Building for Promotion: Local Political Incentives and Spatial Structural Change

Dehua Li*

Job Market Paper

Click here for the latest version.

November 19, 2026

Abstract

Local governments provide most infrastructure, but the officials who run them face political incentives that need not align with residents' welfare. This paper studies how local officials' career promotion incentives shape the spatial allocation of infrastructure and structural change in China. To estimate the effects of these incentives, I exploit plausibly exogenous rotations of local leaders' superiors, which reduce their promotion prospects. I find that prefecture leaders whose prospects decline cut infrastructure investment, which in turn slows the transition out of agriculture. To measure the promotion concerns and quantify aggregate implications of this mechanism, I develop a quantitative spatial model in which local officials value both current public spending and growth-oriented promotion. These incentives lead more than half of prefectures to overinvest relative to a benevolent local planner. Removing these incentives would have large distributional effects across prefectures, although the aggregate welfare effect is modest. Yet the weakening of career incentives over 2000–2020 slowed industrialization, cutting the rise in the manufacturing employment share by 9.2%.

Keywords: political incentives, infrastructure investment, spatial equilibrium, structural change

*dehua.li@glasgow.ac.uk, Adam Smith Business School, University of Glasgow

I am grateful to my advisors, Alex Trew and Tuuli Vanhapelto, for their invaluable advice and continuous support for this project. I appreciate Dávid Nagy's help and guidance during my visit at Universitat Pompeu Fabra (Barcelona). I thank Zvonimir Bašić, Michele Battisti, Doug Gollin, Jarkko Harju, Lars Lefgren, Luca Loose, Nuno Palma, Giacomo Ponzetto, Hugo Reichardt, Radek Stefanski, Sen Xue, Xiaodong Zhu for their helpful comments and feedback, as well as participants at the CREi International Lunch Workshop, 2026 UEA Summer School, and 8th QMUL Economics & Finance Workshop. All errors are my own.

1 Introduction

Infrastructure shapes both the distribution of economic activity across regions and aggregate output (Faber, 2014; Donaldson, 2018). Its provision is decentralized: subnational governments account for about 60% of public investment in the OECD countries (Allain-Dupré et al., 2017) and 94% of infrastructure investment in China (Song and Xiong, 2026). The officials who make these decisions are not benevolent planners. In democracies, they answer to voters and seek re-election; in hierarchical systems, they answer to higher levels of government and seek promotion. In both cases, votes and superiors cannot observe their ability and judge them instead by visible outcomes, such as local growth (Rogoff, 1990; Li and Zhou, 2005). Officials therefore invest to raise these outcomes and, with them, the assessment of their ability (Holmström, 1999), which need not maximize welfare. Yet how far these career concerns move the allocation of infrastructure away from the efficient one, and in which regions, remains largely unquantified.

In this paper, I study how the career incentives of local officials shape infrastructure investment and structural change in China, and quantify what they cost in a spatial equilibrium model. Empirical evidence shows that prefecture leaders who unexpectedly lose promotion prospects cut the infrastructure share of local spending by 20%, which in turn slows the local transition out of agriculture. [1] To quantify the aggregate implications of these career incentives, I develop a quantitative spatial model, in which prefecture leaders choose infrastructure investment under career concerns. They value both current public spending and growth-oriented promotion. The promotion payoff from local output, what I term the career incentive, differs across regions. Prefecture leaders with stronger career incentives allocate a larger share of fiscal revenue to infrastructure. In this sense, the incentive works like a subsidy to local infrastructure: without it, officials would under-invest in infrastructure. Because promotion rather than local returns sets the size of this subsidy, it overshoots in some prefectures and falls short in others: more than half of prefectures overinvest relative to the local planner in 2000. Removing these incentives raises aggregate household welfare by 0.7%, but prefecture-level effects range from -4.5% to 5.8%, with gains where incentives fell short and losses where they overshot. After 2012, as reforms demoted GDP growth as a promotion criterion, the average career incentive fell by more than half. Yet the weakening of career incentives between 2000 and 2020 reduced the rise in the manufacturing employment share by 9.2% of its observed increase.

It is ambiguous whether career incentives distort or correct the provision of local infras-

[1] China's government has five tiers: the central government, 34 province-level divisions, 333 prefecture-level divisions, 2,844 county-level divisions, and approximately 39,000 township-level divisions. This paper studies the prefecture level. For more details on the institutional context, see Section 2.

tructure. Classic theory holds that decentralized provision of public goods is efficient, when local governments answer to their residents and the benefits stay within their borders: residents' mobility (Tiebout, 1956) and local knowledge of residents' preferences (Oates, 1999) then align local choices with local welfare. Neither condition generally holds. The officials who allocate infrastructure often answer to more than local residents: Brazilian legislators steer public funds toward electorally valuable municipalities (Finan and Mazzocco, 2021), and in Kenya, districts that share the president's ethnicity receive more road investment (Burgess et al., 2015). Infrastructure also spills over across regions.

These two departures make the consequences of career incentives hard to assess. First, the direction of the distortion is unclear. An official who cared only about fiscal revenue would underinvest: they would capture the part of infrastructure's return that comes back as tax revenue, but not the higher wages and consumption it brings to local households. Promotion pushes the other way: because superiors evaluate officials by local output, officials have an incentive to build more. Second, local effects are hard to aggregate due to spatial spillovers. Infrastructure built in one prefecture draws workers and demand from others through migration and trade, so a prefecture that gains from more investment might impose losses elsewhere. To address these difficulties, I exploit China's institutional setting to provide evidence that career incentives move local investment, and then develop a quantitative spatial model to quantify their effects. To the best of my knowledge, this is the first paper to measure these consequences in a spatial equilibrium framework.

China offers a sharp setting for this question because local governments provide almost all infrastructure, yet the officials who choose it are appointed and promoted by their superiors rather than elected by residents (Xu, 2011). Promotion rests partly on measured performance and partly on ties to superiors (Jia et al., 2015). These institutions let me measure what is hard to observe elsewhere. Career records identify political ties, and the rotation of provincial leaders, decided by the central government, cuts them at dates that local officials do not choose. These promotion incentives may in turn shape how regions develop. Structural change was rapid but uneven: the national agricultural employment share fell from 60 percent in 1990 to 20 percent in 2020,[2] yet the fastest quarter of prefectures cut their share by more than 59 percentage points and the slowest quarter by less than 30.

The empirical results show that prefecture leaders who face weaker promotion prospects reduce infrastructure investment, which slows labor moving out of agriculture. Specifically, prefecture leaders' promotion depends in part on ties to their superiors—provincial leaders,

[2]Existing studies attribute aggregate structural change to technological progress (Brandt and Zhu, 2010), declining migration costs (Tombe and Zhu, 2019; Hao et al., 2020), and trade liberalization (Erten and Leight, 2021), but these factors account for only a modest share of the observed reallocation (see Chen and Zha (2025) for a review).

so a change in those ties shifts their promotion prospects. I measure ties by past promotion experience between prefecture leaders and provincial leaders. I estimate the effect of *losing* a connection during provincial leadership turnover, which is plausibly exogenous to prefecture-level conditions for two reasons. First, the central government appoints and rotates provincial leaders, so the timing of a rotation does not depend on prefectures. Second, since each province contains 10–20 prefectures, economic conditions in any single prefecture are unlikely to drive the rotation. Results show that prefecture leaders who face weaker promotion prospects after losing connections cut infrastructure spending share by 2.8 percentage points, 20.6% of the average level. This reduction decelerates local structural transformation. The decline in agricultural employment slows and the growth of manufacturing employment weakens. The effect is concentrated among officials aged below 52 (the sample median). Younger officials have longer careers ahead of them and more room for promotion, so their behavior should respond more to career incentives. This result therefore supports the mechanism that local officials' investment decisions respond to their prospects of promotion.

Motivated by these findings, I embed career-motivated local officials in a quantitative spatial model that builds on Eckert and Peters (2025) to quantify the consequences of officials' career incentives. In each prefecture, an official allocates fiscal revenue between current spending and infrastructure investment to maximize an objective with two parts: the value of current consumption and the payoff of promotion. The career incentive, the promotion payoff to output, tilts the official toward infrastructure investment. Observed investment decisions reveal the level of career incentives. I infer the career incentive for each prefecture by inverting the model to match observed infrastructure spending shares.

The recovered career incentives vary widely across prefectures and weaken over time. The ratio of the 90th to the 10th percentile is 9 in 2000, and the average incentive falls by half between 2000 and 2020 while its dispersion widens. As an external validation, I find that the incentives are about twice as large in provincial capitals and sub-provincial prefectures, whose leaders compete for provincial posts and obtain more from promotion. Song and Xiong (2026) recover a similar object, but in a *non-spatial* model that cannot capture the reallocation of activity across regions, which I show matters for the counterfactuals.

Career incentives push most prefectures overinvestment in infrastructure and cause large distributional effects. Relative to the allocation a local planner would choose, 57.8% of prefectures over-invest in 2000. Moving to the planner's allocation would raise aggregate household welfare by 0.7%. The gain is modest but masks large differences across regions: prefecture-level welfare effects range from -4.5% to 5.8%. Prefectures with initially low career incentives gain because they receive more investment under the counterfactual. Prefectures with *moderate* career incentives also gain: even though their investment falls, the

welfare cost is more than offset by the correction of distorted over-investment and trade effects across regions. Only prefectures in the top quintile of the incentive distribution lose, as the decline in investment outweighs the gain from reduced distortion. These results suggest that political incentives, and not only economic fundamentals, determine where infrastructure is built and who gains from it.

To quantify the effects of career incentives on spatial reallocation and structural change, I exploit the model for three counterfactuals. The first captures the effects of spatial reallocation of infrastructure. The second examines whether upper-tier governments can use prefecture leaders' incentives to reduce spatial inequality. The third measures how the weakening of career incentives affected structural change over 2000-2020.

First, I find that spatial reallocation of infrastructure can improve welfare and mitigate more than half of the welfare loss from the baseline misallocation. To isolate this effect, I follow two steps. The first step is to find the level of career incentive that holds the aggregate investment exactly at its baseline. The second step is to assign this level to all regions. Because total spending is unchanged by construction, any effect arises purely from the reallocation of infrastructure across prefectures. This result raises household welfare by 0.4%, more than half of the original welfare loss. Thus, the baseline geographic dispersion of career concerns generates spatial misallocation: the current incentive structure directs infrastructure toward already-industrialized prefectures with high political returns but low marginal productivity of infrastructure, and away from agricultural regions where diminishing returns have not yet set in. This result justifies the spatial framework. An aggregate model, such as Song and Xiong (2026), which tracks only total public investment, would miss this effect.

Second, upper-tier governments can use prefecture leaders' incentives to reduce spatial inequality. Motivated by China's practice of rotating officials between regions, I swap the career incentives of the 10 percent of prefectures with the strongest incentives and the 10 percent with the weakest, leaving the total unchanged, to alleviate spatial misallocation of infrastructure. Infrastructure investment and manufacturing employment rise in the prefectures that receive stronger incentives and fall in the others. More importantly, spatial inequality falls by about 5%, while aggregate outcomes are essentially unchanged: reassigning incentives redistributes local activity across space rather than creating it.

Third, the weakening of career incentives over 2000-2020 slowed industrialization. The average recovered incentive falls by more than half over the period, mirroring a fall in the share of local revenue devoted to infrastructure. The timing matches the history: after 2012, the anti-corruption campaign and the 2013 reform of cadre evaluation demoted GDP growth as a promotion criterion. This leaves local officials with weaker incentives to invest in infrastructure. Had incentives stayed at 2000 levels, the manufacturing employment share

would have risen by a further 1.22 percentage points, 9.2% of the observed increase.

Related Literature. This paper contributes to three strands of literature: it brings politicians' career incentives into quantitative spatial models, identifies a political determinant of reginal structural change, and quantifies the aggregate and spatial costs of local officials' career incentives in China.

First, this paper relates to a small literature that introduces political economy mechanisms into spatial equilibrium models. My contribution is to introduce a distinct source of distortion: namely, politicians' career promotion incentives. A novel implication is that career incentives can induce both overinvestment and underinvestment across regions. Some studies investigate electoral incentives in democratic settings, such as Fajgelbaum et al. (2024); Henkel et al. (2026) and the transition from autocracy to democracy (Hsiao, 2022). Specifically, Hsiao (2022) investigates the effect of democratization on healthcare infrastructure in Indonesia and shows that, prior to democratization, investment was systematically directed toward politically connected regions. Fajgelbaum et al. (2024) and Henkel et al. (2026) examine how electoral incentives distort public spending and infrastructure investment. In addition, Bordeu (2023) models decentralized infrastructure provision across municipalities within a city and shows that it leads to underinvestment near jurisdictional boundaries and overinvestment near core areas; Jiang (2025) finds a similar pattern across U.S. states.

Second, this paper contributes to the literature on spatial structural transformation by showing that spatial misallocation of infrastructure induced by local political incentives could impact the pace of regional industrialization. A large body of work studies structural change across countries, emphasizing market-driven mechanisms such as differential productivity growth, income effects, and relative price changes (Herrendorf et al., 2014; Gollin and Kaboski, 2023), but political determinants have received far less attention (see Martinez-Bravo and Wantchekon (2023) for a review). Cheremukhin et al. (2024) and Song and Xiong (2026) show that political economy frictions have been quantitatively important for China's economic development, but neither study incorporates a spatial equilibrium framework.

A recent strand of this literature employs quantitative spatial models to analyze within-country structural change (Desmet and Rossi-Hansberg, 2014; Tombe and Zhu, 2019; Trew, 2020; Nagy, 2023; Fan et al., 2023; Eckert and Peters, 2025). The most closely related papers are Fan et al. (2023), who analyze services productivity growth and its spatial implications in India, and Eckert and Peters (2025), who study the role of technology diffusion across regions in the structural transformation in U.S. However, I focus on local political incentives. Relative to existing spatial models of structural change, I introduce a new political economy mechanism, which affects local infrastructure investment and structural transformation.

Third, this paper contributes to the literature on political incentives in China by quantify-

ing the aggregate and distributional costs of career-driven distortions in a spatial equilibrium framework. Local officials, such as prefectural leaders, are the primary agents responsible for economic development in their jurisdictions, and career incentives are a central motivation for their intervention in the local economy (Li and Zhou, 2005; Yao and Zhang, 2015; Wang et al., 2020a). Connections with higher-level authorities are a key determinant of promotion prospects (Jia et al., 2015; Francois et al., 2023), which in turn shape officials' policy choices. Empirically, Jiang (2018) exploits past promotion connections between city- and provincial-level leaders and shows that connected officials achieve higher local GDP growth, partly through emphasis on development in policy documents. Sun (2023) finds that officials connected through shared work experience expect earlier promotion and shift spending toward infrastructure. This channel is distinct from the one in this paper, where connections raise the promotion return to higher output, but both predict that connected officials have higher promotion prospects and invest more in infrastructure.

A notable exception is Song and Xiong (2026), who embed local government behavior in an overlapping-generations growth model to quantify the aggregate effects of officials' career incentives. They find that growth-oriented promotion criteria spurred infrastructure investment and growth before 2008, but at the expense of household welfare. Their framework, however, abstracts from space and cannot capture the spatial reallocation effect.

Road Map. The structure of the paper is as follows. Section 2 provides context on the institutional background and regional structural transformation in China. Section 3 presents the empirical evidence on the relationship between political incentives, infrastructure investment, and spatial structural change. Section 4 develops a spatial general equilibrium model with career-motivated local officials. Section 5 brings the model to the data. Section 6 presents the quantitative results, including the recovered career incentives and counterfactual analyses. Section 7 discusses the robustness of the results. Section 8 concludes.

2 Context

This section proceeds in three steps. First, I describe the institutional setting in China. Second, I document the national-level structural transformation between 1990 and 2020. Third, I examine its spatial heterogeneity across prefectures.

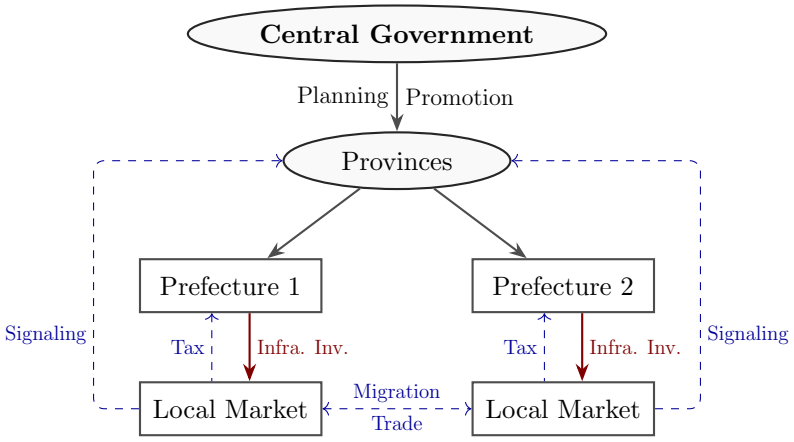
Institutional background in China.

China's political system is the regionally decentralized authoritarianism: political authority is centralized, while economic decisions are delegated to local governments, such as prefectures (Xu, 2011). Three institutional features shape the environment in which prefecture

leaders operate. The first is the administrative hierarchy. Government has five tiers: the central government, 34 province-level divisions, 333 prefecture-level divisions, roughly 2,844 counties, and about 39,000 townships. Figure 1 summarizes the chain of authority. A province contains about 10–20 prefectures on average, so the economic performance of any single prefecture is unlikely to affect its provincial leader's career, a key feature for the identification strategy.

The second is how officials are appointed and evaluated. Officials are appointed and evaluated from above rather than elected: the central government appoints provincial leaders, who in turn appoint prefecture leaders and decide their promotions. Evaluation is partly performance-based and partly discretionary, and ties to the immediate superior and local economic performance are both central to advancement (Jia et al., 2015). Promotion is a tournament: prefecture leaders compete with their peers for a limited number of higher posts (Li and Zhou, 2005). The third is fiscal autonomy combined with competition among peers. Prefecture governments retain discretion over how their revenue is divided between current expenditure and investment. Because superiors judge ability largely by measured economic output, leaders compete by raising it, and infrastructure investment is a direct way to do so.

Figure 1. Institutional framework in China

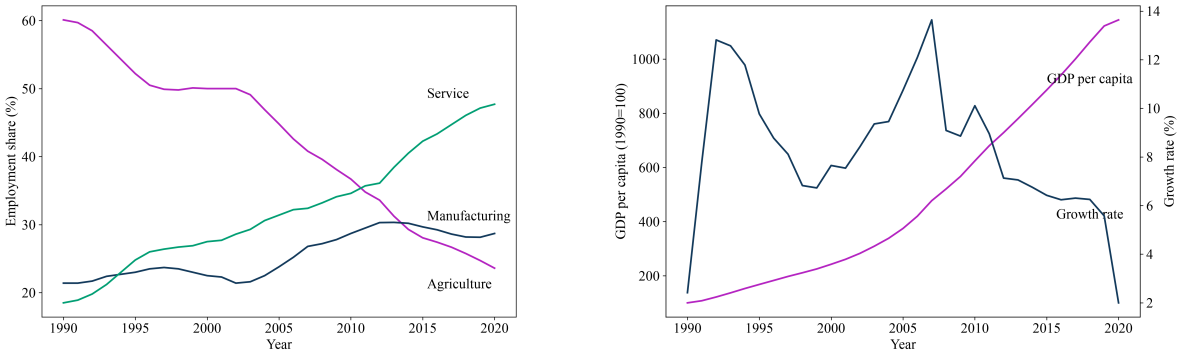


Notes: This figure illustrates the institutional framework of China's regionally decentralized authoritarian system. It shows three tiers of government (central, provincial, and prefecture) and omits the county and township levels. For illustration, it shows one province and two prefectures; China has 34 province-level divisions, each containing about ten prefectures on average. Solid arrows indicate the direction of authority; dashed arrows indicate flows of revenue, factors, and information. For more details on the institutions, see Xu (2011) and Qian (2017).

Rapid structural change and economic growth during 1990-2020.

China underwent a profound structural transformation between 1990 and 2020. Following the national standard industrial classification, I group industries into three broad sectors: agriculture, manufacturing, and service.[3] Panel (a) of Figure 2 plots the sectoral composition of employment. The agricultural employment share fell from 60% in 1990 to about 20% in 2020. The manufacturing share rose from 21% to a peak of about 30% in 2012 and then declined slightly. Services absorbed most of the reallocation: their share rose steadily from 19% to 48%, overtaking agriculture around 2011. Panel (b) shows that this reallocation coincided with an elevenfold increase in real GDP per capita, consistent with non-homothetic demand shifting expenditure toward services as households grow richer.

Figure 2. Occupational structure and GDP per capita of China during 1990–2020



(a) Occupational structure **(b)** GDP per capita and growth rate

Notes: Panel (a) shows the employment share in the three broad sectors: agriculture, manufacturing, and service sector across China from 1990 to 2020. Panel (b) shows the real GDP per capita and its growth rate in China over the same period. Appendix Figures A-1 and A-2 show employment shares, value-added shares, GDP per capita and its growth rate over 1952–2023. Data source: the National Bureau of Statistics of China.

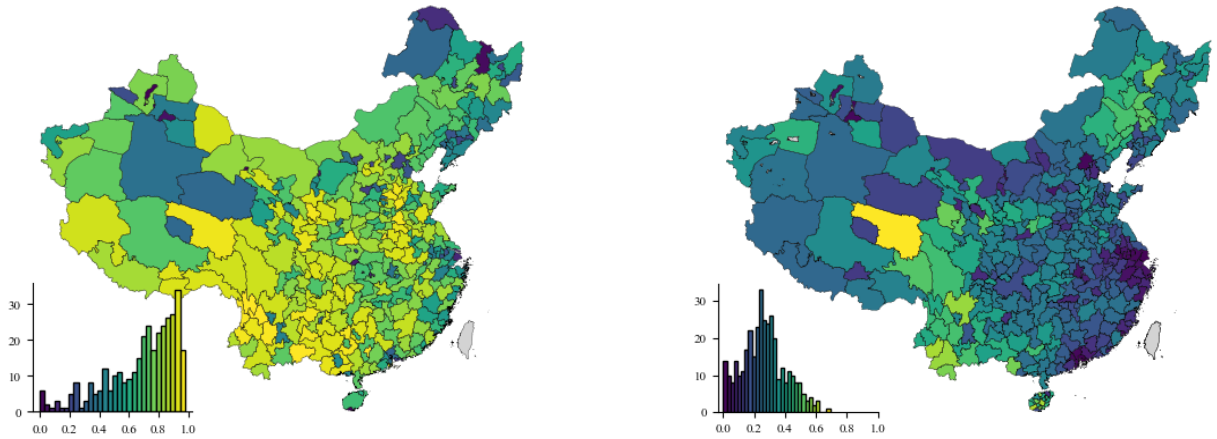
Structural change is uneven across space.

Structural change in China was also highly uneven across space. Figure 3 maps the agricultural employment share across prefectures in 1990 and 2020. In 1990, agriculture employed the majority of workers in most prefectures, although its share was markedly lower in the northeast and along the coast than in the interior. Despite the sharp aggregate decline in agricultural employment, this spatial pattern persisted through 2020. By then, the agricultural share had fallen below 40% in most prefectures, and the Yangtze River Delta (Suzhou,

[3]Agriculture includes agriculture, forestry, animal husbandry, and fishery; manufacturing includes mining, manufacturing, and construction.

Hangzhou, and their neighbors) remained far less agricultural than the western interior.

Figure 3. Agricultural employment share by prefecture, 1990 and 2020



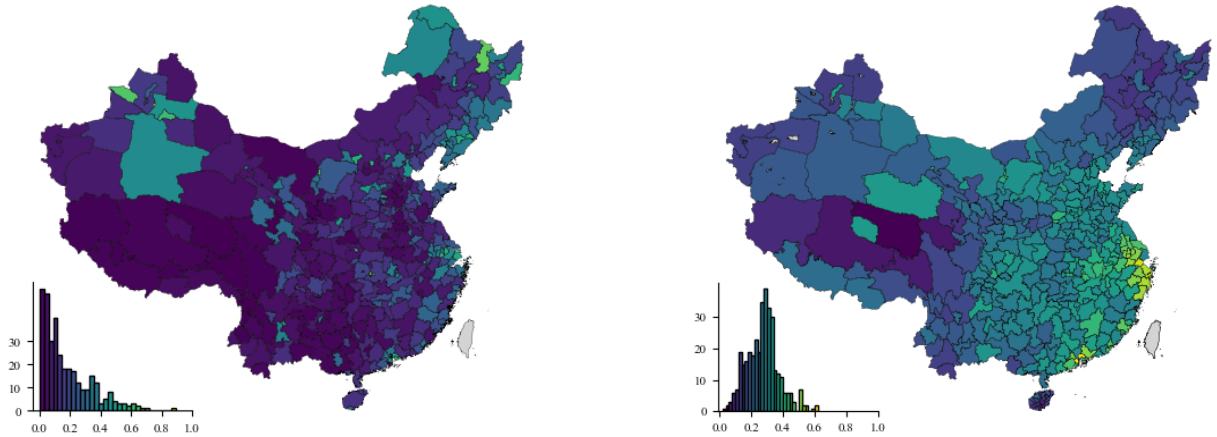
(a) 1990 **(b)** 2020

Notes: These two maps present agricultural employment share across prefectures in 1990 and 2020. Black lines are prefecture boundaries. The histograms at the south-west of each sub-figure show the number of prefectures (y-axis) against the employment share in the agricultural sector (x-axis). Yellow denotes high agricultural employment share, while blue denotes low agricultural employment share. Data source: Census in 1990 and 2020.

Manufacturing employment shares varied just as widely across space. As Figure 4 shows, the average manufacturing share across prefectures rose from about 17% in 1990 to 27% in 2020. In 1990, manufacturing shares were highest in the Northeast, around Shenyang, Dalian, and neighboring prefectures, a legacy of the planned economy's heavy-industry base. Over the following three decades, the Northeast lost its relative position. By 2020, manufacturing employment was most concentrated in the Yangtze River Delta and the Pearl River Delta, centered on Guangzhou and Shenzhen. Services show the clearest shift (Figure A-3): the entire distribution moved to the right. In 1990, the service share was below 20% in most prefectures; by 2020, it exceeded 20% in every prefecture.

In summary, structural transformation in China has been highly uneven across space. Where industry expanded depended not only on geography but also on local economic and political conditions, including the decisions of local governments. A spatial framework that incorporates these forces is therefore needed to understand the aggregate transformation.

Figure 4. Manufacturing employment share by prefecture, 1990 and 2020



(a) 1990 **(b)** 2020

Notes: The histograms at the south-west of each sub-figure show the number of prefectures (y-axis) against the employment share in the manufacturing sector (x-axis). Data source: Census in 1990 and 2020.

3 Empirical Evidence: Political Incentives and Spatial Structural Change

This section presents evidence on how prefecture leaders' career incentives shape local fiscal allocation and structural transformation. After describing the data, I define political connections, show how they vary, and explain how I construct the regression sample. I then estimate how infrastructure spending responds when prefecture leaders face weaker promotion prospects after losing their political connections, and how the local pace of structural change responds to the same shock.

