Local Policies and Firm Location: Measuring the "Unmeasurable"*

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Abstract

This paper investigates how local governments in China compete to attract businesses and examines the role of local leaders' promotion motives in intensifying such competition. Local governments compete by offering city-wide policies, such as lowering tax rates, giving subsidies, providing financial support, or loosening environmental regulations. The difference between what is practiced and what is legally mandated is non-negligible, and many of these policies remain unobservable due to limited data accessibility. To address this issue, I introduce a novel method to quantify the net effect of various policies proposed by local governments. This net effect, referred to as the policy index, is identified using data from all manufacturing plant locations along with a spatial border design. When applying this method to Jiangsu, a province in China with 13 competitive cities, all ranked in the top 100 by GDP over the past decade, I find that geographically proximate cities tend to adopt similar industrial policies. I then incorporate the estimated policy index into a promotion competition framework to understand how policies are determined in equilibrium and how competition, in turn, affects the business landscape. Counterfactual simulations demonstrate that firms are distributed more evenly across space, with only 23% of them choosing a different location if leaders' incentives were the same across all cities.

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1 Introduction

The competition among local governments to lure businesses is a widespread practice around the world. Firms often choose to locate in places with favorable policies, such as lower tax rates and more relaxed environmental regulations. These place-based policies, shaped by local governments, are designed to attract new businesses that boost local economic growth. The mobility of firms creates policy competition among local governments. Investigating this competition among local governments involves two essential steps. First, it requires determining the specific policies that local governments compete on, or finding a way to compare the strength of place-based policies across different localities. Second, it entails examining how these policies are determined in equilibrium. These steps can enhance our understanding of the drivers and consequences of policy competition. With this in mind, we can then discuss whether competition is beneficial or detrimental and explore strategies to either increase or decrease the level of competition.

There are several challenges when investigating local government competition. First, the difference between what is practiced (*de facto*) and what is legally mandated (*de jure*) is non-negligible. We have seen high pollution persist despite strict environmental policies on the books. Second, many of these policies are unobservable to researchers because comparable data on these policies are not easily accessible. These two challenges are especially prevalent for developing countries, like China. Finally, even with policy data, current literature models local government competition only on one policy dimension (e.g., taxes or subsidies) and overlooks other policies. This complexity is further amplified by the fact that competition across local governments is not restricted to one policy. Firms consider various policies, and local governments compete on different dimensions.

To overcome these challenges, I first develop an innovative method to quantify an effective policy index that captures these unobserved policies. I then incorporate this policy index into a promotion competition model to better understand how local government competition shapes local policies. Importantly, this framework allows me to explore how changing leaders' promotion motives affect firms' spatial distribution. This research is conducted within the context of a unique regionally decentralized authoritarian (RDA) system, where local leaders are selected via promotion. This diverges from existing empirical studies primarily focused on developed countries, where leaders are selected via election.[1]

The empirical setting of this study is China, a developing country with a rapidly growing economy. A commonly used instrument for boosting the local economy in China is the promotion tournament among these officials. This phenomenon is driven by the RDA regime, which combines political centralization and economic regional decentralization. Local leaders are promoted by higher-level officials based on the economic performance of their jurisdictions. Government statistics and mass media regularly publish rankings of regional performance, which play a significant role in evaluating and determining the promotions of subnational government officials. Additionally, within their jurisdictions, local officials have the authority to make decisions on various local policies (Li and Zhou, 2005; Xu, 2011). The combination of these two factors, officials' political positions being dependent on the local economic performance and local officials' ability to determine policies, intensely motivates the development of policies designed to boost the local economy.

I choose Jiangsu province as a case study to examine local competition in attracting manufacturing firms for several compelling reasons. First, all 13 cities in Jiangsu have consistently ranked among the top 100 cities in terms of their total GDP, making them ideal subjects for comparison. Second, analyzing local competition within a province aligns with the fact that competition among local leaders to get promoted often occurs within a province (Yu et al., 2016). Moreover, over the past decade, the value-added of the manufacturing industry in Jiangsu increased from 2.3 trillion yuan to 4.2 trillion yuan, accounting for 35.8% of the province's GDP, the highest proportion in the country (Xinhua News Agency).

