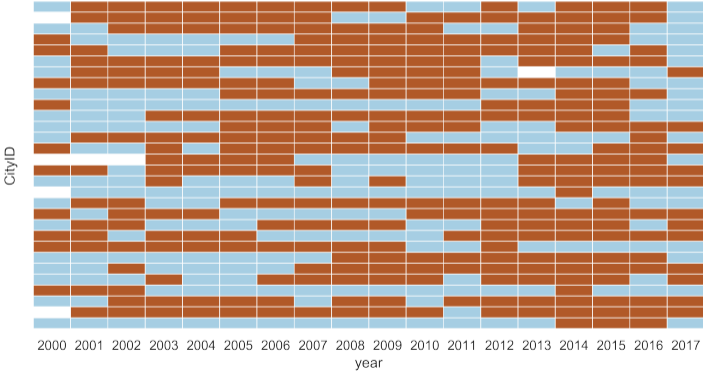
- 5.6% spells are staggered treated and 35% are never treated
- 23% are staggered untreated and 35% is always treated

Connection status over years in term (random sample, 30 spells)



# Connection Status over Years at City Level [▶ back](#)

Connection status over time (random sample, 30 cities)





## Findings 2: The Pursuit of Infrastructure over Innovation [▶ back](#)

Variables	log(Gov Spending)		Policy Posture(SD)
	Infrastructure (1)	Sci&Tech) (2)	Innovation (3)
<i>Connected</i>	0.0687*	-0.0997***	-0.0739**
	(0.041)	(0.032)	(0.037)
<i>Connected<sup>start</sup></i>	-0.0721	0.0370	-0.0133
	(0.049)	(0.041)	(0.049)
Observations	2,391	4,262	3,311
R-squared	0.865	0.935	0.707
Mean	6.103	4.581	-0.019
City and year FE	X	X	X
Controls	X	X	X
SE Cluster	City	City	City

↑ 6.8% in spending on infrastructure

↓ 10% in spending on sci&tech

↓ 0.074 (SD) in policy posture

# Effect of Other type of Connections on Turnovers [▶ back](#)

Variables	Leave			Promoted		
	(1)	(2)	(3)	(1)	(2)	(3)
<i>ShareUni</i>	-0.0129 (0.022)			0.0416* (0.023)		
<i>ShareHometown</i>		0.0120 (0.018)			0.0393* (0.023)	
<i>ShareBoth</i>			-0.0022 (0.014)			0.0320* (0.016)
<i>STEM</i>	-0.0074 (0.008)	-0.0075 (0.008)	-0.0073 (0.008)	0.0130 (0.009)	0.0127 (0.009)	0.0129 (0.009)
<b>1{Age &gt; 50}</b>	<b>0.0411*** (0.008)</b>	<b>0.0410*** (0.008)</b>	<b>0.0410*** (0.008)</b>	<b>-0.0351*** (0.009)</b>	<b>-0.0358*** (0.009)</b>	<b>-0.0354*** (0.008)</b>
Observations	12,668	12,495	12,668	10,160	10,149	10,160
R-squared	0.268	0.245	0.268	0.096	0.094	0.096
Mean	0.087	0.087	0.087	0.087	0.087	0.087
City and year FE	X	X	X	X	X	X
Controls	X	X	X	X	X	X
SE Cluster	City	City	City	City	City	City

# Pre-trends for IRF dynamics [▶ back](#)

$$\begin{aligned}
 y_{t-k} = & \theta_k * Connected_{c,t} \\
 & + \theta_k^{start} * Connected_{c,t}^{start} \\
 & + X_{c,t-k} \Theta_k + \delta_c + \tau_{t-k} + \epsilon_{c,t-k}
 \end{aligned}$$