3.1 Data Description

Economic data. I use prefecture-level economic data from the City Statistical Yearbook (CSY) for 1990 to 2020. The key outcome for structural change is the sectoral composition of value added. The CSY also reports local government total tax revenue and expenditures. In addition, to measure the sectoral composition of employment, I use the 1% samples from Census and mini-Census data from 1990 to 2020. Employment shares in agriculture, manufacturing, and services, are the key moments for inverting the model.

Data on infrastructure investment come from the China Urban-Rural Development Statistical Yearbook for 2002–2017. I measure infrastructure investment by *Fixed Asset Investment in Municipal Public Facilities*, which covers transportation networks, water supply systems,

heating facilities, and other municipal facilities. To check the transfer revenue channel, I also use data on fiscal transfers from the Public Finance Statistical Materials of Prefectures, Cities, and Counties for 2001–2009. [4]

Data on officials. To measure political connections between prefecture and provincial leaders, I use the China Center for Economic Research (CCER) Officials Dataset (Yao et al., 2020). The dataset covers two chief officials of each prefecture, the party secretary and the mayor, from 1994 to 2017. Together, they are responsible for local economic development. I use these data to identify each prefecture leader's connection to the provincial leadership and to compute promotion probabilities across prefectures. I restrict the sample to 2000-2017 because coverage is incomplete before 2000.

Table 1 reports summary statistics. The sample covers Chinese prefectures from 2000 to 2017, restricted to turnover windows, that is, the last year of each provincial secretary's term and the first year of the successor's term. The average prefecture derives about 16% of its value added from agriculture, 48% from manufacturing, and 37% from services, consistent with an economy in the midst of structural transformation. Infrastructure investment varies widely across prefectures and years: log investment has a mean of 11.4 and a standard deviation of 1.5. On average, infrastructure accounts for about 14% of total spending.

Turning to officials' characteristics, the average prefecture leader is about 52 years old, and mayors are slightly younger, at around 50. Both positions are overwhelmingly held by men: only 3% of secretaries and 6% of mayors are women. College education rates are higher among mayors than secretaries, and very few officials share a hometown with the provincial secretary (about 1% of both secretaries and mayors).

Table A-1 presents summary statistics of the full sample of prefectures over 2000–2017. The two are similar on all economic and official characteristics, so the sample in turnover windows is a representative set of prefectures. More importantly, before the turnover, connected and unconnected prefectures in the same turnover window follow similar paths: changes in sectoral shares, output, population, and infrastructure spending do not jointly predict connection status ($F = 1.49$, $p = 0.17$; Appendix Table A-2).

3.2 Effects of Losing Political Connections on Infrastructure Spending

To estimate the effect of local officials' career incentives, I exploit variation in political connections induced by the turnover of their superiors. Specifically, I use past promotions to measure connections following Jiang (2018). A prefecture leader is connected to the provincial party secretary if the leader was promoted to that position from within the province while the current provincial party secretary was in office. Unlike previous studies, which estimate

[4] After 2009, these data are not available.

Table 1. Summary statistics

	Mean	S.D.	Min	Max	Count
Agriculture Value-Added Share (%)	15.642	9.807	0.040	77.329	2010
Manufacturing Value-Added Share (%)	47.671	10.905	14.950	85.920	2010
Service Value-Added Share (%)	36.687	8.553	0.002	77.273	2010
Infrastructure Spending (ln)	11.351	1.543	5.247	16.094	1748
Infrastructure Spending per Capita (ln)	5.493	1.462	-1.306	9.516	1745
Infrastructure Spending Share (%)	13.576	14.342	0.034	88.963	1732
GDP (ln)	6.530	1.079	2.887	9.647	2010
Population (ln)	5.856	0.677	2.770	7.096	1995
GDP per Capita (ln)	9.908	0.856	7.776	12.281	2009
Party Secretary Age	51.846	3.761	32	60	2003
Party Secretary Female (0/1)	0.032	0.177	0	1	2008
Party Secretary College Education (0/1)	0.458	0.498	0	1	2010
Party Secretary Same Hometown as PSec (0/1)	0.009	0.094	0	1	2010
Mayor Age	49.801	4.022	33	67	1916
Mayor Female (0/1)	0.058	0.233	0	1	1923
Mayor College Education (0/1)	0.406	0.491	0	1	2010
Mayor Same Hometown as PSec (0/1)	0.012	0.111	0	1	2010

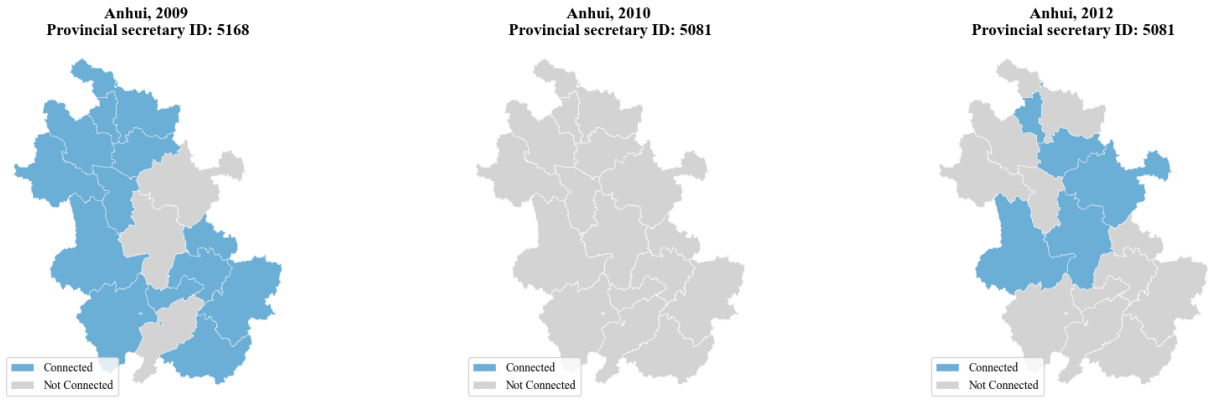
Notes: This table reports the summary statistics of key variables at prefecture-level in the regression analysis. The sample covers 2000–2017. I restrict the sample to the last year and first year of provincial party secretaries' terms, that is the turnover window of the party secretary. The classification of sectors is based on the Industrial Classification for National Economic Activities (GB/T 4754—2011). The infrastructure spending is measured by *Fixed Asset Investment in Municipal Public Facilities* from the China Urban-Rural Development Statistical Yearbook. Other economic data come from the China City Statistical Yearbook. Data on the prefecture party secretaries and mayors come from the CCER Officials Dataset.

the effect of gaining a connection, I estimate the effect of *losing* one. Gaining a connection is likely endogenous: provincial leaders may strategically place trusted subordinates in particular prefectures. Losing a connection, by contrast, occurs mainly when the provincial leader leaves office. The timing of this turnover is decided by the central government and is plausibly exogenous to prefecture leaders and local economic conditions. Moreover, each province contains 10-20 prefectures, so the economic performance of any single prefecture is unlikely to affect the provincial leader's own career.

To isolate this variation, I further restrict the sample to a narrow window around each turnover: the last year of the outgoing leader's term and the first year of the incoming leader's term. Restricting the sample in this way excludes any selection that takes place during a leader's term. Prefectures whose leaders were connected to the outgoing secretary form the treatment group: they lose their connection when the new secretary takes office. Prefectures whose leaders were unconnected form the control group. Each turnover thus yields a two-period difference-in-differences design, and I stack these designs across all turnovers.

Figure 5 illustrates this variation using Anhui province as an example. In 2009, the final year of the incumbent provincial party secretary's term, several prefecture leaders were connected to him. When his successor took office in 2010, no prefecture leader was connected, because the new secretary had not yet made any appointments. Connections then accumulated as he appointed prefecture leaders in subsequent years. The turnover window is therefore 2009–2010, and these two years enter the sample.

Figure 5. Variation in the connection status: Anhui Province (2009–2012)



(a) 2009 **(b)** 2010 **(c)** 2012

Notes: The figure shows the connection status of each prefecture in Anhui province in selected years. A prefecture is marked in blue (*connected*) if its party secretary was promoted to that position while the incumbent provincial secretary was in office, and in gray otherwise. The provincial secretary changed in 2010. All connections to the outgoing secretary were lost at the turnover (panels a and b), and connections to the incoming secretary accumulated as he appointed new prefecture leaders (panel c). Years 2009 and 2010 form Anhui's turnover window in the regression sample. Provincial secretary IDs follow the CCER Officials Dataset (Yao et al., 2020).

Local governments make most infrastructure investment decisions in China. In deciding how much to invest, local officials weigh not only the return to the local economy but also the payoff to their own careers, since stronger local growth improves their prospects for promotion. A change in those prospects should therefore show up in infrastructure investment. I test this by examining how infrastructure investment responds when a prefecture's leader lose their political connections. I estimate

$$y_{i,p,t+1} = \beta_0 + \beta_1 \, HadConn_{i,t} \times PsecChange_{p,t} + \beta_2 HadConn_{i,t} + \Gamma \mathbb{X}_{i,t} + \gamma_i + \eta_{p,t} + \epsilon_{i,t} \quad (1)$$

where $y_{i,p,t+1}$ is the infrastructure spending in prefecture i in province p at year $t+1$, $HadConn_{i,t}$ is an indicator for whether the prefecture's leader was connected to the provincial secretary in the previous year, and $PsecChange_{p,t}$ is an indicator for whether the provincial secretary changed in year t. The coefficient β_1 captures the effect of losing political connec-

tion on infrastructure spending. γ_i is the prefecture fixed effect and $\eta_{p,t}$ is the province-year fixed effect to capture time-varying province-level confounders, such as changes in provincial leadership priorities and industrial policies. $\mathbf{X}_{i,t}$ includes prefecture leaders' individual characteristics: age, gender, college education, and whether the prefecture leaders share a hometown (prefecture) with the provincial leader; and pre-appointment economic conditions: GDP, population, and secondary industry share.

Prefecture leaders cut infrastructure spending after losing their ties to superiors. Table 2 shows that prefectures whose leaders lose a connection reduce infrastructure spending one year after the turnover on every measure: total spending, spending per capita, and the infrastructure share of the local budget. The timing follows the budget cycle. Because local budgets are drafted in the preceding year, a turnover in year t can affect spending only from year $t+1$ onward. Consistent with this timing, the coefficients before and in the turnover year are small and statistically indistinguishable from zero, so the effect does not reflect pre-existing differences; it appears in $t+1$ and fades afterwards as some leaders form new ties with the incoming secretary (Appendix Figure A-8).

Table 2. Losing political connection and infrastructure spending

	(1)	(2)	(3)
	Infras. spending	Spending per capita	Infras. spending share
$HadConn_{i,t} \times PsecChange_{p,t}$	-0.244^{**}	-0.227^{**}	-0.028^{*}
	(0.099)	(0.099)	(0.016)
Controls	Y	Y	Y
Prefecture FEs	Y	Y	Y
Province × Year FEs	Y	Y	Y
R^2	0.862	0.846	0.782
Prefectures	268	268	268
Observations	1,587	1,587	1,579
Mean of dep. var.	11.462	5.571	0.137

Notes: The dependent variable is infrastructure spending (log), infrastructure spending per capita (log), and infrastructure spending share one year ahead. The sample covers turnover windows from 2001 to 2017. Standard errors clustered at the prefecture level are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Other potential channels. Losing a connection could also reduce infrastructure investment by cutting the fiscal resources available to a prefecture rather than by changing its leader's incentives. I find no evidence of this. Fiscal transfers from upper-level governments do not respond significantly (Figure A-9), and neither total government revenue nor revenue and expenditure per capita change (Table A-3). These results suggest that the response operates mainly through how local governments allocate a given budget, shifting resources away from infrastructure investment, rather than through the size of the budget. Results also exclude the anticipation effects before the provincial leaders' turnover (Figure A-8).

3.3 Heterogeneous Effects by Career Incentives

Age is a critical determinant of promotion prospects for Chinese officials (Li and Zhou, 2005), which in turn shape their economic decisions, including infrastructure investment. Figure A-12(a) presents the age distribution and promotion probabilities for municipal party secretaries. Both the median and mean ages are approximately 52 years. Since young governors have stronger career incentives, I exploit this to examine the heterogeneous effects of political incentives on local officials' behavior. In particular, I use this threshold to classify officials as "young" (≤ 52) or "old" (> 52) and run the following specification:

$$y_{i,p,t+1} = \beta_0 + \beta_1 \, LoseConn_{i,t} \times Young_{i,t} + \beta_2 LoseConn_{i,t} + \beta_3 \, Young_{i,t} + \Gamma \mathbb{X}_{i,t} + \gamma_i + \eta_{p,t} + \epsilon_{i,t} \quad (2)$$

where $Young_{i,t}$ is an indicator equal to one if the municipal party secretary is aged 52 or below (the sample median). Other settings, including control variables and fixed effects, are the same as in Equation 1.

Young officials respond more strongly to the loss of political connections than older officials. Table 3 presents results for log infrastructure spending (Column (1)), per capita infrastructure spending (Column (2)), and infrastructure share of total fiscal expenditure (Column (3)). The coefficient on the interaction term (*Lose Connection* $\times$ *Young*) is negative across all specifications, reaching statistical significance in Column (3). This pattern suggests that younger officials exhibit a stronger response to connection loss than their older counterparts. More importantly, the total effect for young officials, $\beta_1 + \beta_2$, is negative and statistically significant at the 5% level across all three outcome measures. In terms of magnitude, young officials who lose their political connections reduce infrastructure spending by approximately 20 percent, and decrease the infrastructure share of fiscal expenditure by 3.4 percentage points. Given that the sample mean of infrastructure share is 13.6%, this represents a reduction of roughly 25% relative to the mean.

By contrast, the coefficient on *Lose Connection* alone, which captures the effect for older officials, is negative but statistically insignificant. This asymmetry is consistent with the career incentive mechanism: younger officials, facing stronger promotion incentives, respond more sharply to the loss of patronage ties.

3.4 Effects on Local Structural Transformation

This section examines how losing political connections affects local structural transformation. Sections 3.2 and 3.3 show that prefecture leaders reduce infrastructure spending after losing their connections. Whether this matters for structural change depends on how infrastructure relates to the sectoral composition. Descriptively, prefectures that spend more on

Table 3. Political connection and infrastructure spending by party secretary age

	(1) Infras. Spending	(2) Spending per capita	(3) Infras. Spending Share
Lose Connection	-0.156	-0.138	-0.008
	(0.105)	(0.106)	(0.016)
Lose Connection × Young	-0.091	-0.091	-0.026***
	(0.069)	(0.069)	(0.009)
Young (Age ≤ 52)	0.168***	0.172***	0.028***
	(0.058)	(0.058)	(0.008)
Total Effect of losing a connection for Young Officials	-0.246**	-0.229**	-0.034*
	(0.103)	(0.104)	(0.017)
Controls	Y	Y	Y
Prefecture FEs	Y	Y	Y
Province × Year FEs	Y	Y	Y
R^2	0.871	0.857	0.787
Prefectures	268	268	268
Observations	1550	1550	1542
Mean of Dep. Var.	11.453	5.563	0.136

Notes: Dependent variable is 1-year forward infrastructure spending (log) and infrastructure share. Young = 1 if prefecture leaders' age ≤ 52 (Median). Total effect for young = $\beta_1 + \beta_2$. All regressions include prefecture and province×year FE. Standard errors clustered at the prefecture level are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

infrastructure per capita have lower agricultural and higher service employment shares, even after conditioning on GDP per capita. The manufacturing share rises with spending at first and then declines (Appendix Figure A-6). I now estimate the effect of losing a connection on local structural transfromation directly.

Since sectoral reallocation unfolds slowly, I estimate long-differences between the year a prefecture loses its tie, t, and each of the following three years. The specification is

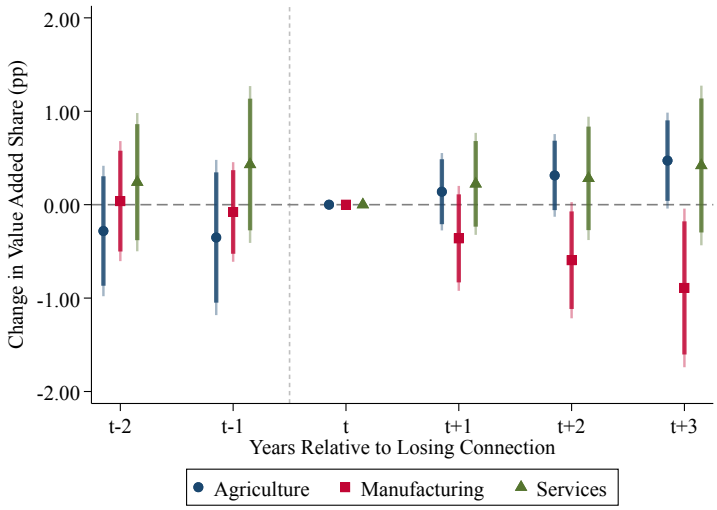
$$y_{i,p,t+k} - y_{i,p,t} = \beta_0 + \beta_1 \, HadConn_{i,t} \times PsecChange_{p,t} + \beta_2 \, HadConn_{i,t} + \Gamma \mathbb{X}_{i,t} + \gamma_i + \eta_{p,t} + \epsilon_{i,t} \quad (3)$$

where $y_{i,p,t}$ is the value added share in various sectors in prefecture i located in province p at year t. The sample, treatment and controls are as in Equation 1.

Prefectures experiencing a loss of political connections exhibit a significant decline in manufacturing share, accompanied by a modest increase in agricultural share. As Figure 6 shows, the estimated coefficients indicate a negative relationship between losing connections and manufacturing growth. In particular, the agricultural share falls by an average of 1.29 percentage points over two years, reflecting ongoing structural transformation. In prefectures that lose connections experience a 0.31 percentage points smaller decline, offsetting about one-quarter of the typical shift out of agriculture. The pattern is more pronounced for

manufacturing. While the sample mean change in manufacturing share is positive (0.42 pps), consistent with ongoing industrialization, the estimated coefficient of -0.59 percentage points implies a net decline in prefectures that lose connections. Losing connections thus does not merely slow industrialization in these prefectures; it reverses it.

Figure 6. Effects of losing a connection on sectoral value-added shares



Notes: The figure plots estimates of β_1 from Equation 3, the effect of losing a connection to the provincial secretary on the change in each sector's value-added share, in percentage points. Table A-4 reports the corresponding coefficients. For $t+k$, the dependent variable is $y_{i,p,t+k} - y_{i,p,t}$; for $t-k$, it is $y_{i,p,t} - y_{i,p,t-k}$. All regressions control for city leaders' characteristics and pre-appointment economic conditions, and include prefecture and province-by-year fixed effects. Thick bars denote 90% confidence intervals and thin bars 95% confidence intervals, based on standard errors clustered at the prefecture level.

Overall, these results indicate that prefecture leaders' career incentives increase local infrastructure investment and promote structural transformation. When those incentives dissolve, the shift from agriculture to manufacturing slows. These estimates are likely a lower bound in magnitude. In the years after a leadership transition, some prefectures form new connections with the incoming provincial leader, which attenuates the estimated impact of losing prior connections.

Robustness Checks. The results are robust to two checks. First, estimating the same specifications without controls yields very similar results (Figure A-10). Second, I conduct a placebo test. I randomly reassign the treatment status across prefectures within the same province and turnover window, holding fixed the number of treated prefectures in each window. I then re-estimate the baseline specification on the permuted data. As Figure A-11 shows, the placebo estimates are centered around zero and the actual estimates lie in the tail of their distribution.

4 A Spatial Equilibrium Model with Political Incentives

Motivated by empirical findings in Section 3, I develop a spatial general equilibrium model to analyze the effects of local officials' career incentives on public investment allocation and further on spatial development, especially regional structural change. In particular, I extend the model of Eckert and Peters (2025) to three sectors and incorporate political determinants of economic development, building on the contributions by Song and Xiong (2026).

The economy comprises R prefectures, indexed by $i, j \in \{1, ..., R\}$, and time, t, is discrete. Prefectures differ in amenities, productivity, and the career incentives of local officials. Each prefecture is populated by households, firms, and a local official. Households, of fixed total mass $\bar{L}_t$, choose a prefecture in which to live, a sector in which to work, and how to spend their income among agriculture, manufacturing, and services goods. Firms in each sector hire labor and sell their output. Agricultural and manufacturing goods are traded across prefectures subject to trade costs, while services are produced and consumed locally.

The local official collects a lump-sum tax from manufacturing firms and divides the revenue between government consumption and infrastructure investment. Infrastructure accumulates into a stock, G_{it}, that raises productivity in manufacturing and services. The official values both government consumption and the prospect of promotion; the payoff on promotion, κ_{it}, is the career incentive. I explain details about this mechanism in Section 4.3.

4.1 Household

Households face three sequential decisions. First, they choose a region in which to reside, subject to migration costs. Second, upon arrival, individuals learn their sector-specific labor productivity and select the sector offering the highest wages. Third, they allocate income across consumption goods to maximize their utility. Households are hand-to-mouth consumers who exhaust their earnings each period. Below, I first specify household preferences and consumption decisions before addressing spatial mobility and sectoral choice.

Preferences

Since the change in expenditure share across sectors is a key feature of structural change, I use non-homothetic preferences to model the consumption choice. In particular, I use the Price Independent Generalized Linear (PIGL) preferences, following Boppart (2014); Eckert and Peters (2025); Fan et al. (2023). Individuals value agricultural, manufacturing, and service goods. Since agriculture and manufacturing goods can be traded across regions, I

assume a CES function to aggregate varieties across regions.

$$c_{iA} = \left(\sum_{j=1}^{R} (c_{ijA})^{\frac{\sigma_A - 1}{\sigma_A}} \right)^{\frac{\sigma_A}{\sigma_A - 1}} \quad \text{and,} \quad c_{iM} = \left(\sum_{j=1}^{R} \int_0^{N_j} c_{ijM}(\omega)^{\frac{\sigma_M - 1}{\sigma_M}} d\omega \right)^{\frac{\sigma_M}{\sigma_M - 1}} \tag{4}$$

where c_{ijA} is the consumption of agricultural goods produced in region j by an individual living in region i. $c_{ijM}(\omega)$ is the consumption of manufacturing variety ω produced in region j by an individual living in region i. σ_A and σ_M are the elasticities of substitution across regions for agricultural and manufacturing goods, respectively. Service goods are non-tradable, so individuals can only consume local service goods.

PIGL preferences have no closed-form direct utility function. The indirect utility function follows:

$$V(e, \mathbb{P}_{ist}) = \frac{1}{\eta} \left(\frac{e}{P_{iAt}^{\phi_A} P_{iMt}^{\phi_M} P_{iSt}^{\phi_S}} \right)^{\eta} - \sum_{s \in A,M,S} \nu_s ln P_{ist} \tag{5}$$

where e is expenditure, $\mathbb{P}_{ist}$ is the price vector. $P_{iAt}, P_{iMt}, P_{iSt}$ are the prices of agricultural, manufacturing, and service goods, respectively. η is the Engel elasticity, which governs the shape of consumers' Engel curves. $\eta, \phi_s \in (0, 1)$.

The individual expenditure share on sector s via Roy's identity follows:

$$\vartheta_s(e, \mathbb{P}_{ist}) = \phi_s + \nu_s \left(\frac{e}{P_{iAt}^{\phi_A} P_{iMt}^{\phi_M} P_{iSt}^{\phi_S}} \right)^{-\eta} \tag{6}$$

where ϕ_s is the asymptotic expenditure share of sector s when expenditure approaches infinity. Since $\eta > 0$, when $\nu_s > 0$, individuals reduce their expenditure share on sector s as their income increases. If $\eta = 1$ and $\nu_s = 0$, the PIGL preferences reduce to the standard homothetic Cobb-Douglas preferences.

Spatial Mobility Individuals can migrate across regions. At the beginning of each period, workers can move to another region but face migration costs. I denote the distribution of workers across regions at the beginning and end of a period by $\{L_{it}\}_i$ and $\{L'_{it}\}_i$, respectively.

I assume that workers only know their labor productivity in each sector after they arrive in a location. The expected utility of a worker i moving from region r to region j at time t is given by:

$$\mathcal{U}_{rjt}^i \equiv \frac{\mathcal{V}_{jt} \mathcal{B}_{jt}}{\mu_{rjt}} \mu_{jt}^i \quad s.t. \quad \mathcal{V}_{jt} = \int V(e, p_{jt}) dF_{jt}(e) \tag{7}$$

$\mathcal{V}_{jt}$ denotes the expected utility of a worker in region j at time t, which reflects the uncertainty of labor productivity after arriving in region j. $\mathcal{B}_{jt}$ denotes amenity, which is exogenous.

μ_{rjt} denotes the migration costs between region r and j at time t. μ^i_{jt} is the idiosyncratic location preference shock, which is independent across individuals and locations. It follows the Fréchet distribution, with shape parameter ϵ.

Workers migrate to the region where they can maximize their expected utility. Using properties of the Fréchet distribution, the migration decision is given by:

$$m_{rjt} = \frac{(\mathcal{V}_{jt}\mathcal{B}_{jt}/\mu_{rjt})^{\epsilon}}{\sum_{j'}(\mathcal{V}_{j't}\mathcal{B}_{j't}/\mu_{rj't})^{\epsilon}} \tag{8}$$

where $\mathcal{V}_{jt} = \int V(e,\mathbb{P})dF_{jt}(e) = \frac{1}{\eta}\Gamma_{\frac{\zeta}{\eta}}(\bar{w}_{jt}/(P^{\phi_A}_{jAt}P^{\phi_M}_{jMt}P^{\phi_S}_{jSt}))^{\eta} + \sum_{s=A,M,S}\nu_s ln(P_{jst})$ is the expected utility.

Thus, the total number of workers in location j at the end of period t is given by:

$$L'_{jt} = \sum_r m_{rjt}L_{rt} \tag{9}$$

Sectoral labor supply One feature of structural transformation is labor reallocation across sectors. In other words, labor moves from agriculture to manufacturing and service. To incorporate this, I assume workers are heterogeneous in their labor productivity across sectors. In particular, I use the typical Roy-type machinery. Workers are specialized in various sectors. An individual worker i in region r can supply z^i_s efficiency units labor to sector s that are drawn from a sector-specific Fréchet distribution, $P(z^i_s \leq z) = F_s(z) = e^{-z^{-\zeta}}$. The parameter ζ captures the dispersion of efficiency units across workers in sector s. Thus, the income of each worker i who works in sector s is $z^i_s w_{rs}$, where w_{rs} denotes the payment per efficiency unit of labor in sector s in region r.

Workers choose the sector to maximize their income, y^i_r. In other words, $y^i_r = max_s\{z^i_s w_{rs}\}$. Since z follows the Fréchet distribution, the income also follows the Fréchet distribution, that is,

$$F_r(y) = e^{-(y/\bar{w}_r)^{-\zeta}} \quad where \quad \bar{w}_r = (w^{\zeta}_{rA} + w^{\zeta}_{rM} + w^{\zeta}_{rS})^{1/\zeta} \tag{10}$$

where $\bar{w}_r$ is the average earnings in region r. Based on this, I get the sectoral employment share and aggregate efficient labor supply:

$$s_{rs} = P(y^i_{rs} > y^i_{rs'}) = \frac{w^{\zeta}_{rs}}{\sum_s w^{\zeta}_{rs}} = \frac{w^{\zeta}_{rs}}{\bar{w}^{\zeta}_{rs}} \tag{11}$$

$$H_{rs} = s_{rs}L_r E(z^i_s|sector\ s\ chosen) = \Gamma_{\zeta}L_r(w_{rs}/\bar{w}_{rs})^{\zeta-1} \tag{12}$$

where $\Gamma_{\zeta} \equiv \Gamma(1-1/\zeta)$ and $\Gamma(\cdot)$ is the gamma function [5]. As shown in Eckert and Peters

[5]The property of the Fréchet distribution: If the CDF is $F(x) = e^{-x^{-\alpha}}$, where α is a shape parameter.