My analysis uses several rich and unique datasets from 2010 to 2018. The first dataset consists of information on industrial land transactions, providing details about the land's characteristics, such as sale price, total area, auction type, use type, land quality, and address. To enhance this land dataset, I also collect data on land use, population, night-

[1] In addition, the findings in the literature are not conclusive, with diverging results. For example, Mast (2020), using detailed information of tax exemptions in New York State, suggests that local tax competition is unlikely to affect the efficiency of firm location substantially. Slattery (2020) focuses on detailed incentive contracts between big firms and states in the US. Different from the conclusion in Mast (2020), Slattery (2020) finds that subsidy competition has a notable effect on firm location decisions, resulting in a 3% welfare gain. However, Ossa (2019) shows that the potential costs from an escalation of subsidy competition among U.S. states are large from a quantitative economic geography model.

time light, and road density at a fine-granularity level (1km x 1km). Moreover, I combine these land transactions with an additional firm database, which records all the manufacturing companies registered in the industrial and commercial registration. This dataset encompasses not only firms that have engaged in land transactions but also firms that have either not commenced operations or operate from family workshops, thus not requiring dedicated land. This database provides information on firms' operating sectors, registered capital, establishment date, and other relevant details. Finally, I compile a comprehensive list of city-level characteristics from various data sources, including demographic information on local leaders from a Chinese political elite database, textual data from annual government work reports, as well as fiscal and economic characteristics from China City Statistical Yearbook.

I start with a firm location choice model and combine it with a spatial border design. This step provides a theoretical foundation for identifying the net effect of policies proposed by local government. The results show that cities that are geographically close to each other tend to implement similar policies. Moreover, an intriguing pattern emerges: Prior to the anti-corruption campaign in 2014, more developed cities located in the south tended to adopt pro-business policies. However, this pattern shifted after the anti-corruption campaign in 2014, upon which less developed cities located in the north began to adopt pro-business policies. Interestingly, city leaders closer to leaving their current position are more likely to enact pro-business policies. Furthermore, the characteristics of city mayors demonstrate a stronger correlation with policy indexes compared to those of party secretaries. This finding is consistent with the fact that mayors are responsible for the city's day-to-day management, while party secretaries oversee personnel control. The estimated policy index is further validated through hypothesis validity and text analysis.

After quantifying the policy differences for all cities in China, I apply the policy index to a promotion competition model to investigate the impact of local government competition on policy choices and, subsequently, on firms' location decisions. Using this model, I estimate key parameters that govern policy determination. The results suggest that local leaders with stronger promotion incentives are more likely to enact pro-business policies. Furthermore, this relationship exhibits convexity, as the rate of increase in pro-business policies in response to changes in promotion incentives accelerates with higher values of promotion incentives. Lastly, with the estimated parameters, I conduct counterfactual analyses on simulated situations in which local leaders face various promotion incentives and examine how these factors affect firms' spatial distribution. The counterfactual exercises demonstrate that 23% of firms would choose a different location if leaders' incentives were the same across all cities; thus, 77% of firms would stay the same.

This paper contributes to the literature on local government competition in several dimensions. First, I develop a novel method that directly addresses challenges when analyzing local government competition. Localities offer a "package deal" ranging from subsidies to financial support. While the economic literature has extensively studied tax and expenditure competition, it has rarely discussed regulatory competition (Agrawal et al., Forthcoming)[2]. Scholars have shown China's local governments compete using corporate income tax (Liu et al., 2020), investment (Yu et al., 2016) or school closure (Wang, 2016) as their policy tool. However, studies focusing on a single policy have limited relevance for understanding the overall effects of local competition. The policy index developed in this paper captures the net effect of all policies affecting the entry of manufacturing firms, such as tax rates, environmental regulation stringency, and many more. I contribute to this strand of literature by providing a theoretical foundation for identifying unobserved local policies through a combination of a firm location model and a spatial border design.