	t-1	t-2	t-3	t-4	t-5
Variables	(1)	(2)	(3)	(4)	(5)
Panel A: Grow Rate in GDP					
<i>Connected</i>	-0.0023 (0.003)	-0.0075*** (0.003)	-0.0048 (0.003)	-0.0008 (0.003)	0.0015 (0.004)
<i>Connected</i> <sup>start</sup>	0.0137*** (0.004)	0.0082* (0.004)	-0.0009 (0.004)	-0.0045 (0.004)	-0.0017 (0.005)
Observations	3,748	3,700	3,602	3,488	3,335
R-squared	0.547	0.539	0.521	0.468	0.429
Mean	0.133	0.138	0.143	0.152	0.159
Panel B: log(# of invention patents application)					
<i>Connected</i>	-0.0054 (0.030)	0.0093 (0.029)	0.0215 (0.030)	0.0092 (0.029)	0.0185 (0.029)
<i>Connected</i> <sup>start</sup>	-0.0383 (0.046)	-0.0056 (0.042)	-0.0111 (0.042)	0.0381 (0.042)	-0.0028 (0.043)
Observations	3,753	3,704	3,608	3,501	3,349
R-squared	0.934	0.929	0.928	0.928	0.928
Mean	5.357	5.142	4.943	4.749	4.576
City and Year FE	X	X	X	X	X
Controls	X	X	X	X	X
SE Cluster	City	City	City	City	City

# Effects on Resource Transfer [▶ back](#)

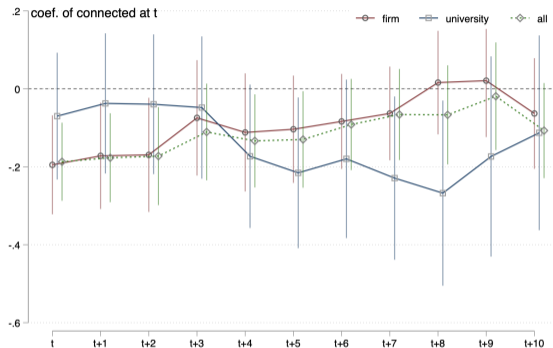
	log(Total Fiscal Transfer)	Dependency on Debt Total Infra.Dev	Dependency on Pro.Gov Fiscal Infra.Dev
Variables	(1)	(2)	(3)
<i>Connected</i>	0.0193 (0.019)	0.0109 (0.010)	0.0075 (0.007)
<i>Connected<sup>start</sup></i>	-0.0421 (0.026)	-0.0021 (0.013)	0.0024 (0.010)
Observations	4,826	4,453	1,394
R-squared	0.926	0.375	0.469
Mean	8.440	0.216	0.055
City and year FE	X	X	X
Controls	X	X	X
SE Cluster	City	City	City

# Horizon v.s. Promotion Prospect [▶ back](#)

Variables	Turnover Outcome		log(Gov Spending)		Policy Posture (SD)
	Exit (1)	Promoted (2)	Infrastructure (3)	Sci&Tech (4)	Innovation (5)
<i>Connected</i>	0.0472*** (0.015)	0.0115 (0.011)	0.2107*** (0.077)	-0.1480*** (0.052)	-0.0918 (0.063)
<i>Connected*Old</i>	-0.0183 (0.020)	0.0397*** (0.015)	-0.1988** (0.100)	0.0891 (0.061)	0.0236 (0.071)
<i>Connected<sup>start</sup></i>	-0.0401** (0.016)	-0.0182 (0.011)	-0.4254*** (0.119)	0.0811 (0.090)	0.1078 (0.093)
<i>Connected<sup>start</sup>*Old</i>	-0.0197 (0.021)	-0.0473*** (0.016)	0.3829*** (0.142)	-0.0696 (0.104)	-0.1543 (0.105)
<i>Old</i>	0.0576*** (0.013)	-0.0333*** (0.009)	-0.1706 (0.121)	-0.0197 (0.083)	0.0911 (0.092)
Observations	11,730	11,730	1,126	4,262	3,034
R-squared	0.287	0.121	0.896	0.935	0.712
Mean	0.245	0.098	6.402	4.581	-0.010
City and year FE	X	X	X	X	X
Controls	X	X	X	X	X
Init.Cond.Depvar			X	X	X
SE Cluster	City	City	City	City	City

- More prominent pursuit of infrastructure-over-innovation among young leaders
- Unlikely to be driven by promotion

# Direct Effect v.s. Indirect Effect [▶ back](#)



- Heterogenous response likely to be driven by difference in
  - Dependency on government's direct funding support
  - Time frame of innovation activities

# Implications for from “made-in-China” to “innovated-in-China” [▶ back](#)



↓ 1 year in tenure →

- ↓ Patents 25%
- ↓ Long-run Growth 1.2 pp
- ↑ Short-run Growth 1 pp