(2025), the parameter ζ captures the sectoral labor supply elasticity. The higher ζ is, the more elastic the labor supply is.

4.2 Production side

To capture the structural transformation, I set up the model with three sectors: agriculture, manufacturing, and service. While agriculture and manufacturing goods are tradeable, services can only be provided by local firms. Moreover, besides normal production factors, infrastructure can raise sectoral productivity.

Agriculture Sector

Agricultural production follows a standard Cobb–Douglas technology.

$$Y_{iAt} = Z_{iAt} H_{iAt}^{1-\alpha} T_{iA}^{\alpha} \tag{13}$$

where Z_{iAt} is the total factor productivity (TFP), which grows at an exogenous rate, H_{iAt} is the efficient labor, and T_{iA} is agricultural land, which is fixed. Thus, the agricultural sector exhibits decreasing returns to scale.

Profit maximization yields the labor demand function:

$$\pi_{iAt} = p_{iAt} Y_{iAt} - \tilde{w}_{iAt} H_{iAt} - r_{iAt} T_{iA} \tag{14}$$

where p_{iAt} is the price of agriculture goods, $\tilde{w}_{iAt}$ is the wage per efficient labor in agriculture sector, r_{iAt} is the land rent. I assume that the land rents go to workers. Thus, the total payment in agricultural sector is $w_{iAt} \equiv \tilde{w}_{iAt} + \frac{\alpha}{1-\alpha}\tilde{w}_{iAt} = \frac{1}{1-\alpha}\tilde{w}_{iAt}$. Thus, the labor demand function of agricultural firms is:

$$H_{iAt} = p_{iAt}^{\frac{1}{\alpha}} w_{iAt}^{-\frac{1}{\alpha}} Z_{iAt}^{\frac{1}{\alpha}} T_{iA} \tag{15}$$

Manufacturing Sector

The manufacturing sector features standard monopolistic competition with a lump-sum tax. There is a representative final-goods firm that assembles the intermediate varieties to final manufacturing consumption goods.

$$Y_{iMt} = \left(\int_0^N y(\omega)^{\frac{\sigma_m - 1}{\sigma_m}} d\omega \right)^{\frac{\sigma_m}{\sigma_m - 1}} = \left(\sum_{j=1}^{R} \int_0^{N_{jt}} y_{jt}(\omega)^{\frac{\sigma_m - 1}{\sigma_m}} d\omega \right)^{\frac{\sigma_m}{\sigma_m - 1}} \tag{16}$$

The expectation of x is $E(x) = \Gamma(1 - \frac{1}{\alpha})$ for $\alpha > 1$

where N is the total number of varieties available and N_{jt} is the number of varieties produced in location j, which is endogenous, σ_m is the elasticity of substitution across varieties.

Intermediate firms face entry costs, f_{iEt}. After firms enter local market, each firm produces a variety ω. The intermediate firm's technology follows:

$$y_{it}(\omega) = \tilde{Z}_{iMt} h_{ipt}(\omega) \tag{17}$$

$$\tilde{Z}_{iMt} = Z_{iMt} G_{it}^{\gamma_M} \tag{18}$$

where $\tilde{Z}_{iMt}$ and Z_{iMt} are the TFP in manufacturing sector, Z_{iMt} follows an exogenous process. G_{it} is the local public investment, such as infrastructure, and h_{ipt} is the efficient labor for production. I assume that the local infrastructure increases the manufacturing sector productivity of the city (as in Song and Xiong (2026); Chambru et al. (2024)). γ_M captures the intensity of the effect. [6]

In addition, intermediate firms have to pay a lump-sum tax, τ_{it}, to local government to finance local infrastructure investment. Thus, for the intermediate firm, the profit function is:

$$\pi_{it} = p_{it}(\omega) y_{it}(\omega) - w_{iMt} h_{iMt} - \tau_{it} \tag{19}$$

subject to the demand function of the intermediate good:

$$y_{it}(\omega) = \left(\frac{p_{it}(\omega)}{P_{iMt}} \right)^{-\sigma} Y_{iMt} \tag{20}$$

where P_{iMt} is the price index of manufacturing goods in region i at time t,

$$P_{iMt} = \left(\sum_{i=1}^{R} \int_0^{N_{it}} p(\omega)_{ijt}^{1-\sigma_m} \lambda_{ijt}^{1-\sigma_m} \, d\omega \right)^{\frac{1}{1-\sigma_m}} \tag{21}$$

Since intermediate firms can freely enter regions, the profits must equal the entry costs. This pins down the mass of firms in each region.

$$p_{it}(\omega) y_{it}(\omega) - w_{iMt} h_{ipt} - \tau_{it} - w_{iMt} f_{iEt} = 0 \tag{22}$$

Since the tax is lump-sum, it does not affect firms' decisions. The optimal price of the

[6] Infrastructure could also affect the productivity in agriculture. However, in the baseline model, I assume the governments' interventions only affect the manufacturing and service sectors to reflect local governments' incentives for boosting local economic development via pro-manufacturing and pro-service investment. In addition, Zeng and Zhou (2024) empirically demonstrate that local officials' career incentives only have significant effects on manufacturing and service sectors and no effect on agriculture sector, which supports my assumption.

intermediate goods is still a constant markup of the cost, $p_{it} = \frac{\sigma}{\sigma-1}MC$, where MC is the marginal cost of the intermediate goods. The profit for each firm is $\frac{1}{\sigma}p_{it}(\omega)y_{it}(\omega)$, which must equal the entry cost.

$$\frac{1}{\sigma}p_{it}(\omega)y_{it}(\omega) = w_{iMt}f_{iEt} + \tau_{it} \tag{23}$$

To get the mass of firms in region i, I use the free entry condition (I drop ω for simplicity) from Equation 22 and get:

$$h_{iPt} = (\sigma - 1)(\tau_{it}/w_{iMt} + f_{iEt}) \tag{24}$$

where h_{iPt} is the labor for production in each intermediate firm. Thus, the total labor demand in manufacturing sector is:

$$H_{iMt} = H_{iPt} + H_{iEt} \quad \text{and} \quad N_{it} = \frac{H_{iMt}}{(\sigma f_{iEt} + (\sigma - 1)\frac{\tau_{it}}{w_{iMt}})} \tag{25}$$

Service Sector

Service goods are non-tradable and are produced by a local representative firm. The technology follows:

$$Y_{iSt} = \tilde{Z}_{iSt}H_{iSt} \tag{26}$$

$$\tilde{Z}_{iSt} = Z_{iSt}G_{it}^{\gamma_S} \tag{27}$$

where $\tilde{Z}_{iSt}$ is the TFP in service sector, Z_{iSt} is the exogenous service TFP, H_{iSt} is the efficient labor, γ_S captures the effect of local public goods on service sector productivity. I assume the service sector is perfectly competitive. The wage in service sector follows:

$$w_{iSt} = P_{iSt}\tilde{Z}_{iSt} \tag{28}$$

where w_{iSt} is the wage in service sector and P_{iSt} is the price of service goods.

4.3 Local government

In each region, local officials maximize their utility from consumption and the probability of career promotion. The local governments collect a lump-sum tax, τ_{it}, from each intermediate firm. Thus, the total tax revenues are $N_{it}\tau_{it}$. These tax revenues are used for current consumption and providing local infrastructure investment.

Local government's decision problem Local governments face intertemporal consumption and public investment problem and intratemporal consumption problem. I assume

that local officials face standard Cobb-Douglas preferences within periods. The local officials' objective function of intratemporal problem in each period is: [7]

$$U_{it}^G = V(E_{it}^G, P_{iAt}, P_{iMt}, P_{iSt}) + \kappa_{it} log(G_{it+1}) \tag{29}$$

where $V(E_{it}^G, P_{iAt}, P_{iMt}, P_{iSt}) = \frac{1}{\eta}\left(\frac{E_{it}^G}{P_{iAt}^{\phi_A} P_{iMt}^{\phi_M} P_{iSt}^{\phi_S}}\right)^{\eta}$ is the indirect utility. E_{it}^G is the local officials' consumption. G_{it} is infrastructure investment. κ_{it} denotes the governor's current-period incentive to invest in infrastructure. If $\kappa_{it} = 0$, there are no career incentives, and local officials care only about current government spending.

The term $\kappa_{it} \log G_{i,t+1}$ is the reduced form of a career-concerns model in the spirit of Holmström (1999), following Song and Xiong (2026). The provincial leadership cannot observe a prefecture leader's ability and infers it from local economic performance, which infrastructure raises. Leaders therefore invest to improve their assessed ability. In equilibrium the evaluator anticipates this extra investment and is not misled. Yet each leader still invests, because a leader who invested less would appear less able. Derivation details are in Appendix Section C.

Combining equations (A-25) and (A-26) yields the local government's constraint:

$$G_{it+1} = N_{it}\tau_{it} + (1 - \delta_{it})G_{it} - E_{it}^G \tag{30}$$

For the intertemporal problem, local officials deal with the optimal spending and investing decision, i.e. choose E_{it}^G and G_{it+1} to maximize their objective.

$$\max_{E_{it}^G, G_{it+1}} U_{i0}^G = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left\{ V(E_{it}^G, P_{iAt}, P_{iMt}, P_{iSt}) + \kappa_{it} log(G_{it+1}) \right\} \tag{31}$$

$$s.t. \quad G_{it+1} = N_{it}\tau_{it} + (1 - \delta_{it})G_{it} - E_{it}^G \tag{32}$$

After some derivations (see Appendix Section E for details), I get the Euler equation:

$$\left(1 - \underbrace{\kappa_{it} \frac{(E_{it}^G)^{1-\eta} \Psi_{it}^{\eta}}{G_{i,t+1}}}_{\text{investment wedge}}\right) \frac{V_E(E_{it}^G)}{V_E(E_{i,t+1}^G)} = \beta \left(1 + \text{MRG}_{i,t+1}\right), \tag{33}$$

where

$$\text{MRG}_{i,t+1} \equiv \varepsilon_{N,G}^{i} \frac{(\text{N}\tau)_{i,t+1}}{G_{i,t+1}} - \delta_{i,t+1}^G \tag{34}$$

[7] The local governors are like the landlords in Kleinman et al. (2023) but not the same, since local governors get income from tax and care about their own political objective.

is the local government's marginal revenue product of infrastructure. Here, $\varepsilon^i_{N,G} = \frac{\sigma_M - 1}{\sigma_M}\gamma_M\left[(\zeta - 1) + s_{it}\right]$ and $s_{it} \equiv \frac{(\sigma_M-1)\tau_{it}/w_{iMt}}{\sigma_M f_{iEt} + (\sigma_M - 1)\tau_{it}/w_{iMt}} \in (0,1)$. Career incentives introduce an investment wedge that tilts the intertemporal trade-off toward infrastructure: higher κ_{it} raises $G_{i,t+1}$ at the expense of current public consumption E^G_{it}. For the details of the derivation, please see Appendix Section E.

4.4 Market Clearing

For agricultural goods, market clearing condition is:

$$w_{iAt}H_{iAt} = \sum_j \underbrace{\left(\frac{\lambda_{ijt}p_{iAt}}{P_{jAt}}\right)^{1-\sigma_A}}_{\text{trade share}} \left(\underbrace{\vartheta_{jAt}\Gamma_\zeta L_{jt}\bar{w}_{jt}}_{\text{private demand}} + \underbrace{\vartheta^G_{jAt}E^G_{jt}}_{\text{public demand}}\right) \tag{35}$$

where ϑ_{jAt} and ϑ^G_{jAt} are the expenditure shares on agriculture goods for private and public demand, respectively.

For manufacturing goods, sales of firm ω located in region i are given by:

$$p_{it}(\omega)y_{it}(\omega) = \sum_j \underbrace{\left(\frac{\lambda_{ijt}p_{iMt}(\omega)}{P_{jMt}}\right)^{1-\sigma}}_{\text{trade share}} (\underbrace{\vartheta_{jMt}\Gamma_\zeta L_{jt}\bar{w}_{jt}}_{\text{private demand}} + \underbrace{\vartheta^G_{jMt}E^G_{jt}}_{\text{public demand}}) \tag{36}$$

where λ_{ijt} denotes the iceberg trade costs between region i and j. $\vartheta_{jMt} = \frac{\int \vartheta_{Mt}(y,\mathbb{P})y\,dF_i(y)}{\int y\,dF_i(y)}$ $= \phi_M + \nu_M \frac{\Gamma_{\zeta/(1-\eta)}}{\Gamma_\zeta}\left(\frac{\bar{w}_i}{P_{iA}^{\phi_A}P_{iM}^{\phi_M}P_{iS}^{\phi_S}}\right)^{-\eta}$ is the aggregate expenditure share on manufacturing goods. $\Gamma_\zeta L_{jt}\bar{w}_{jt}$ is the average income of workers in region j. E^G_{jt} denotes public expenditure.

For local service sector, total sales equal total expenditures on service goods:

$$w_{iSt}H_{iSt} = \underbrace{\vartheta_{iSt}\Gamma_\zeta L_{it}\bar{w}_{it}}_{\text{private demand}} + \underbrace{\vartheta^G_{iSt}E^G_{it}}_{\text{public demand}} \tag{37}$$

Services cannot be traded, thus, all service goods are consumed locally.

For the labor market, the total labor supply in region i is given by:

$$L'_{it} = \sum_i^R L_{it}m_{ijt}, \quad \text{and} \quad m_{ijt} = \frac{(\mathcal{V}_{jt}\mathcal{B}_{jt}/\mu_{ijt})^\epsilon}{\sum_{j'}(\mathcal{V}_{j't}\mathcal{B}_{j't}/\mu_{ij't})^\epsilon} \tag{38}$$

m_{ijt} denotes the migration rate from region i to region j.

Local governments Local officials' optimal consumption and saving conditions are

$$G_{it+1} = N_{it}\tau_{it} + (1-\delta_{it})G_{it} - E^G_{it} \tag{39}$$

$$\left(1 \;-\; \kappa_{it}\,\frac{(E^G_{it})^{1-\eta}\,\Psi^{\eta}_{it}}{G_{i,t+1}}\right)\frac{V_E(E^G_{it})}{V_E(E^G_{i,t+1})} \;=\; \beta\left(1+\mathrm{MRG}_{i,t+1}\right) \tag{40}$$

where $V_E(E^G_{it}) = (E^G_{it})^{(\eta-1)}\left(\frac{1}{P^{\phi_A}_{iAt}P^{\phi_M}_{iMt}P^{\phi_S}_{iSt}}\right)^{\eta}$.

And local officials maximize their objectives, workers maximize their utility and firms maximize their profits. In each region, given structural parameters and local political incentives, I need to solve 5 unknowns $\{L_{it}, w_{iAt}, w_{iMt}, w_{iSt}, E^G_{it}\}$ by solving the system of 5 equations: 35, 36, 37, 38, 39.

Definition 1. ***Static Equilibrium*** *Given structural parameters and the lump-sum tax, τ_i, and the initial distribution of labor, productivity and infrastructure, $\{L_{i0}, Z_{iA0}, Z_{iM0}, Z_{iS0}, G_{i0}\}_i$, the static equilibrium is a set of wages $\{w_{iA}, w_{iM}, w_{iS}\}$, prices $\{P_{iA}, P_{iM}, P_{iS}\}$, workers' consumption $\{C_{iA}, C_{iM}, C_{iS}\}$, local officials' expenditure $\{E^G_i\}$, public investment $\{G_i\}$, and efficient labor supply $\{H_{iA}, H_{iM}, H_{iS}\}$ such that: 1) consumers maximize their location choice utility and consumption; 2) the creation of local varieties is consistent with free entry; 3) firms maximize their profits; 4) local officials maximize their objectives; 5) all markets clear.*

4.5 Social planner's optimal allocation

To compare the decentralized equilibrium with the centralized planner, I assume there is a local planner, who allocates consumption and public goods across regions. This is the benchmark allocation. Its objective is to maximize households' welfare, which is measured by the sum of the utility of local households and local officials' utility from current government expenditure. In this case, local officials' career incentives are not considered. The local planner's problem in region i is:

$$\max_{E_{it},\,G_{it+1}} \quad \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(V^G_{it} + \sum_{r}^{L_{ir}} V_{irt}\right) \tag{41}$$

$$\text{s.t.} \quad G_{it+1} = N_{it}\tau_{it} + (1-\delta)G_{it} - E^G_{it} \tag{42}$$

where i denotes region and I is the total number of regions, V^G_{it} is the utility of current government expenditure for local officials, L_{ir} denotes total population in region i and V_{irt} is resident r's utility in region i. The local planner faces the same budget constraint as the baseline, and other equilibrium conditions. The local planner prices only the benefits

of infrastructure that accrue within its own prefecture, so it isolates the distortion from career incentives. The local planner does not internalize spillovers to other prefectures. Appendix E.8.1 sets out the social planner's problem, which does.

Theoretically, since infrastructure is a public good that creates externalities, decentralized provision is not optimal. The local planner takes externalities into account. Here I compare investment allocation under three scenarios: 1) no career incentive, which means local officials only care about current expenditure; 2) the baseline model: utility from expenditure and career promotion; 3) local planners whose objectives are to maximize local residents' welfare and officials' welfare from expenditure. Table 4 summarizes the three scenarios and their Euler equations and Figure 7 provides an illustrative graph.

This comparison shows that career incentives are not only a distortion; they can also act as a subsidy to infrastructure. When local officials only care about expenditure, they under-invest in public goods since they do not consider the positive externalities from public goods to households. When local officials care about career promotion, they invest more in public goods, which is closer to the socially optimal allocation. But the impact depends on the *intensity* of career incentives.

Table 4. Investment allocation decisions in three scenarios

Scenario	Objective	Euler equation (MC = MB)
1. Baseline	Official: V^G + career incentives ($\kappa_i > 0$)	$V_E(E^G_{it}) = \frac{\kappa_{it}}{G_{i,t+1}} + \beta\,\mathbb{E}_t\Big[(1+\text{MRG}_{i,t+1})\,V_E(E^G_{i,t+1})\Big]$
2. No incentives	Official: V^G only ($\kappa_i = 0$)	$V_E(E^G_{it}) = \beta\,\mathbb{E}_t\Big[(1+\text{MRG}_{i,t+1})\,V_E(E^G_{i,t+1})\Big]$
3. Local planner	Region i: V^G + residents' utility	$V_E(E^G_{it}) = \beta\,\mathbb{E}_t\Big[\sum_{r=1}^{L_i}\frac{\partial V_{ir,t+1}}{\partial G_{i,t+1}} + (1+\text{MRG}_{i,t+1})\,V_E(E^G_{i,t+1})\Big]$

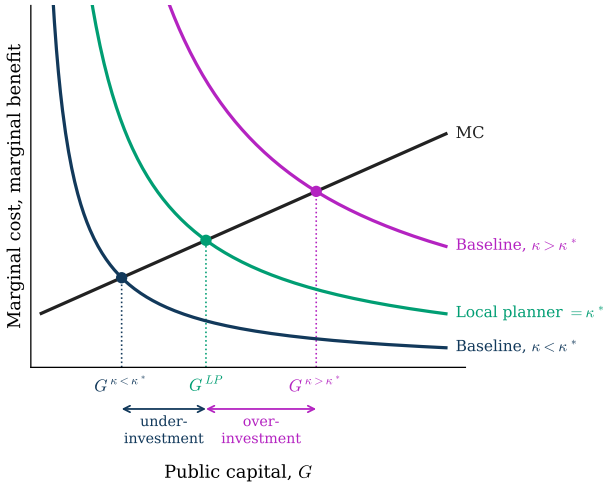
Notes: $V_E(E^G_{it}) \equiv \partial V^G_{it}/\partial E^G_{it}$ is the marginal value of public consumption, the marginal cost of investing one unit in $G_{i,t+1}$. $\text{MRG}_{i,t+1} \equiv \varepsilon^i_{N,G}\,\text{N}\tau_{i,t+1}/G_{i,t+1} - \delta^G_{i,t+1}$ is the local government's marginal revenue product of infrastructure (equation (33)). Comparing rows 1 and 3, the official's choice coincides with the local planner's when $\kappa^*_{it}/G_{i,t+1} = \beta\,\mathbb{E}_t\sum_r \partial V_{ir,t+1}/\partial G_{i,t+1}$: career incentives act as a Pigouvian subsidy for the local benefit of infrastructure.

Proposition (Career incentives and public investment). Let $G^{LP}_{i,t+1}$ denote the local benevolent planner's choice of infrastructure in region i.

1. Without career incentives ($\kappa_{it} = 0$), the local official under-invests: $G_{i,t+1} < G^{LP}_{i,t+1}$.
2. There exists an incentive level $\kappa^*_{it} > 0$, satisfying $\kappa^*_{it}/G^{LP}_{i,t+1} = \beta\,\mathbb{E}_t\sum_r \partial V_{ir,t+1}/\partial G_{i,t+1}$, under which the official chooses $G^{LP}_{i,t+1}$. Career incentives therefore act as a Pigouvian subsidy for the local benefits of infrastructure: officials with $\kappa_{it} < \kappa^*_{it}$ under-invest, and those with $\kappa_{it} > \kappa^*_{it}$ over-invest.

The proof is in Appendix E.7.

Figure 7. Career incentives and infrastructure investment



Notes: Stylized illustration of the official's investment decision. The marginal cost of public capital rises with G because investment is financed by forgone current expenditure. The optimal incentive κ^* aligns the official's marginal benefit with that of a local planner. Officials with $\kappa < \kappa^*$ under-invest (the case $\kappa = 0$ is the limit), and those with $\kappa > \kappa^*$ over-invest. Curves are illustrative, not calibrated.

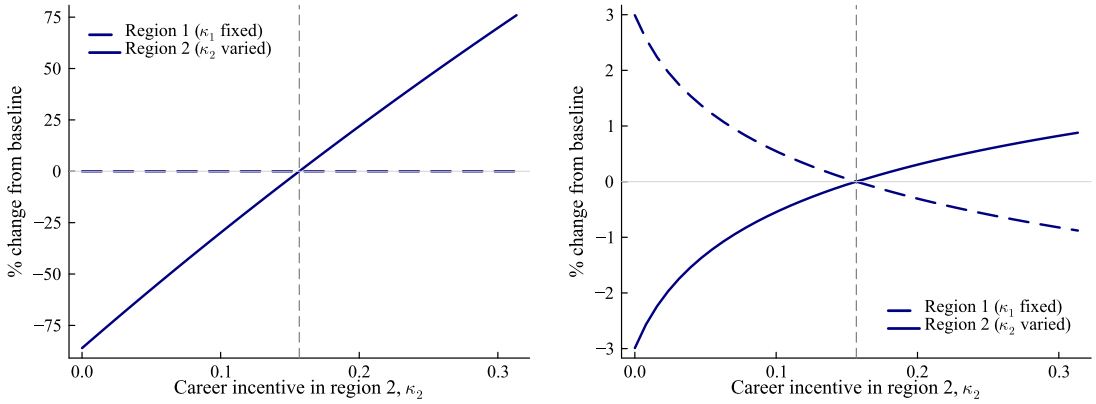
4.6 Illustrative Example: Comparative Statics

To illustrate the mechanism, I consider an economy with two regions that are identical in every respect: productivity, amenities, land, tax rates, and career incentives. I calibrate both regions to the prefecture with the median GDP per capita in 2000. I invert the model on the two-region economy using the structural parameters in Table 5. Migration between the regions is costly, at the median bilateral migration cost in the 2000 sample, and trade is free. The recovered career incentive is $\kappa = 0.16$ in both regions. I then vary the career incentive in region 2 from zero to twice its baseline value, holding region 1's fixed, as would happen if region 2's leader gained or lost a tie to the provincial leader.

Figure 8 shows the effects on investment and population. A stronger career incentive raises region 2's investment ratio: doubling κ_2 raises it by 76 percent, and eliminating it lowers it by 86 percent. Region 1's investment ratio does not move, since its official's incentive is unchanged. The response is asymmetric, falling faster as κ_2 approaches zero than it rises as κ_2 grows, because the return to public capital diminishes as the stock accumulates. Higher public capital raises region 2's productivity in manufacturing and services and draws workers from region 1, but migration costs keep the reallocation small: doubling κ_2 raises region 2's population share by less than 1 percent.

Figure 9 shows the effects on sectoral employment. In region 2, a stronger career incentive moves labor out of agriculture and into manufacturing: doubling κ_2 lowers the agricultural share by 1.4 percent and raises the manufacturing share by 3.5 percent. The service share barely changes, because public capital raises manufacturing productivity more than service productivity ($\gamma_M > \gamma_S$) and services are not traded. Region 1 moves in the opposite direction, though by much less. With free trade, region 2's productivity gain shifts manufacturing toward region 2, so region 1's manufacturing share falls slightly while its agricultural share rises. Career incentives therefore speed structural change where they are strong and slightly slow it in other regions, a spatial spillover that motivates the quantitative model.

Figure 8. Career incentives, infrastructure investment, and population share



(a) Investment ratio

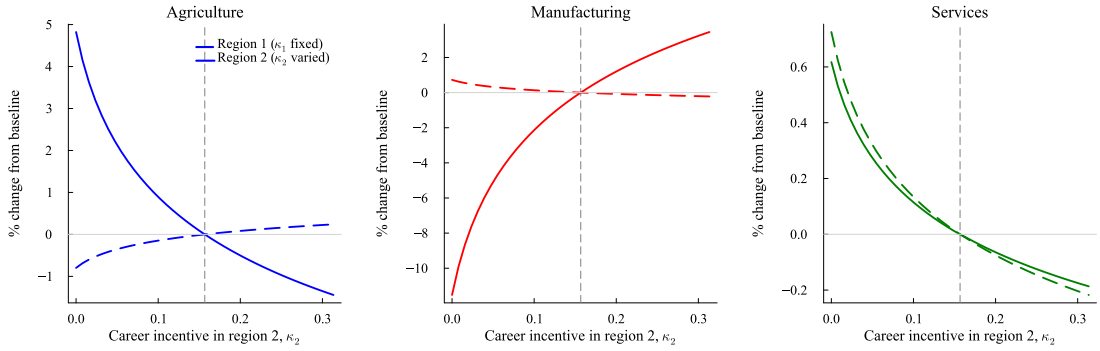
(b) Population share

Notes: Two-region economy calibrated to the prefecture with the median GDP per capita in 2000 (see text). Both regions start at the recovered career incentive, $\kappa = 0.16$ (vertical dashed line). I vary the career incentive in region 2 (solid lines), holding region 1's fixed (dashed lines). The y-axis reports the percentage change relative to the symmetric baseline.