Second, I shed light on the influence of local government competition on firms' location decisions in a developing country context. Despite substantial empirical papers trying to understand this phenomenon in developed-country contexts (Fajgelbaum et al., 2019; Mast, 2020; Kim, 2023; Slattery, 2020; Ossa, 2019), it has not been studied in a developing-country context. Unlike local leaders' incentives, which primarily focus on attracting votes in Western countries, the unique governance structure in China combines centralized personnel control with decentralized operations, thereby intensifying local competition in the form of promotion tournaments. In China, local officials engage in competition with their counterparts in neighboring cities or similar economic-ranking

[2] Agrawal et al. (Forthcoming) provides a detailed literature review.

cities within the same province, aiming to bolster local economic growth, often measured by GDP, which serves as the primary performance indicator (Li and Zhou, 2005; Xu, 2011). Because of local leaders' promotion motives, they compete with other cities in attracting businesses. The heterogeneous promotion incentives among these local leaders determine the differences in policies when they engage in the competition game.

This paper also contributes to the field of leximetrics, which involves the measurement of regulations[3]. Within this domain, two traditional methods for inferring the strength of regulations are surveys and codification[4]. Survey methods have been employed to uncover measures of entry regulation (Djankov et al., 2002), debt enforcement (Djankov et al., 2008), and land use regulations (Gyourko et al., 2008, 2021). The codification method was pioneered by Porta et al. (1998); researchers have since utilized it to examine financial liberalization (Bandiera et al., 2000), labor (Botero et al., 2004), and environmental regulations (Cao et al., 2021)[5]. The effectiveness of measures generated from these two approaches require extensive survey respondents or a thorough search of regulatory documents. Complementing these methods, there is a growing trend in identifying policies through micro-founded models (Kalouptsidi, 2018; Babalievsky et al., 2022). My method aligns with this modeling approach. Specifically, it is a revealed preference approach that generates a quantitative de facto policy index. This approach addresses the discrepancies of regulations written on the books and the actual enforcement on the ground.

This paper proceeds as follows: Section 2 describes the institutional background. Section 3 contains an introduction to the data and descriptive statistics. Section 4 lays out the model for firm entry and local government competition. Section 5 discusses the estimation results. Section 6 conducts counterfactual analysis. Section 7 concludes.

[3] Kholodilin and Pfeiffer (2021) provides an overview of the leximetric literature.

[4] Other methods include using the size of files (Mulligan and Shleifer, 2005) to infer the strength of regulations.

[5] Recent studies have advanced the codification method by incorporating machine learning techniques (Juhász et al., 2022).

2 Institutional Background

2.1 Manufacturing Firm's Plant Selection

When establishing manufacturing plants, firms typically consider local factors such as proximity to raw materials, fuels, and product markets, as well as local policies like taxes, subsidies, and environmental regulations. Once they select a region, they search for suitable land parcels and establish their factories. In the following sections, I will provide detailed descriptions of each of these factors.

2.1.1 Local Factors

Manufacturing firms take several critical factors into account when evaluating potential locations for their operations, all of which have a substantial impact on their decision-making:

(1) Raw materials, fuels, and product market. One of the primary considerations is the accessibility of essential resources. Firms carefully weigh the proximity to raw materials and product sales regions. Additionally, being close to reliable fuel resources that meet quality standards is essential for ensuring smooth operations.

(2) Agglomeration. Another vital aspect is agglomeration, where firms cluster in proximity to similar industries. This practice offers numerous advantages, including knowledge sharing, efficient supply chains, enhanced infrastructure, access to support services, and a readily available labor pool. However, it's essential for firms to be mindful of the potential negative consequences of clustering, such as increased pollution, safety risks, and a higher likelihood of accidents or chemical spills in cases where similar manufacturing plants are located closely together.

(3) Transportation infrastructures. The quality and efficiency of transportation infrastructures play a pivotal role in location decisions. Investments that reduce travel times or transportation costs can significantly benefit manufacturing firms by shortening the distances to important upstream suppliers, downstream markets, and neighboring plants.