5 Taking the Model to the Data

In this section, I describe how I combine calibration and inversion to bring the model to the data. The analysis uses city-level data from 2000 to 2020 to invert the model, with each model period representing 10 years, i.e. 2000, 2010, and 2020. Due to data limitations, I exclude seven provinces: Tibet, Xinjiang, Gansu, Inner Mongolia, Ningxia, Qinghai and Hainan provinces. The first six provinces have predominantly ethnic-minority populations with economic characteristics that differ substantially from the main Chinese population, while Hainan, as an island province, lacks reliable data on migration and trade costs. This sample restriction yields 23 provinces and about 225 prefectures, covering the majority of

Figure 9. Career incentives and sectoral employment shares



Notes: Two-region economy calibrated to the prefecture with the median GDP per capita in 2000 (see text). Both regions start at the recovered career incentive, $\kappa = 0.16$ (vertical dashed line). I vary the career incentive in region 2 (solid lines), holding region 1's fixed (dashed lines). The y-axis reports the percentage change in each sector's employment share relative to the symmetric baseline.

China's economically integrated regions.

Structural parameters borrowed from the literature For the household PIGL preference parameters, I directly adopt values from Chen et al. (2023), who estimate these parameters using China's household-level survey data, making them well-suited for my model. For the labor mobility parameter of the Fréchet distribution, I follow Tombe and Zhu (2019) and set $\epsilon = 2.0$. For the production side, I set the land share in agriculture to $\alpha = 0.36$, following Adamopoulos et al. (2022). In the manufacturing and service sectors, infrastructure can affect productivity. All parameters are shown in Table 5.

Migration costs and trade costs I construct migration costs and goods trade costs using travel time for passengers and freight across prefectures from Ma and Tang (2024), which calculates travel time via roads and railways between prefectures, accounting for transportation infrastructure quality. Migration costs are a function of passenger travel time and trade costs a function of freight travel time, with the time elasticities and mode-specific cost parameters estimated by Ma and Tang (2024). Appendix B.4 gives the details.

Infrastructure elasticity parameters γ_M and γ_S The parameters γ_M and γ_S govern the elasticity of manufacturing and service total factor productivity with respect to local infrastructure, through $\tilde{Z}_{iMt} = Z_{iMt} G_{it}^{\gamma_M}$ and $\tilde{Z}_{iSt} = Z_{iSt} G_{it}^{\gamma_S}$. They are central to the quantitative analysis: together they determine how strongly the spatial allocation of infrastructure passes through to sectoral productivity and, in turn, to structural change. Following Wang et al. (2020b), I set $\gamma_M = 0.05$ and $\gamma_S = 0.03$, with $\gamma_M > \gamma_S$ reflecting the pro-manufacturing orientation of local infrastructure. [8] I report robustness checks for these

[8] Wang et al. (2020b) estimate the effects of infrastructure investment on sectoral productivity in China using firm-level data. Their estimates are consistent with the elasticity parameters used by Henderson et al. (2022) and Song and Xiong (2026).

Table 5. Structural parameters

Variable	Value	Meaning	Source
PIGL Preferences			
η	0.375	Engel elasticity	Chen et al. (2023)
ν_A	0.48	PIGL preference parameter for agriculture	
ν_M	0.52	PIGL preference parameter for manufacturing	
ν_S	-1.0	PIGL preference parameter for service	
ϕ_A	0.01	Asymptotic expenditure share on agriculture goods	
ϕ_M	0.37	Asymptotic expenditure share on manufacturing goods	
ϕ_S	0.62	Asymptotic expenditure share on service goods	
Labor supply			
ϵ	2.0	Location taste heterogeneity	Tombe and Zhu (2019)
ζ	3.0	Labor supply elasticity	Fan et al. (2023)
Production			
α	0.36	Land share in agriculture production function	Adamopoulos et al. (2022)
γ_M	0.05	Share of public goods in manufacturing production function	Wang et al. (2020b)
γ_S	0.03	Share of public goods in service production function	
σ	5.0	Elasticity of substitution between manufacturing goods	Standard
f_E	1.0	Fixed cost of entry	Normalization
Local government			
δ	0.13	Depreciation rate of public investment	Song and Xiong (2026)
β	0.9	Discount factor of local officials	
τ		Local lump-sum tax	Calibration from data
Structural residuals			
Z_{iA}		Local agricultural productivity	
Z_{iM}		Local manufacturing productivity	
Z_{iS}		Local service productivity	
$\mathcal{B}_i$		Local amenity	

two parameters in Section 7.

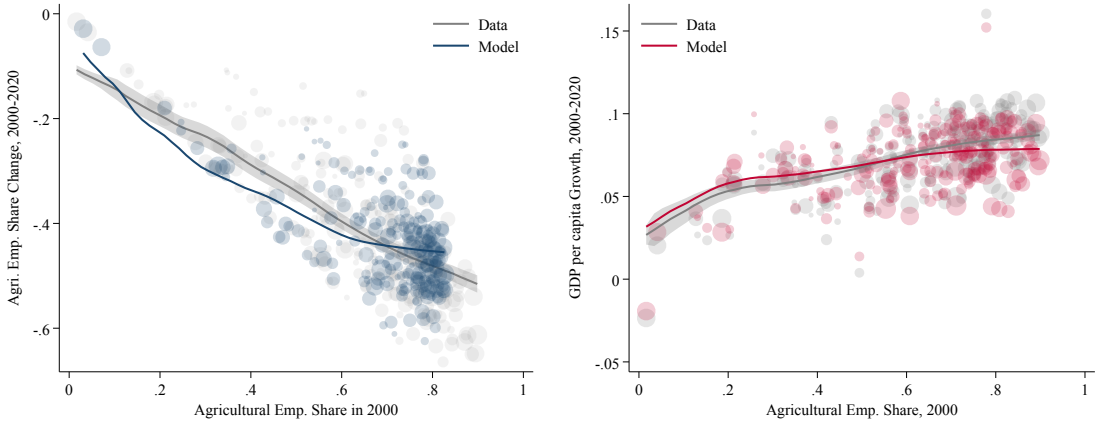
Regional fundamentals in 2000 Given these structural parameters, I use prefecture-level data in 2000 to invert regional fundamentals, including productivity in agriculture (Z_{iA2000}), manufacturing (Z_{iM2000}), and services (Z_{iS2000}), and local amenity ($\mathcal{B}_{i2000}$). Assuming that the average wage equals local GDP per capita, the Fréchet structure gives sectoral wages. Given wages, I solve for sectoral prices from the goods markets clearing conditions. Once prices are known, sectoral productivity follows directly. Meanwhile, I use regional population share to invert local amenity.

5.1 Model Fit

I first check the model's fit to two moments: agricultural employment share and GDP per capita growth. Figure 10 illustrates the model's ability to match the cross-section of structural transformation and growth across Chinese prefectures. Panel (a) shows a strong negative relationship between initial agri1cultural employment share and subsequent structural change: prefectures that were more agricultural in 2000 experienced larger declines in agricultural employment by 2020. Panel (b) shows that more agricultural regions grew somewhat faster in per capita terms, consistent with convergence. Since both moments are

targeted in the model inversion, the close fit confirms that the procedure successfully recovers fundamentals that rationalize observed outcomes. The figure also highlights two salient features of China's regional development over this period: rapid structural transformation away from agriculture was nearly universal, and growth rates exhibited notable convergence across prefectures with different initial economic structures.

Figure 10. Model fit: employment share and GDP per capita growth



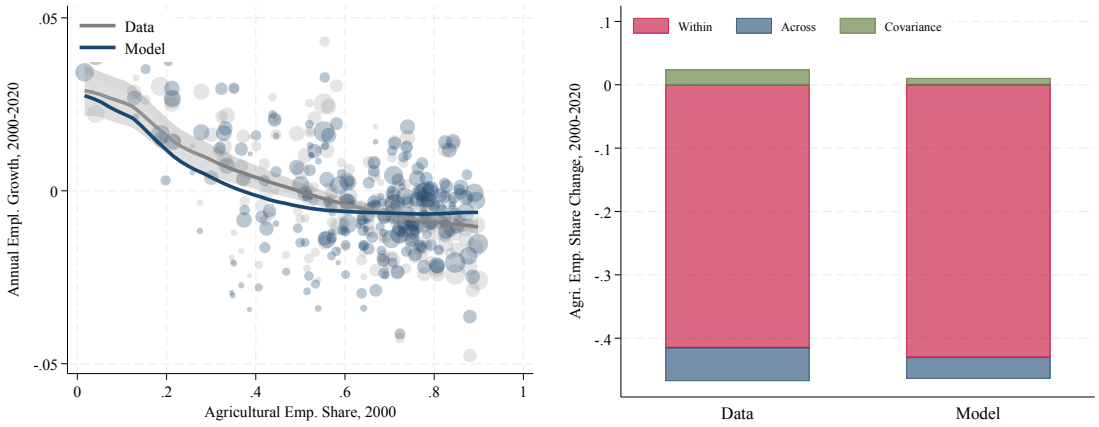
(a) Structural Transformation **(b)** GDP per Capita Growth

Notes: Panel (a) plots the change in agricultural employment share (2000–2020) against the initial agricultural employment share in 2000. Panel (b) plots annualized GDP per capita growth (2000–2020) against the same initial condition. In both panels, each point represents a prefecture, with marker size proportional to initial employment. The gray line and shaded band show a nonparametric local polynomial smooth and its 95% confidence interval estimated from the data; the colored line shows the corresponding smooth from model outcomes.

I also examine the model's fit to non-targeted moments, as shown in Figure 11 for employment change and local labor reallocation. Panel (a) shows that more agricultural prefectures experienced slower employment growth over 2000–2020, a pattern consistent with labor reallocation away from agriculture toward urban sectors. The model reproduces both the level and the nonlinear shape of this relationship closely, including the flattening among prefectures with very high initial agricultural shares. Panel (b) provides a more demanding test by decomposing aggregate structural change into within-prefecture, across-prefecture, and covariance components. In the data, the decline in the national agricultural employment share is driven almost entirely by within-prefecture structural transformation, that is, by workers shifting out of agriculture locally rather than by differential population growth across more and less agricultural regions. The model matches this composition well, with the within component dominating and the across and covariance terms playing quantitatively similar roles in both data and model. The close fit on these non-targeted moments, particularly the decomposition, which disciplines the spatial dimension of the model separately from the sec-

toral dimension, strengthens confidence that the model captures the relevant forces shaping China's structural transformation.

Figure 11. Non-targeted moments: employment growth and structural change



(a) Local employment growth **(b)** Local structural change

Notes: This figure assesses model fit using non-targeted moments. Panel (a) plots annualized local employment growth (2000–2020) against the initial agricultural employment share in 2000. Each point represents a prefecture, with marker size proportional to initial population. The gray and blue lines show nonparametric local polynomial smooths for the data and model, respectively, with 95% confidence bands. Panel (b) decomposes the aggregate decline in the agricultural employment share between 2000 and 2020 into three components following Eckert and Peters (2025): $\Delta s_{At} = \sum_i l_{it}\Delta s_{iAt} + \sum_i \Delta l_{it} s_{iAt} + \sum_i \Delta l_{it}\Delta s_{iAt}$, where Δ denotes the 20-year difference, l_{it} is prefecture i's share of national employment, and s_{iAt} is the agricultural employment share in prefecture i. The three terms correspond to the within, across, and covariance components, respectively.

6 Quantitative Analysis

This section proceeds in three steps. I first recover career incentives for each prefecture from the model and document how they vary across space and over time. I then compare the decentralized equilibrium with the allocation a benevolent local planner would choose, which measures how far career incentives push public investment away from its local optimum. Finally, I use the model for three counterfactuals. First, I choose a uniform incentive level while holding total infrastructure spending constant, to explore the spatial reallocation effect. Second, I reassign career incentives across prefectures to evaluate them as a place-based policy and their effect on spatial inequality. Finally, I restore the 2000 incentives in the 2020 economy to quantify their contribution to structural change over the two decades.

6.1 Recovering Career Incentives

I recover career incentives from officials' fiscal allocation choices. The governor's Euler equation links κ_{it} to how the local budget is divided between public investment and current government expenditure. Given the structural parameters and the equilibrium objects the model delivers (public capital, public consumption, the price index, and the fiscal return to infrastructure), κ_{it} is the only unknown in this equation, so each prefecture's observed infrastructure spending share pins it down exactly. Solving the steady-state Euler equation for κ_i gives

$$\kappa_i \;=\; G_i\,\Psi_i^{-\eta}\,(E_i^G)^{\eta-1}\left[\,1-\beta(1-\delta)-\beta\,\tfrac{\sigma_M-1}{\sigma_M}\,\gamma_M\left[(\zeta-1)+s_i\right]\tfrac{\mathrm{N_i}\tau_i}{G_i}\,\right] \tag{43}$$

where G_{it} is the public investment and E_{it} is the expenditure from the model, and $\Psi = P_{iA}^{\phi_A} P_{iM}^{\phi_M} P_{iS}^{\phi_S}$ is the price index, obtained from the equilibrium. And $s_{it} \equiv \frac{(\sigma_M-1)\,\tau_{it}/w_{iMt}}{\sigma_M\,f_{iEt}+(\sigma_M-1)\,\tau_{it}/w_{iMt}} \in (0,1)$ is the share of the tax-related labor cost in per-firm labor requirement. τ_{it} is the local lump-sum tax, w_{iMt} is the local manufacturing wage, and f_{iEt} is the fixed entry cost. For the derivation, see Appendix Section E.

There are two parts in the bracketed term: the first piece, $1-\beta(1-\delta)$, is the standard user cost of public capital. The second piece, $\beta\,\frac{\sigma_M-1}{\sigma_M}\,\gamma_M\left[(\zeta-1)+s_i\right]\frac{\mathrm{N_i}\tau_i}{G_i}$, is the *fiscal return* to public investment: building G raises the local manufacturing wage, attracts more firms (both through Fréchet labor reallocation and by relaxing the labor-equivalent tax burden), expands the tax base, and partially self-finances. Critically, because s_i varies with the local lump-sum tax τ_i and wage w_{iM}, the fiscal-return elasticity is region-specific.

All terms on the right-hand side of equation (43), other than the structural parameters, are equilibrium objects of the model rather than raw data. The recovery proceeds in three steps. First, I invert the model to obtain the fundamentals (sectoral productivities and regional amenities) that rationalize each prefecture's observed sectoral employment shares, infrastructure spending share, and GDP per capita. Second, I solve the model at these fundamentals to obtain the equilibrium objects that enter the equation, including wages and sectoral prices, which are unobserved in the data. Third, I evaluate equation (43) at these values to obtain κ_{it} for each prefecture.

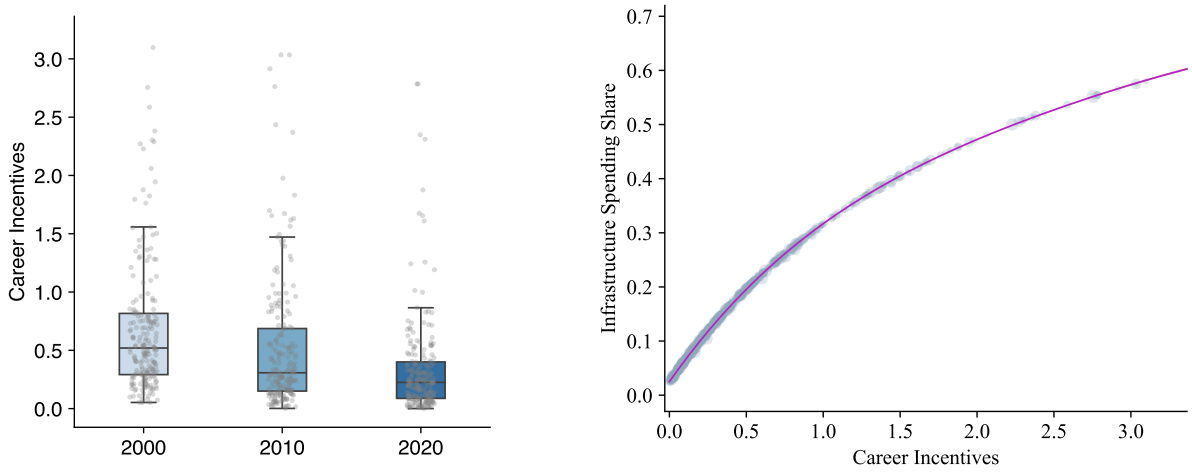
Figure 12 presents prefecture-level career incentives in 2000, 2010, and 2020. Panel (a) shows that the distribution of career incentives in these three years becomes more compressed and shifts down. In particular, the median career incentive declines from 0.520 in 2000 to 0.225 in 2020, and the mean drops from 0.726 to 0.343. The decline coincided with the slowdown in national growth (Appendix Figure A-13). This trend is consistent with the political atmosphere during this period and confirms Song and Xiong (2026)'s result. In this

period, the central government shifted from GDP-driven to inclusive development and local officials' promotion returns from output fall.

Panel (b) plots the infrastructure spending share against the recovered κ. Since infrastructure spending enters the inversion procedure used to recover incentives, the positive relationship is expected by construction. Nevertheless, the figure is informative about the *shape* of the mapping: the concave relationship indicates that κ rises less than proportionally with the infrastructure share, consistent with prefectures that spend heavily on infrastructure also having higher equilibrium prices and wages that attenuate the recovered wedge.

To validate the recovered wedge, I relate it to administrative rank, which plays no role in the inversion. Party secretaries of provincial capitals and sub-provincial cities already hold vice-ministerial rank and compete for provincial leadership: in 2000–2015, 35 to 52 percent of them later reached full-ministerial rank, against 4 percent of other prefecture secretaries. If κ captures the value officials place on promotion, it should be higher where the prize is larger. It is: the recovered incentives in these cities are about twice those elsewhere in each of 2000, 2010, and 2020 (Appendix Figure A-14). In addition, I also check the relationship between these incentives and regional characteristics, such as GDP per capita and population size (Appendix Figure A-15). I find no clear correlation, suggesting that κ does not simply proxy for economic development.

Figure 12. Career incentives and infrastructure spending share across prefectures



(a) Career incentives distribution

(b) Career incentives and infras. spending share

Notes: Panel (a) displays the model-recovered career incentives wedge (κ) from Equation 43 across prefectures in 2000, 2010, 2020. Boxes denote the interquartile range (25th–75th percentile) with the median indicated by the horizontal line; whiskers extend to 1.5 times the interquartile range. Grey dots show individual city-level observations, jittered horizontally for visibility. Panel (b) plots the infrastructure spending share against the career incentives. Each point represents a prefecture, with marker size proportional to population and the red line denotes the best non-linear fit.

6.2 Optimal Infrastructure Allocation

In this section, I compare the allocation chosen by a benevolent local planner with that chosen by career-motivated officials in the baseline equilibrium and quantify to what extent local governments' behavior causes inefficiency and the welfare cost.

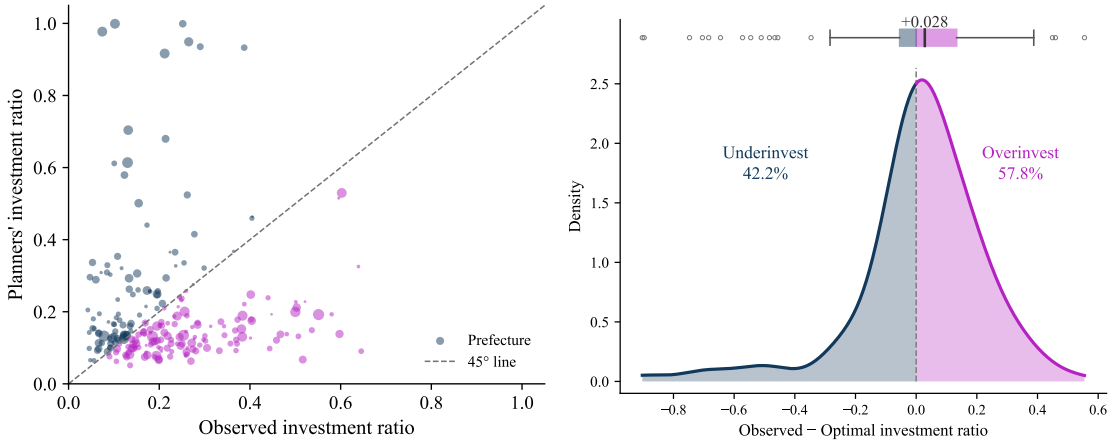
The career concerns lead more than half of prefectures to overinvest relative to the optimal allocation. Figure 13 compares each prefecture's observed investment ratio in 2000 with the ratio a local planner would choose. The planner maximizes the combined welfare of residents and officials subject to the same fiscal budget, so the difference isolates the effect of career incentives on the allocation of public revenue. Panel (a) plots the two ratios against each other and panel (b) shows the distribution of the gap between them.

Three patterns stand out. First, career incentives distort the allocation of investment far more than its level. A majority of prefectures (57.8 percent, holding 57.2 percent of the population) invest more than the planner would, but the median gap is only 2.8 percentage points, and the planner would reduce aggregate public investment by just 5 percent. Second, the observed allocation carries almost no information about the efficient one. The optimal investment ratio is also highly dispersed. Efficiency calls for sharply differentiated investment across prefectures with very different returns to public capital, whereas officials competing on a common promotion metric invest at similar rates regardless of those returns. The gap rises systematically with the recovered career incentive (correlation 0.53), which identifies incentives, rather than local conditions, as its source. Third, the distortion is asymmetric. The typical over-investing prefecture exceeds the optimum by 11.5 percentage points, more than the typical under-investor falls short (7.6 points).

I next examine how the allocation between investment and current expenditure, and welfare, change across the distribution of career incentives. As Figure 14 shows, the effects are heterogeneous across the distribution. In particular, Panel (a) reports the change in each quintile's infrastructure investment and current expenditure. The change is monotone in career incentives. In the lowest-incentive quintile the planner raises public capital by 164.9 percent and finances this by cutting public consumption by 11.8 percent; in the highest quintile it cuts capital by 52.5 percent and returns 48.8 percent to consumption. The two series in panel (a) are linked by the government budget constraint. The point is that the swap is ordered by career incentives and that the middle quintiles are barely touched: Q3 and Q4 see capital change by 3.2 and -2.9 percent. Misallocation is concentrated in the tails of the incentive distribution, not spread across it.

As for the welfare, residents gain in regions with lower career incentives but lose in regions with higher incentives, as shown in Panel (b). Household equivalent variation ranges from $+2.0$ percent in Q1 to -1.0 percent in Q5, a span of three percentage points. This

Figure 13. Optimal vs. decentralized infrastructure allocation



(a) Investment ratio **(b)** Investment gap

Notes: Panel (a) plots each prefecture's observed investment ratio against the ratio chosen by a local planner. Marker size is proportional to population, and the dashed line marks equality (45-degree line). Prefectures below the line (purple) invest more than the planner would choose, and those above it (navy) invest less. Panel (b) shows the difference between observed (decentralized) and the optimal investment ratio under the local planner. A positive value indicates overinvestment. The box plot presents the distribution of the difference values. The median is 0.028. The points denote prefectures outside the 1.5 × IQR range.

is consistent with the local officials' behavior change. Infrastructure enters production by boosting local productivity in manufacturing and service and further affects households' wage and goods prices via general equilibrium effects. In addition, it directly affects officials' welfare by adjusting the allocation between current expenditure and infrastructure in the next period. Public capital is thus cheap in output and expensive in consumption, and misallocating it costs households little while costing public provision a great deal.

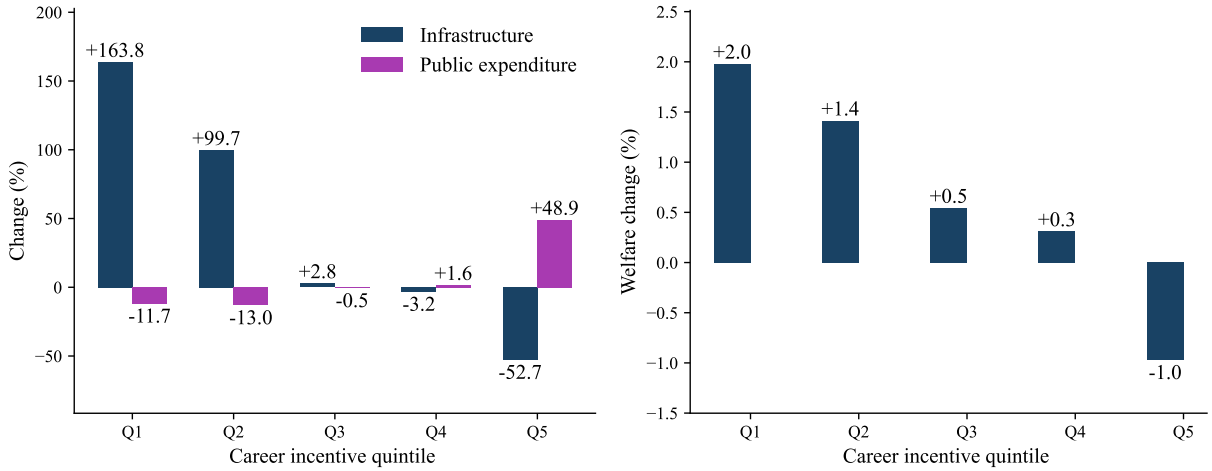
At the aggregate level, household welfare increases by 0.701% (population-weighted) and government welfare increases by 3.615% under the optimal allocation. Although the aggregate effect seems modest, the effects are heterogenous across regions.

The direction of the redistribution follows. Households in low-incentive prefectures are the ones career concerns leave worse off, because those prefectures receive too little infrastructure; households in high-incentive prefectures benefit from the over-provision and lose when it is withdrawn. Career incentives therefore transfer household income toward politically favored prefectures and transfer public services away from them.

6.3 Counterfactual Analysis

In this section, I conduct three counterfactual exercises to quantify the aggregate and distributional effects of career incentives. First, to estimate the effects of reallocating infrastruc-

Figure 14. Optimal vs. decentralized behavior and welfare



(a) Officials' behavior **(b)** Household welfare change

Notes: The y-axis denotes the change between the optimal results and the decentralized results. Panel (a) shows the change of local officials' allocation between infrastructure and current expenditure along the career incentives' distribution (five quintiles). Panel (b) shows the change in household welfare, i.e. equivalent consumption, along the career incentives' distribution.

ture across regions, I find the common incentive level that holds total infrastructure spending fixed and assign it to every prefecture. In this case, I do not change the total spending but only the location of infrastructure spending. Second, I explore whether the political incentives can act as a place-based policy to reduce spatial inequality. Finally, I examine the impact of the change in career incentives on structural change during 2000-2020. These three scenarios together give a complete picture of spatial misallocation, spatial inequality, and the long-run effect on industrilization.

Counterfactual 1: reallocation effects of infrastructure investment

In this case, I examine how equalizing career incentives reallocates infrastructure across prefectures. Specifically, the counterfactual sets every prefecture's incentive to a common level, chosen to leave aggregate infrastructure spending unchanged, so the exercise changes where public capital is built rather than how much. Each panel plots a prefecture's outcome against the change in its own incentive, $\Delta \ln \kappa_i$. The pattern is informative about how spatial misallocation operates and where it bites.

First, there is a large reallocation of infrastructure across prefectures. Results are shown in Panel (a) in Figure 15. Cities whose incentives are raised increase their investment ratio by up to 18 percentage points, and those whose incentives are cut reduce it by as much as 45 points. The relationship is concave: the governor's Euler equation saturates as investment approaches the full budget, so raising an incentive moves investment less than cutting it by

the same log amount. A city whose incentive is unchanged keeps its investment ratio exactly, because the investment decision depends only on its own incentive.

This reallocation translates into sectoral composition through the infrastructure-TFP channel (G^{γ_M}, G^{γ_S}), as shown in Panel (b). The manufacturing employment share rises by 0.55 percentage points per log point of career incentive, an attenuation that reflects the low elasticity of sectoral productivity to public capital ($\gamma_M = 0.05$). The fitted line does not pass through the origin: a prefecture whose own incentive is unchanged still gains 0.14 percentage points. This common component is general-equilibrium in origin. Equalization moves public capital away from prefectures with high incentives, which hold large capital stocks and face low marginal returns, toward prefectures where the return is higher, raising productivity in traded manufacturing that all regions share. At the average change in incentives, this spillover exceeds the direct effect of a prefecture's own incentive (0.14 against 0.10 percentage points), and the aggregate manufacturing share rises by 0.24 percentage points.

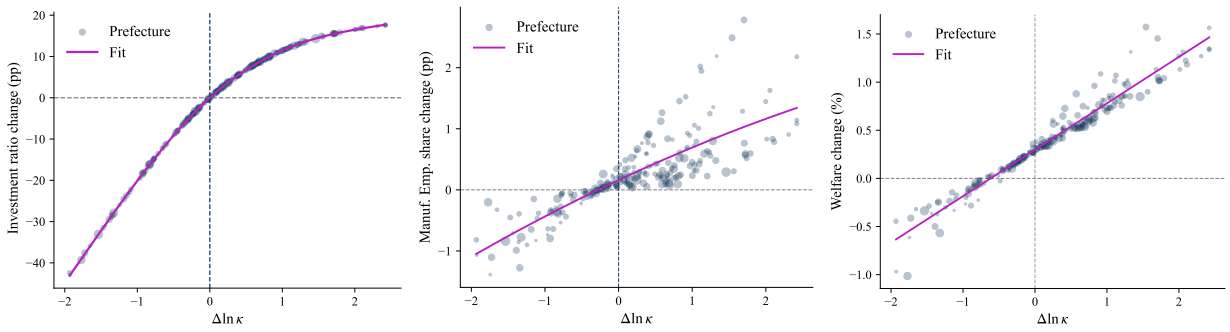
Finally, Panel (c) traces these effects through to household welfare. Welfare rises monotonically with the change in a prefecture's incentive, by about 0.5 percent per log point, and the common component is again positive. Cities whose incentives are cut therefore lose only when the cut is large: the fitted line crosses zero at $\Delta \ln \kappa_i \approx -0.63$, which corresponds to baseline incentives nearly twice the common level. Moderate cuts are more than offset by the gains from reallocation elsewhere. The reform thus harms only the prefectures where career incentives are most concentrated, while the rest of the country benefits from moving public capital toward higher returns.

The aggregate welfare gain of 0.396% thus combines two forces. First, each prefecture's own response to the change in its incentive, positive where incentives rise and negative where they fall. Second, a general equilibrium effect from the reallocation of public capital toward prefectures with higher returns. More importantly, the general equilibrium effect dominates (Appendix Figure A-16). Because every city shares in the common gain, only those whose incentives are cut sharply, with baseline incentives nearly twice the common level, lose on net. Equalization therefore raises aggregate welfare while concentrating its costs on the prefectures where career incentives are strongest.

Counterfactual 2: Political incentives as a place-based policy

There is large dispersion of career incentives and infrastructure spending across regions. In this case, I explore whether these political incentives can act as a place-based policy to balance regional development. This setting is motivated by real policies in China to alleviate poverty and spatial inequality. Specifically, the central government or the provincial governments select young officials with strong career incentives and assign them to poor

Figure 15. Reallocation effects of officials' career incentives



(a) Infrastructure **(b)** Manuf. Emp. Share **(c)** Household Welfare

Notes: Effects of the counterfactual that sets every prefecture's career incentive to a common level $\bar{\kappa}$, chosen so that total infrastructure spending equals its baseline value. The horizontal axis is the change in each prefecture's own incentive, $\Delta \ln \kappa_i = \ln(\bar{\kappa}/\kappa_i)$: positive values are prefectures whose incentives are raised (those with low baseline incentives), negative values those whose incentives are lowered. Panels plot the change relative to the baseline in (a) the investment ratio, (b) the manufacturing employment share, and (c) household welfare. Each marker is a prefecture, with size proportional to population. The solid line is a fitted curve.

regions. Such postings help their future promotion. [9] To simulate this policy, I swap career incentives between top and bottom deciles of prefectures. In this case, the distribution of whole career incentives does not change and only its location change.

This intervention slightly increases aggregate household welfare and reduces spatial inequality. As Panel A in Table 6 shows, the overall investment ratio declines by 0.29%, while aggregate manufacturing employment share and welfare increase by 0.01%. Although the aggregate effect is not large, the impacts on individual regions vary and can be large. In particular, besides the treatment regions' outcomes, including investment ratio, employment share, and household welfare, regions whose incentives do not change also gain. These effects stem from the general equilibrium effects. Because regions that initially lacked infrastructure now receive more investment, their productivity, especially in manufacturing, rises, attracting more workers. Furthermore, the manufacturing price falls. Because manufacturing goods are tradable, the lower price is better for all regions.

Notably, this policy can also reduce spatial inequality across prefectures. As Panel B in Table 6 presents, the income gap declines in terms of all three indices: the Gini index, the Theil index, and the P90/P10 ratio. These results support the central government's policy to allocate more ambitious officials to poor regions.

[9] The cadre secondment system is a pivotal institutional mechanism for fostering cadre exchange, enhancing leadership capabilities, and promoting economic development for poor regions. It also serves as an essential organizational instrument for modernizing the national governance system and governance capacity. For details, see https://paper.people.com.cn/rmlt/html/2020-05/21/content_1993150.htm.

Table 6. Results of swapping κ between the top and bottom deciles

Panel A. Effects by group	N	Pop. share (%)	Δ Inv. ratio (pp)	Δ Manuf. share (pp)	Δ Welfare V (%)	Δ Real income (%)
Bottom 10% κ ($\kappa \uparrow$)	22	9.0	+41.32	+1.53	+1.37	+3.83
Control 80%	181	81.4	+0.57	+0.11	+0.07	+0.20
Top 10% κ ($\kappa \downarrow$)	22	9.6	-46.60	-2.32	-1.79	-4.78
National	225	100.0	-0.29	+0.01	+0.01	+0.05
Panel B. Spatial inequality			Baseline	Counterfactual	Change (%)	
Gini, real income			0.3592	0.3519	-2.05	
Theil index, real income			0.2557	0.2437	-4.70	
Top/bottom-κ income ratio			2.8455	2.5850	-9.16	

Notes: The counterfactual exchanges career incentives between the 22 prefectures with the lowest and the 22 with the highest baseline κ. All other prefectures keep their baseline κ. Panel (A) reports population-weighted means of prefecture-level changes using baseline population. The National row equals the population-weighted sum of the three groups. Panel (B) uses population-weighted inequality measures computed within each equilibrium.

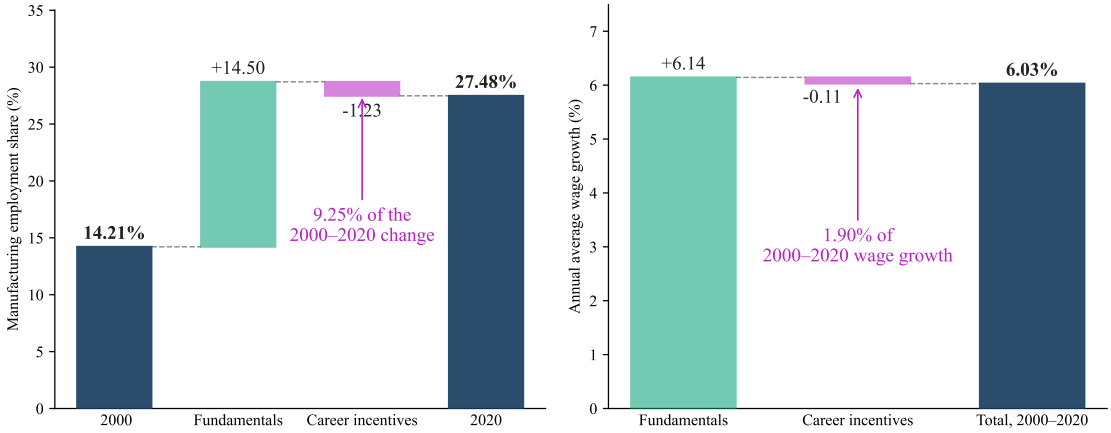
Counterfactual 3: Long-run effects of career incentives

This counterfactual quantifies how much the change in career incentives between 2000 and 2020 contributed to structural change. I solve the 2020 economy with each prefecture's career incentive reset to its 2000 level, holding all other fundamentals at their 2020 values. Because this counterfactual differs from the 2020 equilibrium only in career incentives, the gap between the two isolates the effect of the change in incentives. The observed change splits into two parts: the effect of changing fundamentals, evaluated at 2000 incentives, and the effect of weaker incentives, evaluated at 2020 fundamentals. Figure 16 reports the results.

The manufacturing employment share rose from 14.25 to 27.51 percent (Panel a). Changes in fundamentals alone would have raised it by 14.48 percentage points. The decline in career incentives subtracted 1.22 points, or 9.2% of the observed increase. Average wages grew by 6.04% a year (Panel b), and weaker incentives lowered that rate by 0.11 points, 1.9% of the total. Overall, the erosion of the promotion tournament cost China roughly a tenth of the rise in manufacturing employment but a small fraction of the real wage growth.

The magnitude reflects attenuation, not a weak behavioral response. Between 2000 and 2020 the share of local revenue devoted to public investment fell from 27.6 to 12.2 percent, and restoring 2000 incentives nearly doubles it. That a change of this size in local fiscal behavior moves the manufacturing share by little more than one percentage point follows from the low elasticity of sectoral productivity to public capital. Career incentives governed what local governments built far more than what the local economy became.

Figure 16. Contribution of career incentives to structural change during 2000–2020



(a) Manuf. Emp. Share **(b)** Wage Growth

Notes: Panel (a) reports the population-weighted manufacturing employment share. Panel (b) reports annualized growth of the population-weighted average real wage, $100 \times \Delta \ln \bar{w}/20$. The counterfactual solves the 2020 equilibrium with the 2000 vector of career incentives κ and all other 2020 fundamentals unchanged. "Fundamentals" is the difference between the counterfactual and 2000; "Career incentives" is the difference between 2020 and the counterfactual. The decomposition is exact and assigns the interaction between fundamentals and incentives to fundamentals. The contribution of career incentives is computed as $1.22/(27.51 - 14.25) = 9.22\%$ in panel (a) and $0.115/6.044 = 1.90\%$ in panel (b).

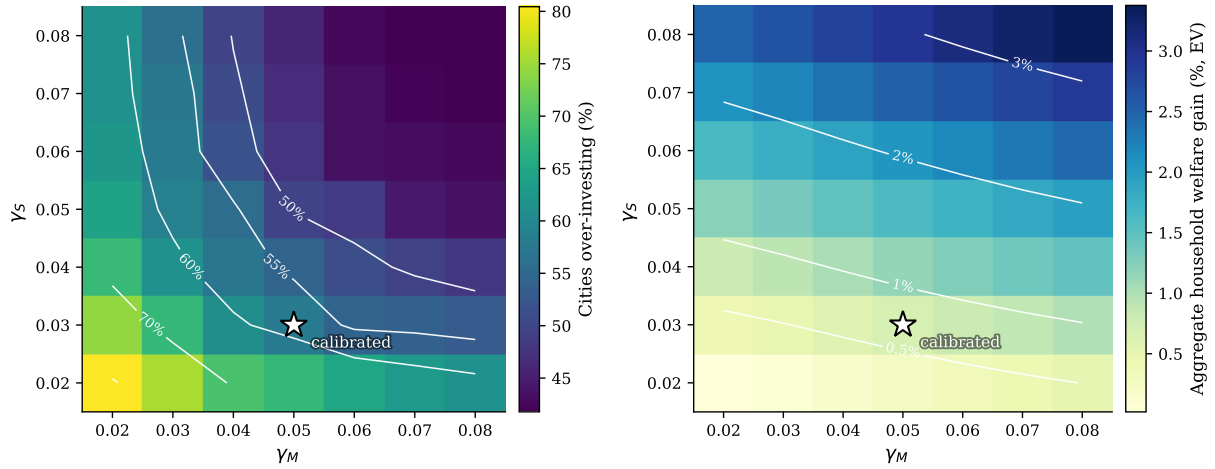
7 Robustness

This section examines how the main results depend on the key parameters. Neither the over-investment result nor the welfare gain from moving to the local planner's allocation is overturned by alternative values. I examine how the results depend on γ_M and γ_S, which govern how strongly infrastructure raises sectoral productivity. Since firms here use only labor and infrastructure is provided as public goods, γ_M and γ_S correspond to the *total* elasticity, which studies, such as Wang et al. (2020b), Henderson et al. (2022), Alder et al. (2023), and Song and Xiong (2026), place near 0.03 for China and below 0.10 elsewhere. Thus, I use a grid of seven values between 0.02 and 0.08. At each pair I re-invert the fundamentals, recover κ_i from officials' Euler equation, and re-solve both the baseline equilibrium and the local planner's allocation, so each grid point is a complete re-solution.

The central conclusions survive across the range of these parameters, as Figure 17 shows. The investment gap rises with career incentives at every point, so public investment is misallocated across space throughout the range. The magnitudes behave as expected: the share of prefectures that over-invest falls as public capital becomes more productive, from 80 percent to 42 percent. And the aggregate welfare gain from the benevolent planner's allocation rises with the service elasticity. That gain is positive at every point considered, between 0.02 and

3.4 percent. The baseline calibration is a conservative choice for welfare, since its gain of 0.7 percent lies near the bottom of this range. The corresponding share of over-investing prefectures, 58%, sits in the middle.

Figure 17. Robustness of the results to variations in γ_M and γ_S



(a) Share of Overinvestment

(b) Household Welfare

Notes: Each cell is a separate solution of the model at that pair (γ_M, γ_S): the fundamentals are re-inverted, the career incentives κ_i are recovered again from the governor's Euler equation, and both the decentralized equilibrium and the benevolent local planner's allocation are re-solved. Panel (a) reports the share of prefectures whose observed investment ratio exceeds the local planner's. Panel (b) reports the population-weighted equivalent variation of moving from the decentralized allocation to the planner's. White curves are contours of the plotted statistic and the star marks the baseline calibration $(\gamma_M, \gamma_S) = (0.05, 0.03)$. The plotted range $[0.02, 0.08]$ brackets the estimates of the output elasticity of infrastructure discussed in Section 5. Across the plotted range the share of over-investing prefectures is between 42 and 80 percent (58 percent at the baseline) and the welfare gain is positive at every point, between 0.02 and 3.4 percent.

8 Conclusion

This paper studies how political career incentives shape infrastructure investment and structural transformation in China. I provide reduced-form evidence that the weakening of career incentives induced by losing ties to superiors causes prefecture leaders to reduce infrastructure spending, decelerating local structural change. To quantify the aggregate consequences of these political frictions, I develop a spatial equilibrium model in which career incentives operate as an investment wedge on local infrastructure investment.

The paper presents three main findings. First, dispersed political incentives cause more than half of prefectures to overinvest in infrastructure. If we eliminate this distortion, both household welfare and the overall efficiency of infrastructure investment would improve. Second, even if we keep the current aggregate infrastructure spending, we can raise household

welfare via spatial reallocation of the infrastructure. And this spatial reallocation effect can offset more than half of the welfare cost at the baseline. Third, the overall career incentives declined during 2000-2020. This decline reduced regional infrastructure investment and slowed industrialization.

These findings bear on the political economy of infrastructure and regional development more broadly. Local governments carry out most public investment, about 60 percent in the OECD (Allain-Dupré et al., 2017). The case for decentralization rests on local governments' better knowledge of local preferences (Oates, 1999), but the officials who run them also respond to political incentives, whether re-election, promotion, or fiscal revenue. This paper shows that such incentives distort not only how much infrastructure is built but also where, with broader implications. First, political incentives are not simply distortions to be removed. Because local governments capture only part of the return to infrastructure, an incentive that rewards measured performance can offset under-provision. Its welfare effect is therefore non-monotone, and reforms that weaken it can overshoot, as China's experience between 2000 and 2020 illustrates. Second, much of the cost of political incentives is spatial. It lies in where capital is built, not only in how much, so evaluations of decentralization that track aggregate public investment miss this spatial margin, and policies that merely relocate incentives, such as rotating officials toward lagging regions, redistribute activity without raising it.

References

Adamopoulos, Tasso, Loren Brandt, Jessica Leight, and Diego Restuccia, "Misallocation, selection, and productivity: A quantitative analysis with panel data from China," *Econometrica*, 2022, *90* (3), 1261–1282.

Alder, Simon, Michael Zheng Song, and Zhitao Zhu, "On (Un) Congested Roads: A Quantitative Analysis of Infrastructure Investment Efficiency using Truck GPS Data," Technical Report, Working Paper 2023.

Allain-Dupré, Dorothée, Claudia Hulbert, and Margaux Vincent, "Subnational Infrastructure Investment in OECD Countries: Trends and Key Governance Levers," *OECD Regional Development Papers*, 2017, *2017* (5), 0_1–36.

Boppart, Timo, "Structural change and the Kaldor facts in a growth model with relative price effects and non-Gorman preferences," *Econometrica*, 2014, *82* (6), 2167–2196.

Bordeu, Olivia, "Commuting infrastructure in fragmented cities," *Job Market Paper, University of Chicago Booth School of Business*, 2023, *6*, 64.

Brandt, Loren and Xiaodong Zhu, "Accounting for China's growth," 2010.

Burgess, Robin, Remi Jedwab, Edward Miguel, Ameet Morjaria, and Gerard Padró i Miquel, "The value of democracy: evidence from road building in Kenya," *American Economic Review*, 2015, *105* (6), 1817–1851.

Chambru, Cédric, Emeric Henry, and Benjamin Marx, "The Dynamic Consequences of State Building: Evidence from the French Revolution," *American Economic Review*, 2024, *114* (11), 3578–3622.

Chen, Kaiji and Tao Zha, "China's macroeconomic development: The role of gradualist reforms," *Journal of Economic Literature*, 2025, *63* (4), 1331–1362.

Chen, Xilu, Guangyu Pei, Zheng Song, and Fabrizio Zilibotti, "Tertiarization Like China," *Annual Review of Economics*, 2023, *15* (1), 485–512.

Cheremukhin, Anton, Mikhail Golosov, Sergei Guriev, and Aleh Tsyvinski, "The Political Development Cycle: The Right and the Left in People's Republic of China from 1953," *American Economic Review*, 2024, *114* (4), 1107–1139.

Desmet, Klaus and Esteban Rossi-Hansberg, "Spatial Development," *American Economic Review*, April 2014, *104* (4), 1211–1243.

Donaldson, Dave, "Railroads of the Raj: Estimating the impact of transportation infrastructure," *American Economic Review*, 2018, *108* (4-5), 899–934.

Eckert, Fabian and Michael Peters, "Spatial Structural Change," 2025.

Erten, Bilge and Jessica Leight, "Exporting out of agriculture: The impact of WTO accession on structural transformation in China," *Review of Economics and Statistics*, 2021, *103* (2), 364–380.

Faber, Benjamin, "Trade integration, market size, and industrialization: evidence from China's National Trunk Highway System," *Review of Economic Studies*, 2014, *81* (3), 1046–1070.

Fajgelbaum, Pablo D, Cecile Gaubert, Nicole Gorton, Eduardo Morales, and Edouard Schaal, "Political Preferences and Transport Infrastructure: Evidence from California's High-Speed Rail," Working Paper 31438, National Bureau of Economic Research July 2024. Revise and Resubmit at American Economic Review.

Fan, Tianyu, Michael Peters, and Fabrizio Zilibotti, "Growing like India—the unequal effects of service-led growth," *Econometrica*, 2023, *91* (4), 1457–1494.

Finan, Frederico and Maurizio Mazzocco, "Electoral incentives and the allocation of public funds," *Journal of the European Economic Association*, 2021, *19* (5), 2467–2512.

Francois, Patrick, Francesco Trebbi, and Kairong Xiao, "Factions in nondemocracies: Theory and evidence from the Chinese Communist Party," *Econometrica*, 2023, *91* (2), 565–603.

Gollin, Douglas and Joseph P Kaboski, "New views of structural transformation: insights from recent literature," *Oxford Development Studies*, 2023, *51* (4), 339–361.

Hao, Tongtong, Ruiqi Sun, Trevor Tombe, and Xiaodong Zhu, "The effect of migration policy on growth, structural change, and regional inequality in China," *Journal of Monetary Economics*, 2020, *113*, 112–134.

Henderson, J Vernon, Dongling Su, Qinghua Zhang, and Siqi Zheng, "Political manipulation of urban land markets: Evidence from China," *Journal of Public Economics*, 2022, *214*, 104730.

Henkel, Marcel, Eunjee Kwon, and Pierre Magontier, "The unintended consequences of post-disaster policies for spatial sorting," *MIT Center for Real Estate Research Paper*, 2026, (22/08).

Herrendorf, Berthold, Richard Rogerson, and Akos Valentinyi, "Growth and structural transformation," *Handbook of economic growth*, 2014, *2*, 855–941.

Holmström, Bengt, "Managerial incentive problems: A dynamic perspective," *The review of Economic studies*, 1999, *66* (1), 169–182.

Hsiao, Allan, "Democratization and infrastructure investment: Evidence from healthcare in indonesia," Technical Report 2022.

Jia, Ruixue, Masayuki Kudamatsu, and David Seim, "Political selection in China: The complementary roles of connections and performance," *Journal of the European Economic Association*, 2015, *13* (4), 631–668.

Jiang, Junyan, "Making bureaucracy work: Patronage networks, performance incentives, and economic development in China," *American Journal of Political Science*, 2018, *62* (4), 982–999.

Jiang, Yuyang, "Strategic Transportation Investment and Coordinative Policies: Evidence from the U.S. Highway Network," Technical Report, Princeton University December 2025. Job Market Paper.

Kleinman, Benny, Ernest Liu, and Stephen J Redding, "Dynamic Spatial General Equilibrium," *Econometrica*, 2023.

Li, Hongbin and Li-An Zhou, "Political turnover and economic performance: the incentive role of personnel control in China," *Journal of public economics*, 2005, *89* (9-10), 1743–1762.

Ma, Lin and Yang Tang, "The distributional impacts of transportation networks in China," *Journal of International Economics*, 2024, *148*, 103873.

Martinez-Bravo, Monica and Leonard Wantchekon, "Political economy and structural transformation: democracy, regulation and public investment," *Oxford Development Studies*, 2023, *51* (4), 417–435.

Maskin, Eric, Yingyi Qian, and Chenggang Xu, "Incentives, information, and organizational form," *The review of economic studies*, 2000, *67* (2), 359–378.

Nagy, Dávid Krisztián, "Hinterlands, city formation and growth: Evidence from the US westward expansion," *Review of Economic Studies*, 2023, *90* (6), 3238–3281.

Oates, Wallace E, "An essay on fiscal federalism," *Journal of economic literature*, 1999, *37* (3), 1120–1149.

Qian, Yingyi, *How reform worked in China: The transition from plan to market*, MIT Press, 2017.

Rogoff, Kenneth, "Equilibrium Political Budget Cycles," *The American Economic Review*, 1990, *80* (1), 21–36.

Song, Zheng (Michael) and Wei Xiong, "The Mandarin Model of Growth," *American Economic Review*, 2026. Forthcoming.

Sun, Xueping, "The Innovation Cost of Short Political Horizons: Evidence from Local Leaders' Promotion in China," Technical Report, Technical Report. Working Paper 2023.

Tiebout, Charles M, "A pure theory of local expenditures," *Journal of political economy*, 1956, *64* (5), 416–424.

Tombe, Trevor and Xiaodong Zhu, "Trade, migration, and productivity: A quantitative analysis of china," *American Economic Review*, 2019, *109* (5), 1843–1872.

Trew, Alex, "Endogenous infrastructure development and spatial takeoff in the first industrial revolution," *American Economic Journal: Macroeconomics*, 2020, *12* (2), 44–93.

Wang, Zhi, Qinghua Zhang, and Li-An Zhou, "Career incentives of city leaders and urban spatial expansion in China," *Review of Economics and Statistics*, 2020, *102* (5), 897–911.

Wang, Zhifeng, Guiying Laura Wu, and Qu Feng, "Productivity of core infrastructure investment in China: An input–output approach," *The World Economy*, 2020, *43* (12), 3384–3406.

Xu, Chenggang, "The fundamental institutions of China's reforms and development," *Journal of economic literature*, 2011, *49* (4), 1076–1151.

Yao, Yang and Muyang Zhang, "Subnational leaders and economic growth: Evidence from Chinese cities," *Journal of Economic Growth*, 2015, *20* (4), 405–436.

_ , Tianyang Xi, Lixing Li, He Wang, and Feng Wan, "Selection, Training and Incentivizing — Evidence from the CCER Officials Dataset," *China Economic Quarterly*, 2020, *19* (03), 1017–1040. In Chinese.

Zeng, Jiangnan and Qiyao Zhou, "Mayors' promotion incentives and subnational-level GDP manipulation," *Journal of Urban Economics*, 2024, *143*, 103679.

Appendix

A Data Appendix **A-2**

A.1 Employment share and GDP per capita during 1952-2023 . . . . . A-2

A.2 Constructing the sample for empirical analysis A-3

B Additional Results **A-6**

B.1 Summary statistics and descriptive analysis A-6

B.2 Robustness check A-8

B.3 Age distribution and promotion probability of municipal secretaries A-14

B.4 Construction of migration and trade costs A-17

B.5 Additional quantitative results A-17

C Microfoundation of Career Incentives **A-19**

D Model derivations **A-21**

D.1 Household's problem A-21

D.2 Production A-21

E Local government's optimization problem **A-23**

E.1 Setup A-23

E.2 Lagrangian A-24

E.3 First-order conditions A-24

E.4 The fiscal-return term $\text{IncG}'_{it}(G_{it})$ A-24

E.5 Euler equation A-26

E.6 Inversion for κ_i A-26

E.7 Proof of the Proposition A-27

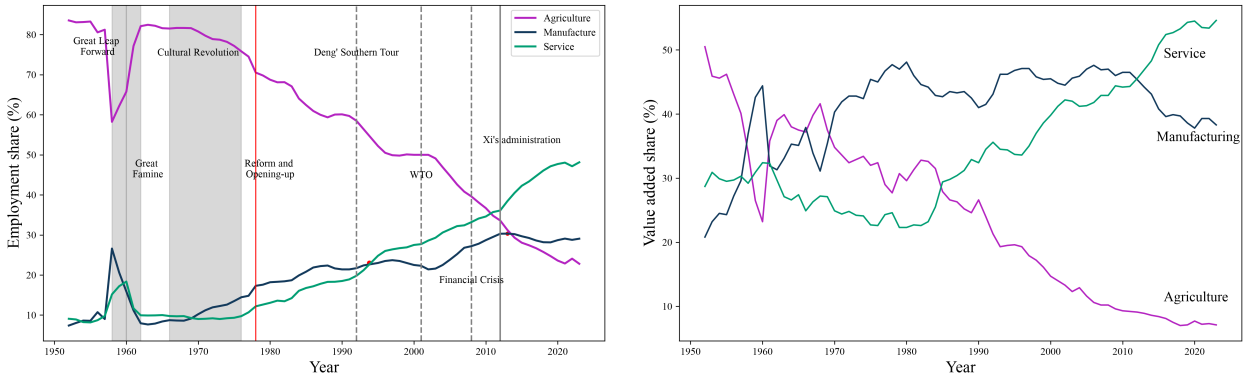
E.8 Model extensions A-28

A Data Appendix

A.1 Employment share and GDP per capita during 1952-2023

At the country level, I can trace employment share and value-added share over 1952-2023. As Figure A-1 shows, the pattern is the canonical one predicted by the structural change literature, but compressed into a much shorter time horizon than in Western economies. GDP per capita and its growth rate during 1952-2023 are shown in Figure A-2.