(4) Meteorological conditions. Weather conditions also factor into the decision-making process. Extreme conditions like high temperatures, high humidity, fog, sandstorms, and lightning can negatively affect manufacturing operations.

(5) Labor force. The availability, quality, and cost of labor are paramount. An area with a plentiful supply of high-quality, affordable labor is highly attractive to manufacturing firms.

2.1.2 Local Policies

Local policies also play a significant role in influencing decisions regarding the establishment of plants in specific areas. Unlike local factors, local policies can vary significantly across jurisdictional boundaries. Taxes, subsidies, and environmental regulations are among the most commonly encountered local policies. However, there are also policies that are less standardized, making the study of local competition challenging. For example, Suqian has implemented an “Innovation Voucher” system, which transforms government financial subsidies into tradable securities distributed to businesses in the form of non-repayable grants. When companies purchase research and development equipment or acquire research services from universities and research institutions, they can use the ”Innovation Vouchers” for payment (source: CPC Jiangsu Provincial Committee Organ Publication).

In this study, local policies are categorized into pro-business (“subsidy”-type) policies and anti-business (“tax”-type) policies. Besides directly subsidizing firms or offering tax reduction, financial and infrastructure support can also be categorized as pro-business policies. Furthermore, the formats of pro-business policies can vary across jurisdictions. Any policy that enhances the convenience of business operations falls under the category of pro-business policies. For example, the local government in Nanjing announced a document titled “Policies to Optimize the Business Environment in Nanjing” (Figure A.1), outlining 100 pro-business policies. These policies include enhancing the convenience of business registration, reducing the required materials for business applications, granting autonomy of enterprises to determine their own names, and providing the “New Business Startup Package” service. Conversely, anti-business policies oppose pro-business policies and hinder firms from establishing manufacturing plants. For example, firms may dislike stringent environmental regulations or lengthy approval processes.

The policy index developed in this paper has several key features. First, it captures local policies that vary among jurisdictions where local leaders have the autonomy to determine policy strength[6]. These local industrial policies differ from national industrial policies, which are determined by the central government. The purpose of national industrial policies is to promote the growth of selected sectors, such as the shipbuilding (Barwick et al., 2019, 2021b) and fuels (Aghion et al., 2015). When studying how local policies are shaped by local leaders to attract businesses, it is sufficient to understand the relative strength of policies among different jurisdictions. Therefore, the policy index in this paper only measures the relative strength of policies across cities, rather than their absolute magnitude. Second, the index captures local policies that do not involve externalities. For instance, policies promoting transportation infrastructure, such as highways, near the borders would not be fully captured in the index because firms located near the borders on either side can benefit from the highways. Similarly, policies aiming to provide free labor training to enhance local labor performance would not be captured because firms located near the borders can access the same labor force. Unless the policies explicitly specify that free labor training is available only to workers employed by firms within their jurisdictional boundaries.

2.1.3 Firm-specific Factors

Finally, aside from the local factors and policies mentioned above, the characteristics of the specific potential plant they might operate become crucial. When firms decide to establish plants in their preferred regions, they begin searching for available land parcels to open their factories. If the land prices are too high for them to afford, they might either wait or consider their secondary options. Their decision is also influenced by other firm-specific factors, including size and quality of the land, firm-specific policies[7].

[6] Chinese local governments can make decisions on subsidizing input prices, environmental regulation, labor regulation, and general pro-business policies, which are important factors when firms consider setting up plants there (Carlton, 1983; Holmes, 1998; Becker and Henderson, 2000; Greenstone, 2002; Kahn and Mansur, 2013).

[7] In this paper, the main focus is not on the design of local policies aimed at attracting large industrial plants, as documented in the literature on bidding for firms (Black and Hoyt, 1989; Greenstone et al.,

2.2 Local Governments' Incentives

The empirical setting of this study is China, where the fundamental institution is referred to as the regionally decentralized authoritarian (RDA) system by Xu (2011). The system features a combination of political centralization and economic regional decentralization.