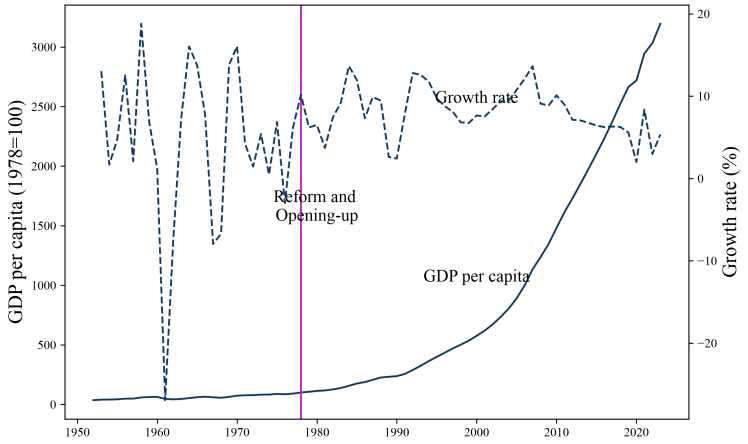
Figure A-1. Employment and value-added shares in broad sectors during 1952–2023



(a) Employment share **(b)** Value-added share

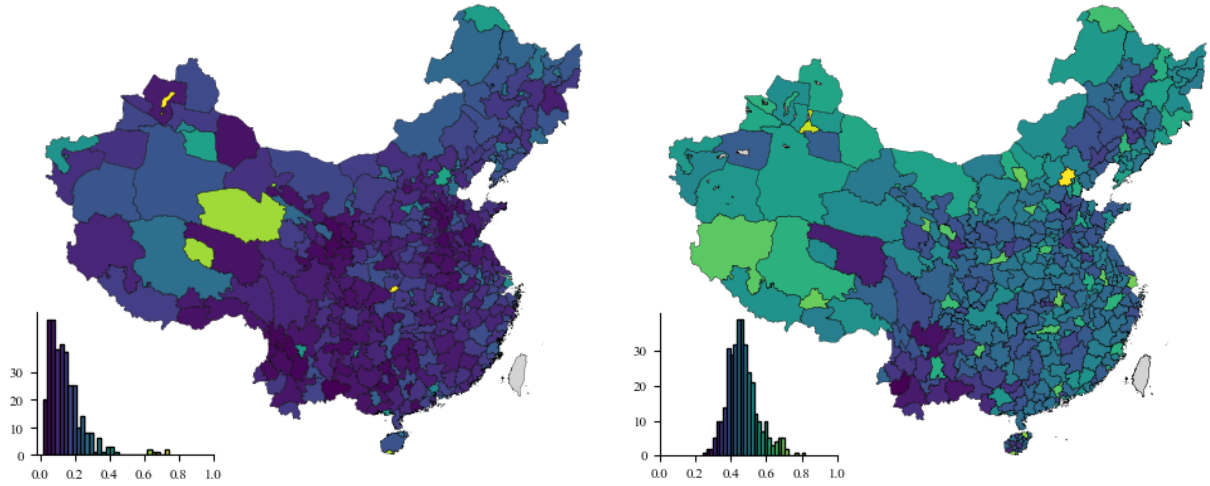
Notes: Panel (a) shows the employment shares and panel (b) the value-added shares of the three broad sectors during 1952–2023. The classification of broad sectors changed in 2012, which caused a jump in the employment share of the tertiary sector and a drop in that of the secondary sector. Vertical bands and lines denote major political and economic events. Data source: National Bureau of Statistics of China.

Figure A-2. GDP per capita and its growth rate during 1952-2023



Notes: This figure shows the GDP per capita and its growth rate during 1952-2023. Vertical line denotes the Open and Reform in 1978. Data source: National Bureau of Statistics of China.

Figure A-3. Service employment share by prefecture, 1990 and 2020



(a) 1990 **(b)** 2020

Notes: The histograms at the south-west of each sub-figure show the number of prefectures (y-axis) against the employment share in the service sector (x-axis). Data source: Census in 1990 and 2020.

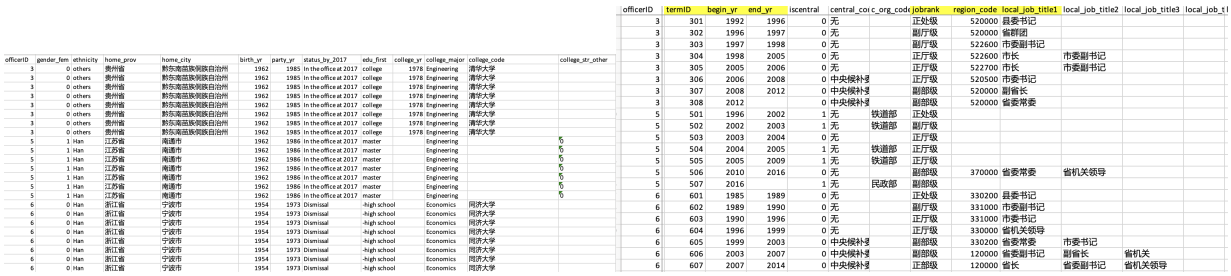
A.2 Constructing the sample for empirical analysis

In the empirical analysis, I use prefecture-level data from 2000-2017. Specifically, I use local officials' data from the CCER officials' dataset, whose latest version extends to 2017, to construct the main independent variable, political connection between prefecture-level leaders and provincial leaders. Since I estimate the effects of losing a connection, not gaining connection, I further restrict the sample to the provincial leaders turnover windows, i.e. the last year and the first year of provincial leaders' terms.

As Figure A-4 shows, the CCER officials' dataset provides detailed information on local officials, including their hometown, birthdate, education, every term after *Zhengchuji* (like the county-level leader), job rank, start year and end year for each term, and local job titles. First, I find provincial secretaries for all provinces and their career paths. Second, I find prefectural party secretaries for all prefectures and when they were first promoted to this rank. If the prefectural leader is first promoted to this position by the current provincial party secretary, I classify them as connected and set the indicator to 1, and to 0 otherwise. Finally, I restrict the sample to the start year and end year since the provincial leaders' change is decided by the central government, which is plausibly exogenous to prefectures.

Figure A-5 describes how prefecture governments allocated their resources in 2006. Panel (a) shows that education and administration were the largest items of general budget expenditure, at 16 and 11 percent, while budgetary capital construction accounted for 7 percent.

Figure A-4. Data sample from CCER officials' dataset



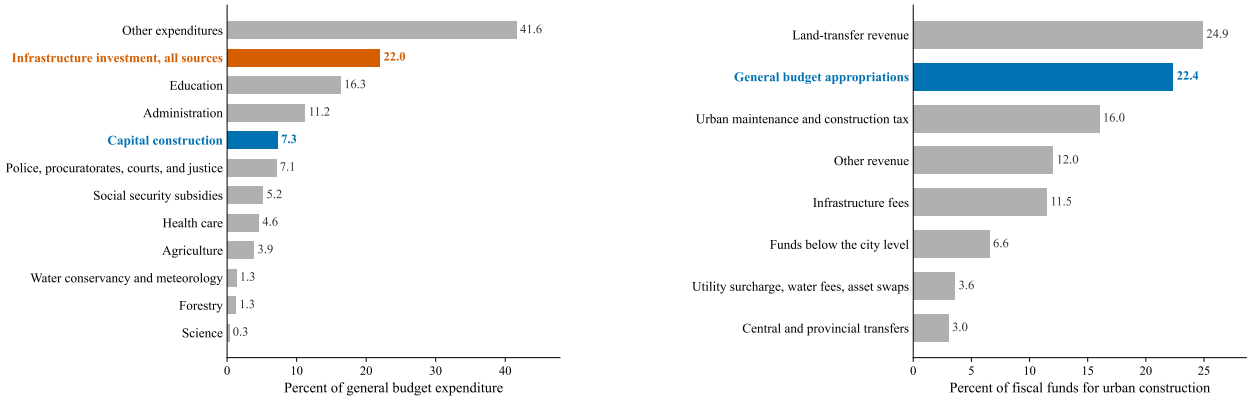
officerID	gender_fem	ethnicity	home_prov	home_city	birth_yr	party_yr	status_by_2017	edu_first	college_yr	college_major	college_code	college_str_other
3	0	others	贵州省	黔东南苗族侗族自治州	1962	1985	In the office at 2017	college	1978	Engineering	清华大学	
3	0	others	贵州省	黔东南苗族侗族自治州	1962	1985	In the office at 2017	college	1978	Engineering	清华大学	
3	0	others	贵州省	黔东南苗族侗族自治州	1962	1985	In the office at 2017	college	1978	Engineering	清华大学	
3	0	others	贵州省	黔东南苗族侗族自治州	1962	1985	In the office at 2017	college	1978	Engineering	清华大学	
3	0	others	贵州省	黔东南苗族侗族自治州	1962	1985	In the office at 2017	college	1978	Engineering	清华大学	
3	0	others	贵州省	黔东南苗族侗族自治州	1962	1985	In the office at 2017	college	1978	Engineering	清华大学	
5	1	Han	江苏省	南通市	1962	1986	In the office at 2017	master		Engineering		5
5	1	Han	江苏省	南通市	1962	1986	In the office at 2017	master		Engineering		5
5	1	Han	江苏省	南通市	1962	1986	In the office at 2017	master		Engineering		5
5	1	Han	江苏省	南通市	1962	1986	In the office at 2017	master		Engineering		5
5	1	Han	江苏省	南通市	1962	1986	In the office at 2017	master		Engineering		5
5	1	Han	江苏省	南通市	1962	1986	In the office at 2017	master		Engineering		5
6	0	Han	浙江省	宁波市	1954	1973	Dismissal	high school		Economics	同济大学	
6	0	Han	浙江省	宁波市	1954	1973	Dismissal	high school		Economics	同济大学	
6	0	Han	浙江省	宁波市	1954	1973	Dismissal	high school		Economics	同济大学	
6	0	Han	浙江省	宁波市	1954	1973	Dismissal	high school		Economics	同济大学	
6	0	Han	浙江省	宁波市	1954	1973	Dismissal	high school		Economics	同济大学	
6	0	Han	浙江省	宁波市	1954	1973	Dismissal	high school		Economics	同济大学	

officerID	termID	begin_yr	end_yr	iscentral	central_co	c_org_code	jobrank	region_code	local_job_title1	local_job_title2	local_job_title3	local_job_t
3	301	1992	1996	0	无		正处级	520000	县委书记			
3	302	1996	1997	0	无		副厅级	520000	省部团			
3	303	1997	1998	0	无		副厅级	522600	市委副书记			
3	304	1998	2005	0	无		正厅级	522600	市长	市委副书记		
3	305	2005	2006	0	无		正厅级	522700	市长	市委副书记		
3	306	2006	2008	0	中央候补委		正厅级	520500	市委书记			
3	307	2008	2012	0	中央候补委		副部级	520000	副省长			
3	308	2012		0	中央候补委		副部级	520000	省委常委			
5	501	1996	2002	1	无	铁道部	正处级					
5	502	2002	2003	1	无	铁道部	副厅级					
5	503	2003	2004	0	无		正厅级					
5	504	2004	2005	1	无	铁道部	正厅级					
5	505	2005	2009	1	无	铁道部	正厅级					
5	506	2010	2016	0	无		副部级	370000	省委常委	省机关领导		
5	507	2016		1	无	民政部	副部级					
6	601	1985	1989	0	无		正处级	330200	县委书记			
6	602	1989	1990	0	无		副厅级	331000	市委副书记			
6	603	1990	1996	0	无		正厅级	331000	市委书记			
6	604	1996	1999	0	无		正厅级	330000	省机关领导			
6	605	1999	2003	0	中央候补委		副部级	330200	省委常委	市委书记		
6	606	2003	2007	0	中央候补委		副部级	120000	省委副书记	副省长	省机关	
6	607	2007	2014	0	中央候补委		正部级	120000	省长	省委副书记	省机关领导	

Notes: The figure shows excerpts from the two linked files of the CCER Officials Dataset (Yao et al., 2020), which covers prefecture party secretaries and mayors from 1994 to 2017. The left panel is the biographical file, with one record per official: gender, ethnicity, hometown, year of birth, year of joining the Party, and education. The right panel is the career file, with one record per position held: start and end years, administrative rank, the region code of the post, and job titles. The two files are linked by the official identifier (`officerID`). I use the biographical file to construct officials' age, gender, education, and hometown ties, and the career file to date each prefecture leader's promotion and identify the provincial secretary in office at the time, which defines political connections.

These budget items understate how much local governments spend on infrastructure. Investment in municipal public facilities from all sources equaled 22 percent of general budget expenditure, more than any single budget item. The gap arises because most infrastructure is financed outside the general budget. Panel (b) shows that budgetary appropriations provided only 22 percent of the fiscal funds for urban construction, while land-transfer revenue provided 25 percent and earmarked taxes and fees most of the remainder.

Figure A-5. Local government spending and the financing of urban infrastructure, 2006



(a) General budget expenditure allocation

(b) Sources of fiscal funds for urban construction

Notes: Panel (a) reports general budget expenditure by item in 2006, summed over 261 prefectures (prefecture and county levels combined), from the *Fiscal Statistics of Prefectures, Cities, and Counties*; items follow the pre-2007 budget classification, in which "Other expenditures" bundles items not reported separately, including urban maintenance and construction. The vermillion bar is not a budget item: it reports fixed-asset investment in municipal public facilities from all sources, the measure used in the main text, as a percent of general budget expenditure in the 216 prefectures that report both. Panel (b) reports the sources of fiscal funds for urban maintenance and construction in 2006, national total (354.1 billion yuan), from the *China Urban Construction Statistical Yearbook*; these funds exclude bank loans and borrowing by local government financing vehicles.

B Additional Results

B.1 Summary statistics and descriptive analysis

Table A-1. Summary statistics of all prefecture-years sample

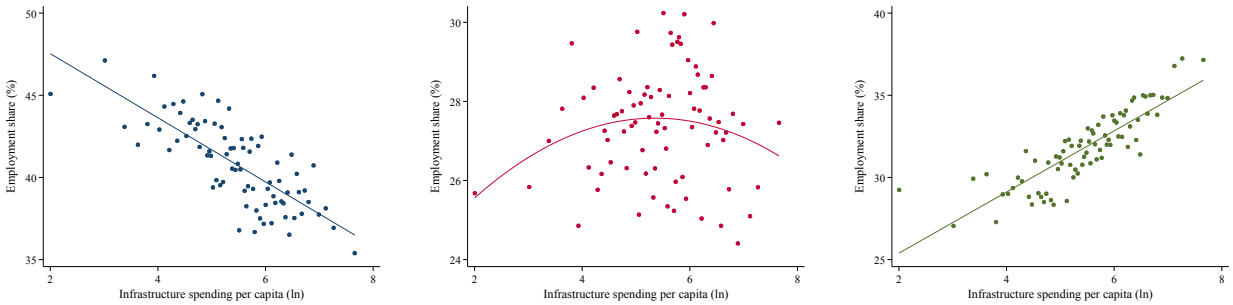
	Mean	S.D	Count
Agriculture Value-Added Share (%)	15.929	10.163	6203
Manufacturing Value-Added Share (%)	46.591	11.070	6203
Service Value-Added Share (%)	37.479	9.214	6203
Infrastructure Spending (ln)	11.418	1.592	4418
Infrastructure Spending per Capita (ln)	5.554	1.512	4406
Infrastructure Spending Share (%)	13.323	14.655	4375
GDP (ln)	6.438	1.284	6204
Population (ln)	5.823	0.701	6164
GDP per Capita (ln)	9.844	1.011	6201
Secretary Age	52.148	4.134	6139
Secretary Female (0/1)	0.037	0.190	6200
Secretary College Education (0/1)	0.438	0.496	6204
Secretary Same Hometown as PSec (0/1)	0.012	0.109	6204
Mayor Age	50.177	4.248	5613
Mayor Female (0/1)	0.051	0.220	5666
Mayor College Education (0/1)	0.354	0.478	6204
Mayor Same Hometown as PSec (0/1)	0.015	0.120	6204
Had Political Connection (0/1)	0.766	0.423	2777

Notes: The full sample includes all prefecture-years from 2000 to 2017 outside Beijing, Tianjin, Shanghai, and Chongqing. Variables are the same defined in Table 1. The estimation sample restricts it to provincial turnover windows (the last year of an outgoing provincial secretary's term and the first year of the successor's term) and excludes prefectures whose leaders gain a connection in the successor's first year.

Figure A-7 reports the number of prefectures in the treatment and control groups in each year from 2000 to 2017. Because the sample is restricted to turnover windows and provinces change secretaries in different years, the number of prefectures in the sample varies from year to year.

Table A-2 tests whether prefectures that lose a connection and prefectures that do not were on similar paths before the provincial turnover. The comparison is made in the outgoing secretary's last year in office ($T-1$), before any connection is lost. Because the regressions in Section 3.2 compare prefectures within the same province and year, each comparison is made within a turnover window, defined by a province and the last year of its outgoing secretary. For each variable, I regress the variable on the treatment indicator with turnover-window fixed effects and cluster standard errors by prefecture. The coefficient is the average within-window difference between treated and control prefectures. The control mean is computed

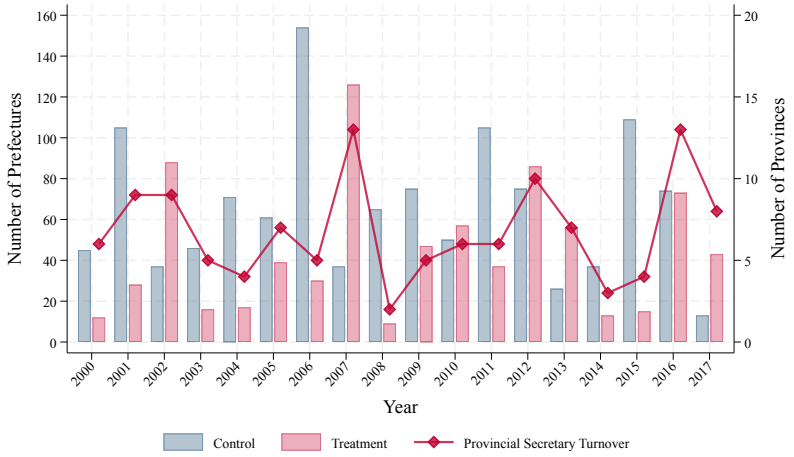
Figure A-6. Infrastructure spending and sectoral employment shares



(a) Agriculture **(b)** Manufacturing **(c)** Services

Notes: Binned scatter plots of sectoral employment shares against infrastructure spending per capita (log), with 80 equal-sized bins. Year fixed effects are absorbed and log GDP per capita is partialled out. Lines show linear fits (agriculture, services) and a quadratic fit (manufacturing).

Figure A-7. Treatment and control groups for losing a political connection



Notes: The bars show the number of prefectures in the treatment and control groups in each year (left axis); the line shows the number of provinces whose party secretary changed (right axis). The sample is restricted to turnover windows, that is, the last year of an outgoing provincial secretary's term and the first year of the successor's term. Because provinces change secretaries in different years, the number of prefectures in the sample varies from year to year. The treatment group comprises prefectures whose leaders were connected to the outgoing secretary and therefore lose their connection when the successor takes office; the control group comprises prefectures whose leaders were not connected. A prefecture leader is connected if they were promoted to their position while the outgoing secretary was in office.

in the same windows, and the treated mean equals the control mean plus this difference.

The sample is built in four steps. I start from the 1,109 observations in $T-1$ of the estimation sample, one for each prefecture and turnover window. I then keep the 60 of 115 windows that contain both treated and control prefectures; in the remaining windows all prefectures fall in the same group, so they offer no within-window comparison and do not identify the treatment effect. This leaves 700 observations. Pre-turnover changes require data in $T-2$, which removes the prefecture-years dropped by the GDP-growth filter and leaves 644 observations. Finally, infrastructure spending is available only from 2002, so the changes in infrastructure spending cover turnovers from 2003 onward (530 to 535 observations).

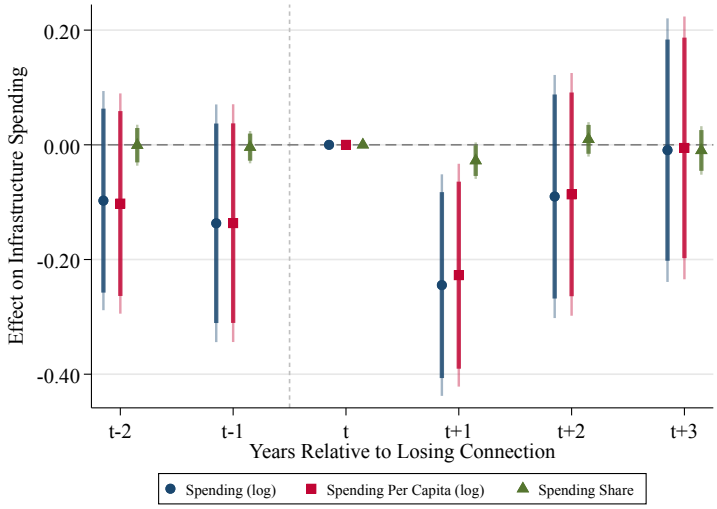
The two groups differ in levels but not in trends. In $T-1$, connected prefectures have higher agricultural shares, lower output, and lower infrastructure spending than unconnected prefectures in the same window; prefecture fixed effects absorb these differences. What identification requires is that the two groups follow similar paths, and Panel A shows that they do. Changes in sectoral value-added shares, output, population, and infrastructure spending in the year before the turnover are small and statistically insignificant, and together they do not predict connection status ($F = 1.49$, $p = 0.17$). The one exception is the infrastructure spending share, which rises by 1.6 percentage points more in connected prefectures ($p = 0.05$). If this rise reflects mean reversion, it would bias the estimates toward finding a decline after the turnover. It is, however, also what career incentives predict: the outgoing secretary's last year is a connected official's final opportunity to impress his patron. Panel B reports the characteristics of officials. Connected secretaries and mayors are about two years younger, because they were promoted more recently, and connected secretaries are slightly more likely to be women and to share a hometown with the provincial secretary. All regressions control for these characteristics.

B.2 Robustness check

Figure A-8 reports the estimates for each year around the turnover. Before the turnover, the coefficients are small and statistically indistinguishable from zero, so there is no sign that prefecture leaders adjust spending in anticipation of losing their connection. The effect appears one year after the turnover, when infrastructure spending falls by about 20 log points, and fades in the following years.

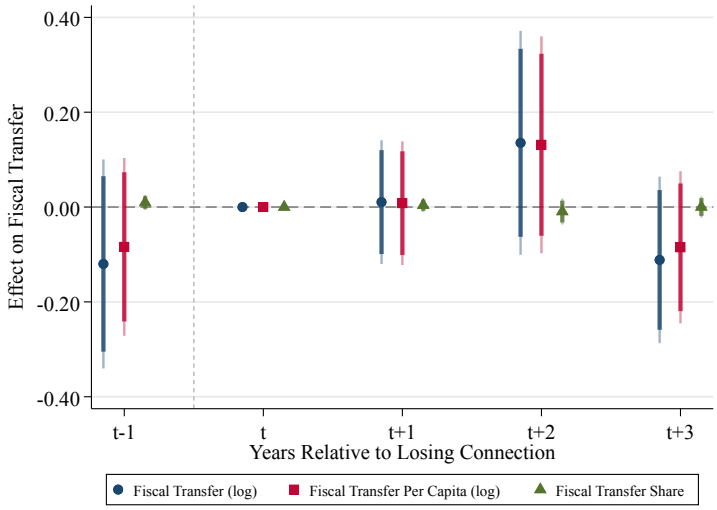
I check the effects of losing ties on fiscal transfer. As the Figure A-9 shows, there is no effect on fiscal transfer, which excludes the fiscal income channel. I also examine the impacts on government spending per capita and revenue per capita. Table A-3 reports these results and shows that there is no significant effect on government spending per capita and revenue per capita. This excludes the channels via total government spending and revenue.

Figure A-8. Effects of losing a connection on infrastructure spending



Notes: The figure shows the estimated results of the regression analysis. The dependent variables are total infrastructure spending, infrastructure spending per capita, and infrastructure spending share of all local government expenditure. The infrastructure spending data are from the China Urban-Rural Development Statistical Yearbook for 2002–2017. I use the indicator *Fixed Asset Investment in Municipal Public Facilities* to denote infrastructure spending. This indicator includes investment in transportation networks, water supply systems, heating facilities, and other municipal public facilities. The thick bars denote 90% CIs and thin bars denote 95% CIs.

Figure A-9. Effects of losing a connection on fiscal transfers



Notes: The figure shows the estimated results of regression: $y_{i,p,t+k} = \beta_0 + \beta_1\, had_connection_i \times psec_change_t + \Gamma\mathbb{X}_{i,t} + \gamma_i + \eta_{p,t} + \epsilon_{i,t}$ for total fiscal transfer, fiscal transfer per capita, and fiscal transfer share of all local government expenditure. The fiscal transfer data are from the *Public Finance Statistical Materials of Prefectures, Cities, and Counties (quanguo dishixian caizheng tongji ziliao)* from 2001 to 2009. After 2009, the data are not available. The thick bars denote 90% CIs and thin bars denote 95% CIs.

Table A-2. Balance test: treated and control prefectures before the turnover

	Control	Treated	Within-window difference		
	mean	mean	Estimate	(SE)	N
Panel A: Pre-turnover change, $y_{T-1} - y_{T-2}$					
Agriculture value-added share (pp)	-1.071	-0.878	0.193	(0.269)	644
Manufacturing value-added share (pp)	0.263	0.285	0.022	(0.149)	644
Service value-added share (pp)	0.809	0.591	-0.218	(0.270)	644
Infrastructure spending (ln)	0.062	0.141	0.079	(0.068)	535
Infrastructure spending per capita (ln)	0.051	0.132	0.081	(0.068)	535
Infrastructure spending share (pp)	-1.923	-0.285	1.638**	(0.832)	530
GDP (ln)	0.135	0.128	-0.007	(0.005)	644
Population (ln)	0.010	0.008	-0.002	(0.002)	644
GDP per capita (ln)	0.125	0.126	0.001	(0.006)	643
Joint F-test (p-value)			1.49 (0.172)		530
Panel B: Official characteristics in $T-1$					
Secretary age	53.005	51.322	-1.683***	(0.314)	697
Secretary female (0/1)	0.025	0.075	0.050**	(0.021)	699
Secretary college education (0/1)	0.452	0.470	0.018	(0.045)	700
Secretary shares hometown with provincial secretary (0/1)	0.000	0.024	0.024**	(0.011)	700
Mayor age	50.432	48.375	-2.057***	(0.363)	657
Mayor female (0/1)	0.040	0.054	0.014	(0.020)	659
Mayor college education (0/1)	0.421	0.442	0.021	(0.043)	700
Mayor shares hometown with provincial secretary (0/1)	0.015	0.016	0.001	(0.011)	700
Turnover windows			60		

Notes: The table compares treated prefectures, whose party secretary or mayor is connected to the outgoing provincial party secretary, with control prefectures, whose leaders are not, in the outgoing secretary's last year in office ($T-1$), before any connection is lost. Each comparison is made within a turnover window, defined by a province and the last year of its outgoing secretary. The within-window difference is the coefficient from a regression of each variable on the treatment indicator with turnover-window fixed effects; standard errors are clustered by prefecture. The control mean is computed in the same windows, and the treated mean equals the control mean plus the within-window difference. Panel A reports pre-turnover changes, $y_{T-1} - y_{T-2}$, the relevant test of parallel trends; the joint F-test regresses the treatment indicator on all changes in Panel A with turnover-window fixed effects. Panel B reports the characteristics of officials in $T-1$, which enter the regressions as controls. The infrastructure spending share is measured as a share of general budget expenditure. The sample is built in four steps: (i) it starts from the $T-1$ observations of the estimation sample, one per prefecture and turnover window (1,109 observations); (ii) it keeps the 60 of 115 turnover windows that contain both treated and control prefectures, since the other windows offer no within-window comparison (700 observations); (iii) changes require data in $T-2$, which removes prefecture-years dropped by the GDP-growth filter (644 observations); (iv) infrastructure spending is available only from 2002, so the changes in infrastructure spending cover turnovers from 2003 onward, and shares above one are set to missing (530–535 observations). The joint F-test uses the observations with no missing variable in Panel A. $^{*}\,p < 0.10$, $^{**}\,p < 0.05$, $^{***}\,p < 0.01$.

For the results on regional structural change, I conduct two robustness checks. First, excluding all controls yields very similar results, as shown in Figure A-10. Second, I conduct a placebo test. The estimated coefficients lie in the tail of the distribution of placebo estimates.

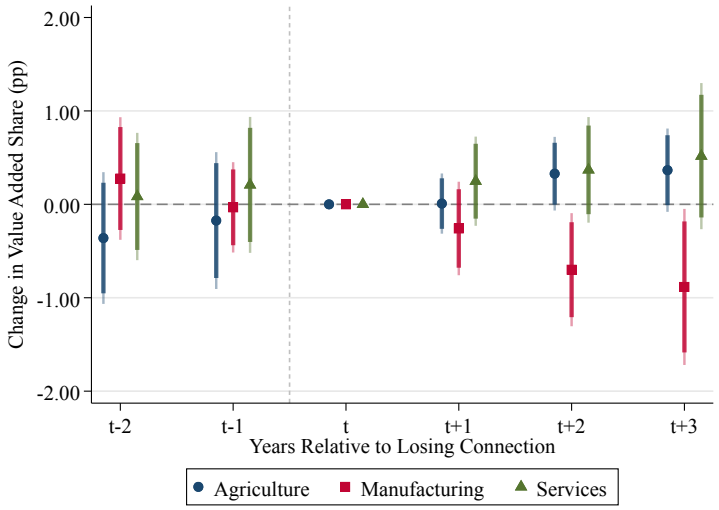
Table A-3. Political connection and total government spending and revenue

	(1) Total Exp.	(2) Exp. per capita	(3) Total Rev.	(4) Rev. per capita
Treat × Post	-0.064**	-0.043	-0.041	0.006
	(0.029)	(0.031)	(0.034)	(0.027)
R^2	0.945	0.925	0.981	0.978
Prefectures	278	278	278	278
Observations	1684	1684	1682	1684
Mean of Dep. Var.	4.769	8.106	4.377	7.277

Notes: Sample size is from 2000-2017. Dependent variable is 1-year forward total government spending and revenue (log). All regressions include prefecture and province×year FE. Controlled city leaders' characteristics, including age, gender, education, and hometown network. Controlled pre-appointed economic conditions, including GDP, population size, and secondary GDP ratio. Standard errors clustered at the prefecture level are in parentheses.

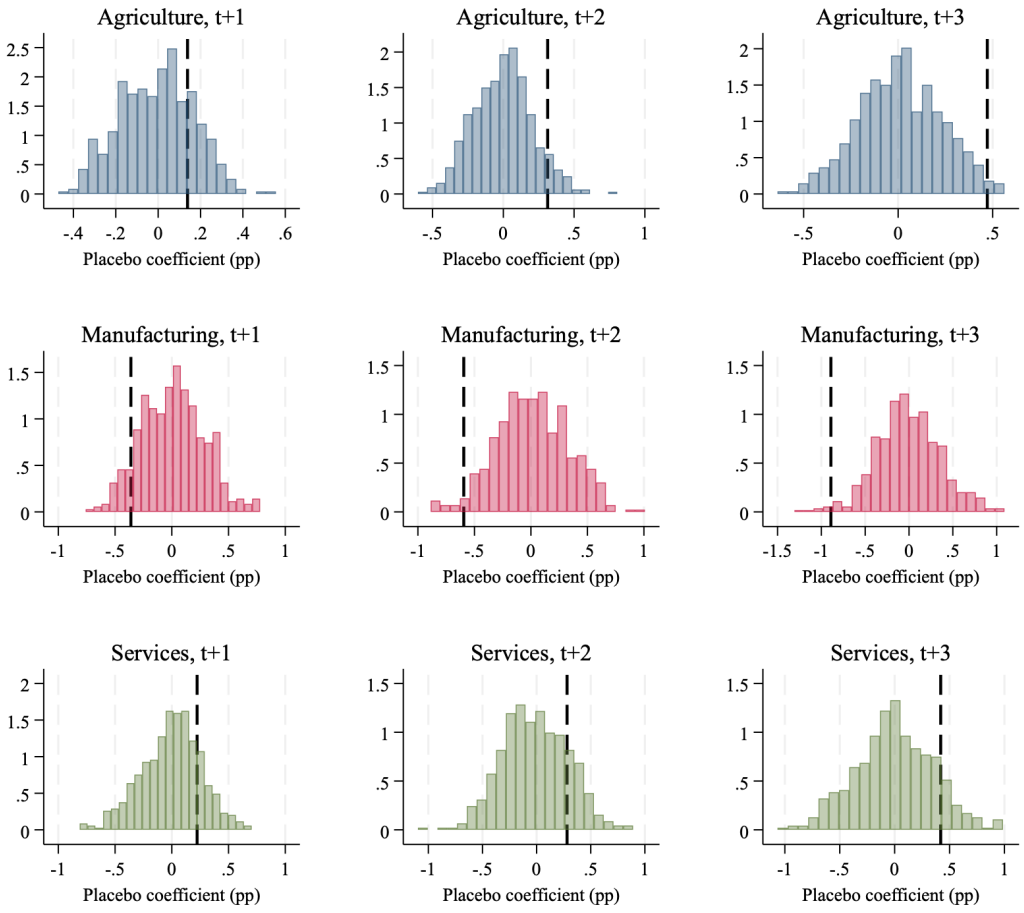
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure A-10. Effects of losing a connection on sectoral value-added shares without controls



Notes: The figure repeats Figure 6 without controls: the regressions estimate Equation 3 with prefecture and province-by-year fixed effects only, omitting city leaders' characteristics and pre-appointment economic conditions. Thick bars denote 90% confidence intervals and thin bars 95% confidence intervals, based on standard errors clustered at the prefecture level.

Figure A-11. Placebo test: randomization inference for the effects of losing a connection



Notes: Each panel plots the distribution of placebo estimates of β_1 in Equation 3 for the change in a sector's value-added share at horizon $t+k$, in percentage points. In each of 500 draws, connection status is randomly reassigned across prefectures within the same province and turnover window, holding the number of connected prefectures fixed, and the specification of Figure 6 is re-estimated. Dashed lines mark the estimated coefficients.

Table A-4. Losing a connection and sectoral value-added shares

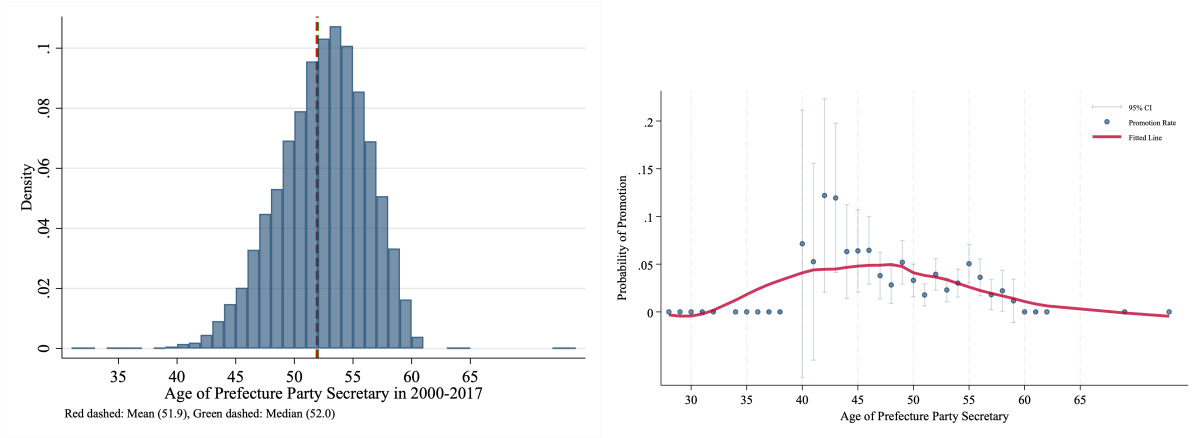
	Pre-turnover		Post-turnover		
	$t-2$	$t-1$	$t+1$	$t+2$	$t+3$
Panel A: Agriculture					
Lose connection	-0.282	-0.351	0.139	0.313	0.472*
	(0.356)	(0.424)	(0.211)	(0.226)	(0.262)
Mean of dep. var.	-1.375	-0.684	-0.662	-1.294	-1.760
Observations	1628	1668	1633	1587	1592
Prefectures	275	276	274	274	274
Panel B: Manufacturing					
Lose connection	0.038	-0.078	-0.361	-0.594*	-0.891**
	(0.328)	(0.272)	(0.286)	(0.317)	(0.433)
Mean of dep. var.	0.584	0.279	0.361	0.418	0.009
Observations	1628	1668	1633	1587	1592
Prefectures	275	276	274	274	274
Panel C: Services					
Lose connection	0.241	0.430	0.223	0.281	0.420
	(0.378)	(0.428)	(0.279)	(0.337)	(0.436)
Mean of dep. var.	0.790	0.405	0.301	0.876	1.751
Observations	1628	1668	1633	1587	1592
Prefectures	275	276	274	274	274

Notes: Corresponding table for Figure 6. The table reports estimates of β_1 from equation (3). Columns $t+h$ use $y_{i,p,t+h} - y_{i,p,t}$ as the dependent variable; pre-turnover columns $t-h$ use $y_{i,p,t} - y_{i,p,t-h}$. Value-added shares are in percentage points. All regressions include prefecture and province-by-year fixed effects and the controls of equation (1). Standard errors, clustered by prefecture, are in parentheses. $^{*}\,p < 0.10$, $^{**}\,p < 0.05$, $^{***}\,p < 0.01$.

B.3 Age distribution and promotion probability of municipal secretaries

The underlying mechanism is straightforward. Younger officials face stronger career incentives: with longer time horizons and higher promotion probabilities, they have greater motivation to signal competence through visible infrastructure projects that stimulate local economic growth. Consequently, when these officials lose their political connections, the reduction in their infrastructure spending should be more pronounced. In contrast, older officials—facing diminished promotion prospects regardless of their connections—have weaker baseline incentives to invest in growth-enhancing infrastructure, implying a more muted response to connection loss.

Figure A-12. Age distribution and promotion probability of municipal secretaries



(a) Age distribution **(b)** Promotion probability by age

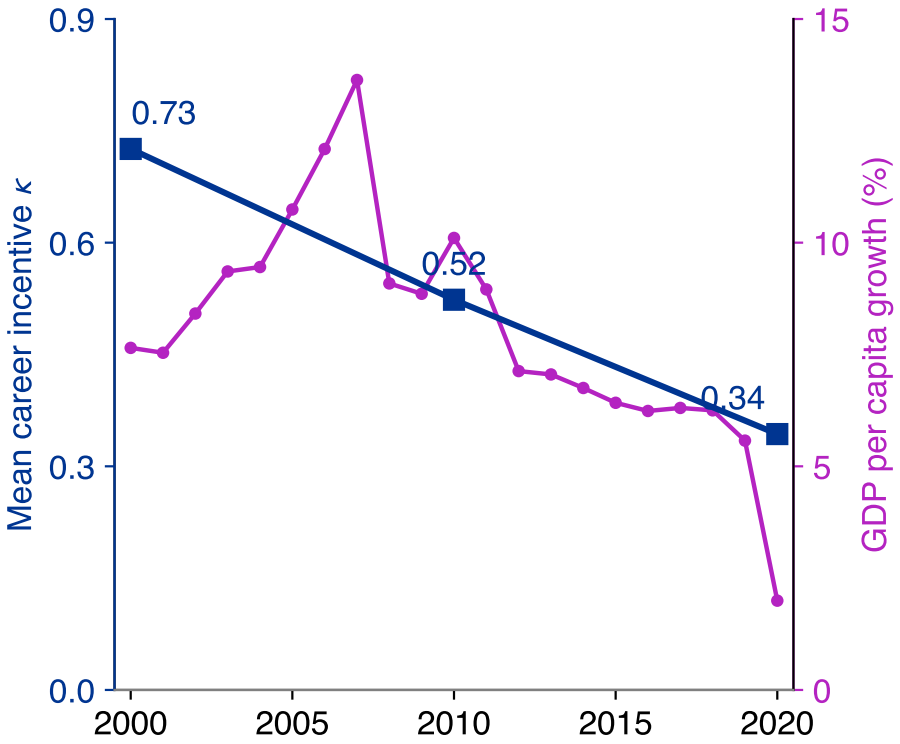
Notes: Panel (a) shows the age distribution of municipal secretaries in 2000-2017. Panel (b) plots the promotion probability by age group and period. Promotion is defined as being promoted to a higher-level position (e.g., from municipal secretary to provincial official). I calculate the promotion probability for each age year and plot the average promotion probability for each age year.

External validation of the recovered career incentives

Figure A-13 compares the path of the recovered incentives with national growth. The mean incentive falls from 0.73 in 2000 to 0.52 in 2010 and 0.34 in 2020, while real GDP per capita growth peaks at about 13 percent in 2007 and slows to about 6 percent by 2019. The decline in κ thus coincides with the end of China's high-growth era and with a shift in the evaluation of local officials away from GDP growth after 2013, when the Organization Department instructed that GDP growth should no longer be the main criterion for promotion. With only three inverted years, the figure documents a common trend rather than a causal relationship.

The inversion recovers κ from investment behavior alone, so I validate it against administrative rank, which plays no role in the inversion. Provincial capitals and sub-provincial

Figure A-13. Career incentives and GDP growth



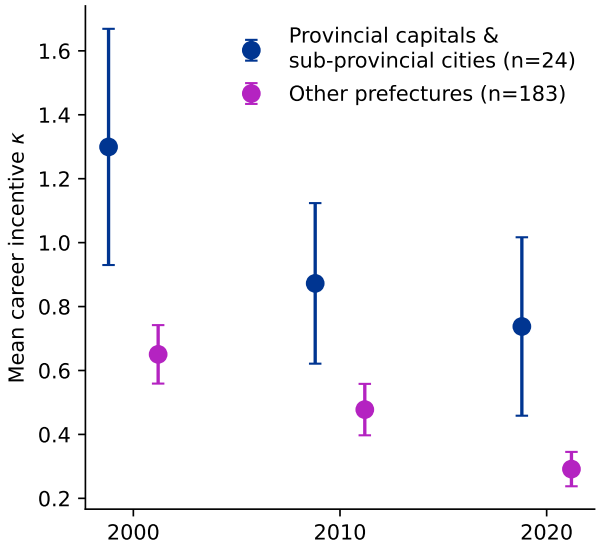
Notes: The dark blue line (left axis) plots the mean career incentive κ_{it}, recovered by inverting the model for 2000, 2010, and 2020 (Section 6.1). The light blue line (right axis) plots national real GDP per capita growth, computed from the per capita GDP index of the National Bureau of Statistics (previous year = 100). The fall in growth in 2020 reflects the COVID-19 pandemic.

cities rank above other prefectures, and their party secretaries already hold vice-ministerial rank. They therefore compete for provincial leadership rather than for vice-ministerial posts. In the CCER officials data, 1,409 terms as prefecture party secretary began in 2000–2015 and ended by 2016. Of the secretaries of provincial capitals and sub-provincial cities, 35 and 52 percent later reached full-ministerial rank, against 4% of other prefecture secretaries. If κ measures the value officials place on promotion, it should be higher where the prize is larger.

Figure A-14 confirms this prediction. In each of 2000, 2010, and 2020, the mean recovered incentive in provincial capitals and sub-provincial cities is about twice that in other prefectures. Pooling the three years with year fixed effects, the gap in $\log \kappa$ is 1.00 (standard error 0.14). It remains 1.07 (0.16) after controlling for the log population share, log GDP per capita, log land area, and province fixed effects, so it does not reflect the size, income, or location of these cities. Standard errors are clustered by prefecture.

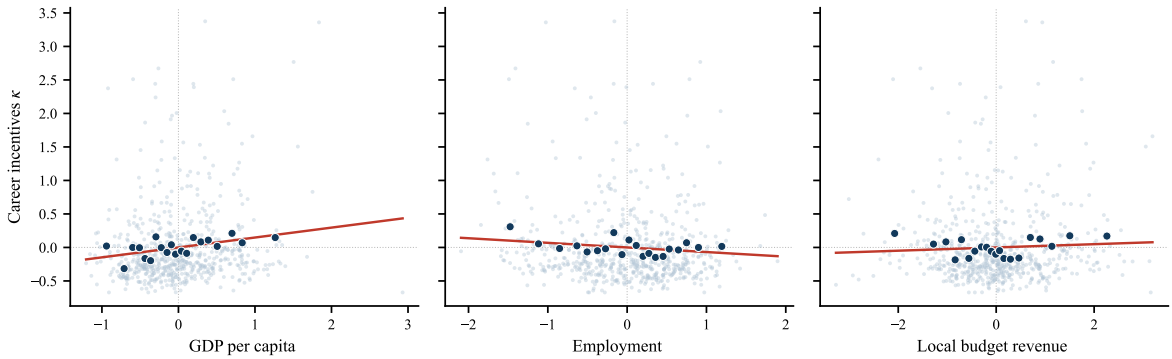
Finally, Figure A-15 shows that the inferred career incentives are not correlated with prefecture characteristics, such as GDP per capita, local employment, and local fiscal revenue.

Figure A-14. Career incentives by administrative rank



Notes: The figure plots the mean recovered career incentive κ in provincial capitals and sub-provincial cities (24 prefectures) and in other prefectures (183 prefectures), with 95 percent confidence intervals, for 2000, 2010, and 2020. The sample is the balanced panel of 207 prefectures rationalized in all three years. Administrative rank is measured in 2000 and is not used in the inversion.

Figure A-15. Career incentives and city characteristics



Notes: This figure plots the relationship between the model-recovered career incentive wedge (κ) and local GDP per capita, employment, and government revenues across prefectures in 2000, 2010, and 2020. All three variables are in logs and demeaned by year for comparability. Each gray point represents a prefecture-year observation and the dark blue points denote the means of 20 bins. The red line is the linear fit.

B.4 Construction of migration and trade costs

The data of Ma and Tang (2024) report, for each pair of prefectures and each year from 1994 to 2024, the shortest railway travel time for passengers, T^P_{ijt}, and for freight, T^F_{ijt}. Travel times are symmetric, and I set own travel time to zero. I map travel time into costs as

$$\mu_{ijt} = \exp\big(a^P (T^P_{ijt})^{h^P}\big), \qquad \lambda_{ijt} = \exp\big(a^F (T^F_{ijt})^{h^F}\big),$$

so that $\mu_{iit} = \lambda_{iit} = 1$. I take the railway parameters estimated by Ma and Tang (2024, Table 5): $a^F = 1.052$ and $h^F = 0.05$ for freight, and $a^P = 1.208$ and $h^P = 0.2$ for passengers. For migration, Ma and Tang (2024) specify the direct cost as $a^P (T^P_{ijt})^{h^P}$; I apply the same exponential transformation as for trade so that μ_{ijt} is a multiplicative friction no smaller than one, as the model requires.

B.5 Additional quantitative results

Table A-5 reports the summary statistics of the recovered career incentives κ across prefectures in 2000, 2010, and 2020.

Table A-5. Summary statistics: career incentives

	Mean	Std. dev.	P10	P25	Median	P75	P90
2000	0.726	0.701	0.178	0.292	0.520	0.817	1.496
2010	0.523	0.577	0.075	0.150	0.307	0.687	1.289
2020	0.343	0.443	0.031	0.088	0.225	0.400	0.717

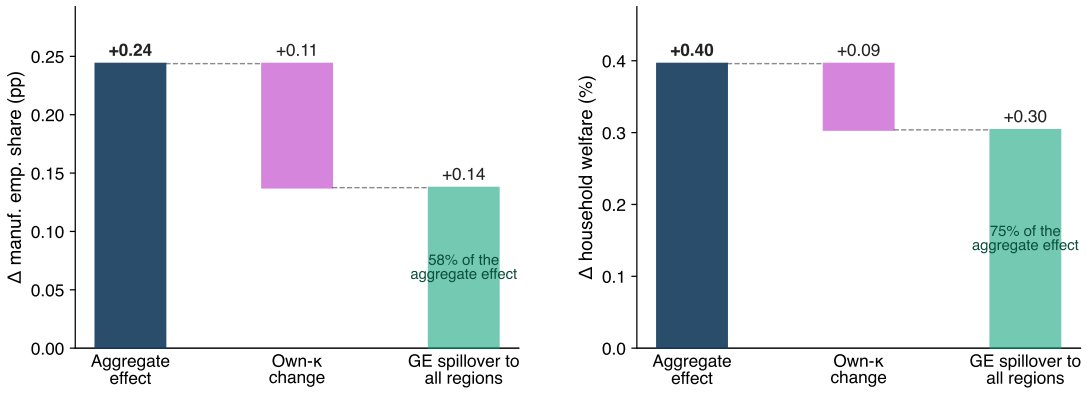
Notes: N=207. The table shows the summary statistics for the career incentives in 2000, 2010, and 2020.

Additional results for counterfactual analysis 1: equalizing career incentives across prefectures

Most of the effect of equalizing career incentives works through general equilibrium rather than through each prefecture's own incentive. Figure A-16 decomposes the average change across prefectures by regressing each prefecture's outcome on the change in its own incentive. Equalization raises the manufacturing employment share of the average prefecture by 0.24 percentage points. Only 0.11 points come from the prefecture's own change in κ; the remaining 0.14 points, 58 percent of the total, reach a prefecture whose own incentive is unchanged. These gains come from investment reallocated elsewhere, which spreads through migration and trade: infrastructure built in high-return prefectures raises demand for their goods and draws workers from the rest of the country. Household welfare follows the same pattern. Of the 0.40 percent average gain, 0.30 percent, or 75 percent, is a general-equilibrium spillover.

A model without spatial linkages would therefore miss most of the consequences of reallocating infrastructure, which is why the spatial framework matters for evaluating career incentives.

Figure A-16. Decomposition of the effects of equalizing career incentives across prefectures



(a) Δ manuf. emp. share (pp) **(b)** Δ household welfare (%)

Notes: The figure decomposes the effects of Counterfactual 1, which sets every prefecture's career incentive to a common level that leaves aggregate infrastructure spending unchanged. The first bar is the unweighted average change across prefectures in the manufacturing employment share (panel a, percentage points) and in household welfare (panel b, percent). To decompose it, I regress each prefecture's change on the change in its own incentive, $\Delta y_i = a + b\,\Delta \ln \kappa_i + e_i$. The own-$\kappa$ component, $b\,\overline{\Delta \ln \kappa}$, is the part of the average change explained by each prefecture's own incentive. The general-equilibrium component, the intercept a, is the change in a prefecture whose own incentive is unchanged; it captures spillovers from investment reallocated to other prefectures through migration and trade. The two components sum to the first bar.

C Microfoundation of Career Incentives

This appendix derives the career payoff $\kappa_{it} \log G_{i,t+1}$ in the official's objective (equation A-27) from a model of career concerns in the spirit of Holmström (1999), following Song and Xiong (2026). Officials' ability is not observed. Their evaluator infers it from local economic performance, and infrastructure raises measured performance. Officials therefore invest to improve the evaluator's assessment of their ability, even though, in equilibrium, the evaluator anticipates this behavior and is not misled.

Ability and measured productivity. The official governing prefecture i in period t affects manufacturing productivity through ability a_{it}:

$$\tilde{Z}_{iMt} = Z_{iMt}\, G_{it}^{\gamma_M}\, e^{a_{it}+\varsigma_{it}}, \tag{A-1}$$

where $a_{it} \sim N(\bar{a}_i, \sigma_a^2)$ and $\varsigma_{it} \sim N(0, \sigma_\varsigma^2)$ is a prefecture-specific shock unrelated to the official. The two are independent, and their distributions are common knowledge.

The evaluator's inference. Prefecture leaders are evaluated by the provincial leadership, which I refer to as the evaluator. The evaluator observes local output Y_{it}, but not a_{it}, ς_{it}, or the official's investment choice. Ability and the shock affect output only through manufacturing productivity, so to a first order around the equilibrium, log output can be written as

$$\log Y_{it} = \mathcal{Y}_{it}^0 + \theta_{it}\big(a_{it} + \varsigma_{it} + \gamma \log G_{it}\big), \tag{A-2}$$

where $\theta_{it} > 0$ is the elasticity of output with respect to manufacturing productivity, γ is the elasticity of measured performance with respect to infrastructure,[10] and $\mathcal{Y}_{it}^0$ collects the determinants of output that the evaluator knows.

The evaluator judges performance against expected output. Let $\bar{\mathcal{Y}}_{it}$ denote its expectation of log output in prefecture i, formed before the official acts. The performance statistic is output relative to this benchmark, rescaled by θ_{it}:

$$z_{it} \equiv \frac{\log Y_{it} - \bar{\mathcal{Y}}_{it}}{\theta_{it}} = \big(a_{it} - \bar{a}_i\big) + \varsigma_{it} + \gamma \log G_{it} - c_{it}, \tag{A-3}$$

where $c_{it} \equiv (\bar{\mathcal{Y}}_{it} - \mathcal{Y}_{it}^0)/\theta_{it} - \bar{a}_i$ is fixed before the official acts. Because the benchmark is the evaluator's expectation, z_{it} has prior mean zero, and with normal priors the evaluator's

[10] Infrastructure also raises service productivity, so γ combines the two channels: $\gamma = \gamma_M + (\theta_{it}^S/\theta_{it})\,\gamma_S$, where θ_{it}^S is the elasticity of output with respect to service productivity. Because κ_{it} is recovered from the data, this decomposition does not affect any result.

posterior estimate of ability is

$$\hat{a}_{it} \equiv \mathbb{E}\big[a_{it} \mid z_{it}\big] = \bar{a}_i + \lambda\, z_{it}, \qquad \lambda \equiv \frac{\sigma_a^2}{\sigma_a^2 + \sigma_\varsigma^2} \in (0,1), \tag{A-4}$$

where λ is the signal-to-noise ratio: the share of variation in measured performance attributed to ability.[11]

Rewards and the official's incentive. The official is rewarded in proportion to the evaluator's estimate of ability, $\hat{\kappa}_{it}\,(\hat{a}_{it} - \bar{a}_i)$, where $\hat{\kappa}_{it} \geq 0$ measures how strongly promotion depends on assessed performance and may vary across officials and over time. Investment chosen in period t determines $G_{i,t+1}$ and hence the performance statistic on which the official is evaluated in period $t+1$. Taking the benchmark as given, and using $\mathbb{E}_t[a_{i,t+1} - \bar{a}_i + \varsigma_{i,t+1}] = 0$, the expected reward is

$$\mathbb{E}_t\Big[\hat{\kappa}_{i,t+1}\big(\hat{a}_{i,t+1} - \bar{a}_i\big)\Big] = \underbrace{\hat{\kappa}_{i,t+1}\,\lambda\,\gamma}_{\equiv\,\kappa_{it}} \log G_{i,t+1} \;-\; \hat{\kappa}_{i,t+1}\,\lambda\, c_{i,t+1}, \tag{A-5}$$

where the last term does not depend on the official's choice. Up to that constant, the reward is the term $\kappa_{it} \log G_{i,t+1}$ in equation (A-27).[12]

Equilibrium and interpretation. In equilibrium the evaluator's benchmark is correct on average: expected log output equals $\bar{\mathcal{Y}}_{i,t+1}$, so $z_{i,t+1}$ has mean zero and the assessment of ability is unbiased. The official nonetheless invests more than an official without career concerns would: because the benchmark is fixed before the official acts, investing less would lower output relative to the benchmark and hence the assessment. Because the evaluator is not misled in equilibrium, the additional investment is a cost of the incentive scheme rather than a means of conveying information.

Equation (A-5) decomposes the career incentive into three components: the reward intensity $\hat{\kappa}_{i,t+1}$, the signal-to-noise ratio λ, and the elasticity of measured performance with respect to infrastructure, γ. The model does not separate them: the inversion in Section 5 recovers their product. Variation in $\hat{\kappa}$ maps directly onto the evidence in Section 3. Ties to the provincial leader raise the payoff to higher output, so losing a tie lowers $\hat{\kappa}$, and hence κ_{it}. Officials approaching the age limits have little to gain from it, so their $\hat{\kappa}$ is low.

[11] If the evaluator also observed the performance of other prefectures subject to a common shock, it would rank officials against their peers, as in the promotion tournament of Maskin et al. (2000) and Li and Zhou (2005). Differencing out the common shock raises λ but leaves the form of equation (A-4) unchanged.

[12] Discounting the reward by β would only rescale κ_{it}. Because κ_{it} is recovered from the data, this choice does not affect any result.

D Model derivations

D.1 Household's problem

The individual expenditure share on sector s via Roy's identity follows:

$$\vartheta_s(e, \mathbb{P}_{ist}) = -\frac{\partial V(e, P_{iAt}, P_{iMt}, P_{iSt})/\partial P_{rs}}{\partial V(e, P_{iAt}, P_{iMt}, P_{iSt})/\partial e} \cdot \frac{P_{is}}{e} \tag{A-6}$$

$$= \phi_s + \nu_s \left(\frac{e}{P_{iAt}^{\phi_A} P_{iMt}^{\phi_M} P_{iSt}^{\phi_S}} \right)^{-\eta} \tag{A-7}$$

D.2 Production

For agriculture sector, profit maximization yields the labor demand function:

$$\pi_{iAt} = p_{iAt} Y_{iAt} - \tilde{w}_{iAt} H_{iAt} - r_{iAt} T_{iA} \tag{A-8}$$

where p_{iAt} is the price of agriculture goods, $\tilde{w}_{iAt}$ is the wage per efficient labor in agriculture sector, r_{iAt} is the land rent.

Taking the first order condition, I can get:

$$(1-\alpha) p_{iAt} Z_{iAt} H_{iAt}^{-\alpha} T_{iA}^{\alpha} = \tilde{w}_{iAt} \tag{A-9}$$

$$\alpha p_{iAt} Z_{iAt} H_{iAt}^{1-\alpha} T_{iA}^{\alpha-1} = r_{iAt} \tag{A-10}$$

For manufacturing sector, since intermediate firms can freely enter regions, the profits must equal the entry costs. This pins down the mass of firms in each region.

$$p_{it}(\omega) y_{it}(\omega) - w_{iMt} h_{ipt} - \tau_{it} - w_{iMt} f_{iEt} = 0 \tag{A-11}$$

Since the tax is lump-sum, it does not affect firms' decisions. The optimal price of the intermediate goods is still a constant markup of the cost, $p_{it} = \frac{\sigma}{\sigma-1} MC$, where MC is the marginal cost of the intermediate goods. The profit for each firm is $\frac{1}{\sigma} p_{it}(\omega) y_{it}(\omega)$, which must equal the entry cost.

$$\frac{1}{\sigma} p_{it}(\omega) y_{it}(\omega) = w_{iMt} f_{iEt} + \tau_{it} \tag{A-12}$$

To get the mass of firms in region i, I use the free entry condition (I drop ω for simplicity)

from Equation 22 and get:

$$p_{it}y_{it} - w_{iMt}h_{ipt} - \tau_{it} - w_{iMt}f_{iEt} = 0 \tag{A-13}$$

$$p_{it}y_{it} - w_{iMt}\frac{y_{it}}{\tilde{Z}_{iMt}} - \tau_{it} - w_{iMt}f_{iEt} = 0 \tag{A-14}$$

$$\frac{\sigma}{\sigma-1}\frac{w_{iMt}}{\tilde{Z}_{iMt}}y_{it} - w_{iMt}\frac{y_{it}}{\tilde{Z}_{iMt}} - \tau_{it} - w_{iMt}f_{iEt} = 0 \tag{A-15}$$

$$\frac{1}{\sigma-1}\frac{w_{iMt}}{\tilde{Z}_{iMt}}y_{it} = \tau_{it} + w_{iMt}f_{iEt} \tag{A-16}$$

$$\frac{w_{iMt}y_{it}}{\tilde{Z}_{iMt}} = (\sigma-1)(\tau_{it} + w_{iMt}f_{iEt}) \tag{A-17}$$

$$w_{iMt}h_{iPt} = (\sigma-1)(\tau_{it} + w_{iMt}f_{iEt}) \tag{A-18}$$

$$h_{iPt} = (\sigma-1)(\tau_{it}/w_{iMt} + f_{iEt}) \tag{A-19}$$

where h_{iPt} is the labor for production in each intermediate firm. Thus, the total labor demand in manufacturing sector is:

$$H_{iMt} = H_{iPt} + H_{iEt} \tag{A-20}$$

$$H_{iMt} = N_{it}h_{iPt} + N_{it}h_{iEt} \tag{A-21}$$

$$H_{iMt} = N_{it}((\sigma-1)(\frac{\tau_{it}}{w_{iMt}} + f_{iEt}) + f_{iEt}) \tag{A-22}$$

$$H_{iMt} = N_{it}(\sigma f_{iEt} + (\sigma-1)\frac{\tau_{it}}{w_{iMt}}) \tag{A-23}$$

$$N_{it} = \frac{H_{iMt}}{(\sigma f_{iEt} + (\sigma-1)\frac{\tau_{it}}{w_{iMt}})} \tag{A-24}$$

E Local government's optimization problem

E.1 Setup

Local governments use tax revenues to provide local infrastructure and government expenditure. The local government's budget constraint is:

$$E_{it}^G + I_{it}^G = \tau_{it} N_{it} \tag{A-25}$$

where E_{it}^G denotes expenditure for officials' consumption, and I_{it} is spending on public investment. Public investment can accumulate and it evolves as:

$$G_{it+1} = (1 - \delta_{it}) G_{it} + I_{it}^G \tag{A-26}$$

where G_{it} is infrastructure investment, δ_{it} is the depreciation rate.

The local government in prefecture i chooses a sequence of public consumption $\{E_{it}^G\}$ and next-period public capital $\{G_{i,t+1}\}$ to maximize

$$U_{i0}^G \;=\; \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \Big\{ V\big(E_{it}^G,\, P_{iAt}, P_{iMt}, P_{iSt}\big) + \kappa_{it} \,\log G_{i,t+1} \Big\}, \tag{A-27}$$

subject to the law of motion for public capital

$$G_{i,t+1} \;=\; N_{it}\, \tau_{it} \;+\; (1 - \delta_{it}^G)\, G_{it} \;-\; E_{it}^G, \tag{A-28}$$

where $N_{it}\tau_{it} \equiv \mathrm{IncG}_{it}(G_{it})$ is fiscal revenue from the mass N_{it} of manufacturing firms, and δ_{it}^G is the depreciation rate of public capital. The period payoff $V(\cdot)$ takes the indirect-utility form

$$V(E_{it}^G, \mathbf{P}_{it}) \;=\; \frac{1}{\eta}\, \Psi_{it}^{-\eta}\, (E_{it}^G)^{\eta}, \qquad \Psi_{it} \equiv \Psi(P_{iAt}, P_{iMt}, P_{iSt}), \tag{A-29}$$

so that $V_E(E_{it}^G) = \Psi_{it}^{-\eta}\, (E_{it}^G)^{\eta-1}$.

Fiscal revenue depends on G_{it} through the manufacturing productivity spillover

$$\tilde{Z}_{iMt} \;=\; Z_{iMt}\, G_{it}^{\gamma_M}, \qquad \gamma_M \in (0,1). \tag{A-30}$$

E.2 Lagrangian

Attach the multiplier λ_{it} (the shadow value of public capital entering period $t+1$) to the period-t budget constraint (A-28). The Lagrangian for the infinite-horizon problem is

$$\mathcal{L} \;=\; \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \Bigg\{ V(E^G_{it}, \mathbf{P}_{it}) + \kappa_{it}\, \log G_{i,t+1} \\ +\; \lambda_{it} \Big[\, N_{it}(G_{it})\, \tau_{it} + (1-\delta^G_{it})\, G_{it} - E^G_{it} - G_{i,t+1} \,\Big] \Bigg\}. \tag{A-31}$$

E.3 First-order conditions

(i) w.r.t. E^G_{it} (the flow-spending choice):

$$\frac{\partial \mathcal{L}}{\partial E^G_{it}} \;=\; \beta^t \big[\, V_E(E^G_{it}) - \lambda_{it} \,\big] \;=\; 0 \quad\Longrightarrow\quad \lambda_{it} \;=\; V_E(E^G_{it}). \tag{A-32}$$

(ii) w.r.t. $G_{i,t+1}$ (the investment choice): The variable $G_{i,t+1}$ appears in two places: (a) the period-t payoff $\kappa_{it} \log G_{i,t+1}$ and the period-t constraint (with multiplier λ_{it}), and (b) the period-$(t+1)$ constraint, where it enters the resource term $\mathrm{IncG}_{i,t+1}(G_{i,t+1}) + (1-\delta^G_{i,t+1})G_{i,t+1}$ with multiplier $\lambda_{i,t+1}$. Collecting:

$$\frac{\partial \mathcal{L}}{\partial G_{i,t+1}} \;=\; \beta^t \left[\frac{\kappa_{it}}{G_{i,t+1}} - \lambda_{it} \right] + \beta^{t+1}\, \mathbb{E}_t \Big\{ \lambda_{i,t+1} \left[(1-\delta^G_{i,t+1}) + \mathrm{IncG}'_{i,t+1}(G_{i,t+1}) \right] \Big\} \;=\; 0. \tag{A-33}$$

Dividing by β^t and rearranging,

$$\lambda_{it} \;=\; \frac{\kappa_{it}}{G_{i,t+1}} \;+\; \beta\, \mathbb{E}_t \Big\{ \lambda_{i,t+1} \left[(1-\delta^G_{i,t+1}) + \mathrm{IncG}'_{i,t+1}(G_{i,t+1}) \right] \Big\}. \tag{A-34}$$

Again, there is *no* factor of β multiplying $\kappa_{it}/G_{i,t+1}$ because $G_{i,t+1}$ is contemporaneous with the period-t payoff.

E.4 The fiscal-return term $\mathrm{IncG}'_{it}(G_{it})$

Fiscal revenue is collected as a per-firm lump-sum tax on manufacturing,

$$\mathrm{IncG}_{it} \;=\; N_{it}\, \tau_{it}, \tag{A-35}$$

where τ_{it} is exogenous and N_{it} is the endogenous mass of intermediate manufacturing firms. Hence the fiscal return to public capital operates entirely through the firm-mass margin:

$$\mathrm{IncG}'_{it}(G_{it}) \;=\; \tau_{it}\,\frac{\partial N_{it}}{\partial G_{it}} \;=\; \frac{\mathrm{IncG}_{it}}{G_{it}}\cdot \underbrace{\frac{\partial \log N_{it}}{\partial \log G_{it}}}_{\equiv\,\varepsilon_{N,G}}. \tag{A-36}$$

Decomposing $\varepsilon^{i}_{N,G}$. The mass of firms is determined by the manufacturing labor-market clearing condition,

$$N_{it} \;=\; \frac{H_{iMt}}{\sigma_M\, f_{iEt} + (\sigma_M - 1)\,\dfrac{\tau_{it}}{w_{iMt}}} \;\equiv\; \frac{H_{iMt}}{D_{it}}, \tag{A-37}$$

where H_{iMt} is efficiency-unit labor demand in manufacturing, f_{iEt} is the per-firm fixed entry cost, and the term $(\sigma_M - 1)\tau_{it}/w_{iMt}$ captures the labor-equivalent burden of the lump-sum tax. Both the numerator H_{iMt} and the denominator D_{it} depend on G_{it} through the manufacturing wage.

Numerator. From the Fréchet sector-choice block, expected efficiency-unit labor in manufacturing sector at location r is

$$H_{rM} \;=\; s_{rM}\,L_r\,\mathbb{E}(z^{i}_{rM} \mid M \text{ chosen}) \;=\; \Gamma_\zeta\,L_r\,(w_{rM}/\bar{w}_r)^{\zeta-1}, \quad\Longrightarrow\quad \frac{\partial \log H_{iMt}}{\partial \log w_{iMt}} \;=\; \zeta - 1. \tag{A-38}$$

Wage–productivity link. Under Dixit–Stiglitz monopolistic competition with elasticity σ_M, the equilibrium wage scales with efficient productivity as

$$w_{iMt} \;\propto\; \tilde{Z}_{iMt}^{\frac{\sigma_M-1}{\sigma_M}} \;=\; \left(Z_{iMt}\,G_{it}^{\gamma_M}\right)^{\frac{\sigma_M-1}{\sigma_M}}, \quad\Longrightarrow\quad \frac{\partial \log w_{iMt}}{\partial \log G_{it}} \;\equiv\; \alpha \;=\; \frac{\sigma_M - 1}{\sigma_M}\,\gamma_M. \tag{A-39}$$

Denominator. Only the tax term in D_{it} moves with G_{it} (through w_{iMt}):

$$\frac{\partial \log D_{it}}{\partial \log G_{it}} \;=\; \frac{(\sigma_M-1)}{D_{it}}\cdot\frac{\partial(\tau_{it}/w_{iMt})}{\partial \log G_{it}} \;=\; -\,s_{it}\,\alpha, \quad s_{it} \;\equiv\; \frac{(\sigma_M-1)\,\tau_{it}/w_{iMt}}{\sigma_M\,f_{iEt} + (\sigma_M-1)\,\tau_{it}/w_{iMt}} \in (0,1), \tag{A-40}$$

where s_{it} is the share of the tax-related labor cost in the per-firm labor requirement. A higher wage relaxes the tax burden in labor-equivalent terms, so a larger s_{it} amplifies the firm-mass response to G_{it}.

Combining. The total elasticity of firm mass with respect to public capital is

$$\varepsilon^{i}_{N,G} \;\equiv\; \frac{\partial \log N_{it}}{\partial \log G_{it}} \;=\; \frac{\sigma_M - 1}{\sigma_M}\,\gamma_M\,\big[(\zeta-1) + s_{it}\big], \qquad \mathrm{IncG}'_{it}(G_{it}) \;=\; \frac{\mathrm{IncG}_{it}}{G_{it}}\,\varepsilon^{i}_{N,G}. \tag{A-41}$$

The fiscal return is the product of three forces: (i) the public-capital spillover into productiv-

ity (γ_M), (ii) the Dixit–Stiglitz markup adjustment that translates productivity into wages ($(\sigma_M - 1)/\sigma_M$), and (iii) a labor-supply composite $(\zeta - 1) + s_{it}$ that combines the Fréchet reallocation of efficiency-unit labor with the tax-burden relief that higher wages provide on entry. Because s_{it} varies with the local tax rate τ_{it} and wage w_{iMt}, the elasticity $\varepsilon^i_{N,G}$ is *region-specific*: prefectures with a heavier lump-sum tax burden experience a larger fiscal return to infrastructure.

E.5 Euler equation

Eliminating the multiplier with (A-32) (i.e. $\lambda_{it} = V_E(E^G_{it})$ and $\lambda_{i,t+1} = V_E(E^G_{i,t+1})$) and substituting into (A-34),

$$V_E(E^G_{it}) \;=\; \frac{\kappa_{it}}{G_{i,t+1}} \;+\; \beta\,\mathbb{E}_t\!\left\{ V_E(E^G_{i,t+1})\Big[(1-\delta^G_{i,t+1}) + \varepsilon^i_{N,G}\,\frac{\mathrm{IncG}_{i,t+1}}{G_{i,t+1}}\Big]\right\}. \tag{A-42}$$

In a steady state with $V_E(E^G_i) = \Psi_i^{-\eta}(E^G_i)^{\eta-1}$, equation (A-42) collapses to

$$\Psi_i^{-\eta}\,(E^G_i)^{\eta-1}\left[\,1 \;-\; \beta(1-\delta^G_i) \;-\; \beta\,\varepsilon^i_{N,G}\,\frac{\mathrm{IncG}_i}{G_i}\,\right] \;=\; \frac{\kappa_i}{G_i}. \tag{A-43}$$

Equivalently, dividing (A-42) by $V_E(E^G_{i,t+1})$ and rearranging in growth-rate form yields the standard consumption–savings representation with an investment wedge:

$$\left(1 \;-\; \underbrace{\kappa_{it}\,\frac{(E^G_{it})^{1-\eta}\,\Psi^{\eta}_{it}}{G_{i,t+1}}}_{\text{investment wedge}}\right)\frac{V_E(E^G_{it})}{V_E(E^G_{i,t+1})} \;=\; \beta\,\big(1+\mathrm{MRG}_{i,t+1}\big), \tag{A-44}$$

where

$$\mathrm{MRG}_{i,t+1} \;\equiv\; \varepsilon^i_{N,G}\,\frac{\mathrm{IncG}_{i,t+1}}{G_{i,t+1}} \;-\; \delta^G_{i,t+1} \tag{A-45}$$

is the local government's marginal revenue product of infrastructure. Career incentives introduce an investment wedge that tilts the intertemporal trade-off toward infrastructure: higher κ_{it} raises $G_{i,t+1}$ at the expense of current public consumption E^G_{it}.

E.6 Inversion for κ_i

Solving (A-43) for the career-incentive wedge,

$$\kappa_i \;=\; G_i\,\Psi_i^{-\eta}\,(E^G_i)^{\eta-1}\left[\,1-\beta(1-\delta^G_i) - \beta\,\tfrac{\sigma_M-1}{\sigma_M}\,\gamma_M\,\big[(\zeta-1)+s_i\big]\,\tfrac{\mathrm{IncG}_i}{G_i}\,\right] \tag{A-46}$$

The bracketed term has a clean interpretation. The first piece, $1-\beta(1-\delta^G_i)$, is the

standard user cost of public capital. The second piece, $\beta\,\varepsilon^{i}_{N,G}\,\mathrm{IncG}_i/G_i$, is the *fiscal return* to public investment: building G raises the local manufacturing wage, attracts more firms (both through Fréchet labor reallocation and by relaxing the labor-equivalent tax burden), expands the tax base, and partially self-finances. Critically, because s_i varies with the local lump-sum tax τ_i and wage w_{iM}, the fiscal-return elasticity is region-specific. Failing to absorb s_i in the inversion would misattribute heterogeneity in tax structure to career incentives: high-τ_i provincial capitals, where public capital pays back especially fast through the entry margin, would be assigned a spuriously high κ_i.

E.7 Proof of the Proposition

The proposition compares the period-t investment rule of the official with that of the local planner. Both face the same state, the same budget constraint (A-28), and the same equilibrium prices, and I hold fixed the continuation term that both Euler equations share. Write current public consumption as a function of the investment choice, $E^G_{it}(G_{i,t+1}) = N_{it}\tau_{it} + (1-\delta^G_{it})G_{it} - G_{i,t+1}$, and define

$$
\begin{aligned}
C(G_{i,t+1}) &\equiv V_E\big(E^G_{it}(G_{i,t+1})\big) && \text{(marginal cost of investment)},\\
B(G_{i,t+1}) &\equiv \beta\,\mathbb{E}_t\Big[(1+\mathrm{MRG}_{i,t+1})\,V_E(E^G_{i,t+1})\Big] && \text{(continuation value of fiscal returns)},\\
H(G_{i,t+1}) &\equiv \beta\,\mathbb{E}_t\sum_r \frac{\partial V_{ir,t+1}}{\partial G_{i,t+1}} && \text{(residents' marginal benefit)}.
\end{aligned}
$$

I use three properties. (a) C is strictly increasing: V is strictly concave in E^G ($\eta < 1$), so V_E falls with E^G, and E^G_{it} falls one-for-one with $G_{i,t+1}$. (b) B is weakly decreasing: the fiscal return to infrastructure diminishes with its stock ($\gamma_M < 1$). (c) H is strictly positive: infrastructure raises local productivity and hence residents' utility. Let $\Phi(G) \equiv C(G) - B(G)$, which is strictly increasing by (a) and (b). From Table 4, the official's Euler equation is $\Phi(G) = \kappa_{it}/G$, and the local planner's is $\Phi(G) = H(G)$.

Part 1. Without career incentives, the official's choice G^0 solves $\Phi(G^0) = 0$. At the planner's choice, $\Phi(G^{LP}) = H(G^{LP}) > 0$ by (c). Because Φ is strictly increasing, $\Phi(G^0) < \Phi(G^{LP})$ implies $G^0 < G^{LP}$: the official under-invests.

Part 2. Define $\kappa^*_{it} \equiv G^{LP}H(G^{LP})$, which is strictly positive by (c). At $G = G^{LP}$, the official's Euler equation then holds: $\Phi(G^{LP}) = H(G^{LP}) = \kappa^*_{it}/G^{LP}$. The solution is unique, because $\Phi(G) - \kappa_{it}/G$ is strictly increasing in G for any $\kappa_{it} \geq 0$. Hence the official with $\kappa_{it} = \kappa^*_{it}$ chooses G^{LP}. For the comparison with other values of κ_{it}, let $G(\kappa)$ solve $\Phi(G) = \kappa/G$.

The left-hand side is strictly increasing in G, and the right-hand side is strictly increasing in κ and decreasing in G, so $G(\kappa)$ is strictly increasing in κ. It follows that $G(\kappa_{it}) < G^{LP}$ when $\kappa_{it} < \kappa^*_{it}$ and $G(\kappa_{it}) > G^{LP}$ when $\kappa_{it} > \kappa^*_{it}$. □

Remarks. The threshold κ^*_{it} is evaluated at the planner's allocation and therefore depends on the equilibrium: it varies across prefectures and over time with the local benefits of infrastructure. The proposition holds the continuation term B fixed across the two decision makers. In the dynamic equilibrium, their future choices, and hence B, also differ, so the proposition characterizes the investment rules period by period rather than the full equilibrium paths; the quantitative comparison in Section 6.2 solves for the full paths.

E.8 Model extensions

E.8.1 Social planner objective

The social planner chooses local government current expenditure and next-period infrastructure spending for every region and faces the budget constraint across all regions. The social planner's problem is:

$$\max_{E_{it},\, G_{it+1}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \sum_{i}^{I} \{V^G_{it} + \sum_{r}^{L_{ir}} V_{irt}\} \tag{A-47}$$

$$\text{s.t.} \quad \sum_{i}^{I} G_{it+1} = \sum_{i}^{I} (N_{it}\tau_{it} + (1-\delta)G_{it} - E^G_{it}) \tag{A-48}$$

Table A-6. Investment allocation decisions in four scenarios

Scenario	Objective	Euler equation (MC = MB)
1. Baseline	Official: V^G + career incentives ($\kappa_i > 0$)	$V_E(E^G_{it}) = \dfrac{\kappa_{it}}{G_{i,t+1}} + \beta\,\mathbb{E}_t\Big[(1+\mathrm{MRG}_{i,t+1})\,V_E(E^G_{i,t+1})\Big]$
2. No incentives	Official: V^G only ($\kappa_i = 0$)	$V_E(E^G_{it}) = \beta\,\mathbb{E}_t\Big[(1+\mathrm{MRG}_{i,t+1})\,V_E(E^G_{i,t+1})\Big]$
3. Local planner	Region i: V^G + residents' utility	$V_E(E^G_{it}) = \beta\,\mathbb{E}_t\Big[\sum_{r=1}^{L_i}\dfrac{\partial V_{ir,t+1}}{\partial G_{i,t+1}} + (1+\mathrm{MRG}_{i,t+1})\,V_E(E^G_{i,t+1})\Big]$
4. Social planner	All regions, with transfers	$V_E(E^G_{it}) = \lambda_t \quad \forall i,$ $\lambda_t = \beta\,\mathbb{E}_t\Big[\sum_{j=1}^{I}\sum_{r=1}^{L_j}\dfrac{\partial V_{jr,t+1}}{\partial G_{i,t+1}} + (1+\overline{\mathrm{MRG}}_{i,t+1})\,\lambda_{t+1}\Big]$

Notes: $V_E(E^G_{it}) \equiv \partial V^G_{it}/\partial E^G_{it}$ is the marginal value of public consumption, the marginal cost of investing one unit in $G_{i,t+1}$. $\mathrm{MRG}_{i,t+1} \equiv \varepsilon^{i}_{N,G}\,\mathrm{N}\tau_{i,t+1}/G_{i,t+1} - \delta^G_{i,t+1}$ is the local government's marginal revenue product of infrastructure (equation (33)). $\overline{\mathrm{MRG}}_{i,t+1}$ is its economy-wide counterpart, which nets out revenue that relocates across regions. $V_{ir,t+1}$ is the utility of resident r in region i, and λ_t is the multiplier on the aggregate budget constraint, which transfers equalize across regions. Comparing rows 1 and 3, the official's choice coincides with the local planner's when $\kappa^*_{it}/G_{i,t+1} = \beta\,\mathbb{E}_t\sum_r \partial V_{ir,t+1}/\partial G_{i,t+1}$: career incentives act as a Pigouvian subsidy for the local benefit of infrastructure.