On the one hand, local officials are promoted based on their performance evaluations by upper-level leaders. The evaluation and promotion system follows a regional-based multilevel hierarchy in which central government leaders evaluate provincial leaders (e.g., governors), provincial leaders rate city/prefecture leaders (e.g., mayors), city leaders assess county leaders (e.g., county heads), and so forth. This study focuses on the promotion competition among city leaders, where provincial leaders evaluate their performance. Additionally, the evaluation is based on the relative performance. When provincial leaders determine whether to promote a city official, they compare the official's performance with that of other city officials within a province. Research has found that evaluations are mainly based on regional economic performance (Li and Zhou, 2005; Yao and Zhang, 2015). This comparison is possible because Chinese cities have similar economic and social compositions.

On the other hand, the RDA regime provides regional officials with a significant degree of control over local resources. For instance, city leaders have the authority to make decisions on fiscal affairs, resource allocations, policy development, and so on. City party secretaries and city mayors are the top city officials. Anecdotal evidence has shown that city party secretaries primarily handle personnel control, while city mayors are responsible for day-to-day city management (Xu, 2011; Yao and Zhang, 2013). In the 2015 documentary "The Chinese Mayor", it is evident that Geng Yanbo, the mayor of Datong in China, oversaw the administration and development of the city. Generally, party secretaries are more powerful than city mayors, largely due to the ruling position of the Chinese Communist Party. Therefore, the transition from mayor to party secretary is considered a promotion.

It is well-documented that GDP is a critical factor in determining the promotion

2010; Slattery, 2020). Instead, the focus is on understanding city-wide, one-size-fits-all policies.

prospects of local leaders (Zhou, 2007; Xu, 2011; Guo, 2009; Li et al., 2019; Zhou, 2022). City annual government reports also underscore the significance of increasing GDP as the primary goal for city officials. In these reports, local governments emphasize specific targets for achieving a certain percentage of GDP growth. For example, in Suzhou's 2011 annual government work report, their goals for 2012 were to increase local GDP by 12%. It is worth noting that the total outputs generated by industrial firms make a significant contribution to GDP. By attracting businesses, especially industrial firms, local officials can stimulate economic growth by increasing local outputs[8]. However, local officials need to make efforts to attract these firms, which may involve leveraging policy tools such as providing subsidies or relaxing environmental regulations.

Unlike Western local officials, whose objective is to get reelected and attract votes, Chinese local leaders aim to secure promotions, which depend on evaluations of their performance by upper-level governments. If the criteria for evaluating Chinese city officials reflect what median voters value in a Western context, there are no differences in the competition to attract industrial firms between Western and Chinese officials (List and Sturm, 2006). However, if median voters place a much higher weight on environmental factors and the evaluation criteria set a much lower weight on environmental issues, the differences in local competition in China and the Western world could be more pronounced. In China, even though upper-level governments also take into account various "second-dimensional" factors, such as environmental concerns (Zheng et al., 2014; Kahn et al., 2015; Chen et al., 2018; Wu and Cao, 2021; Lin and Rao, 2023) and coal mine safety (Jia and Nie, 2017; Shi and Xi, 2018), when assessing the performance of local leaders, economic growth remains the most crucial factor.

[8]There are trade-offs between allocating land parcels to industrial and residential purposes (He et al., 2022). Roughly 75% of the revenue generated from public land auctions originates from residential land sales. Local officials can increase fiscal revenue by selling long-term leaseholds for residential land. This revenue can then be used to finance the provision of public infrastructure, further enhancing economic performance. In the study by Wang et al. (2020), the focus is on residential development determined by city leaders' career incentives. In contrast, my paper focuses on the political incentives for attracting industrial businesses. The trade-offs between residential and industrial development are beyond the scope of this study. Future work should consider these trade-offs.

3 Data and Descriptive Statistics

3.1 Data Source

The scope of this project encompasses 13 cities in Jiangsu province from 2010 to 2018. The main analysis relies on data regarding firms' locations and characteristics, as well as city characteristics such as demographic information of city leaders. The following paragraphs show the details of each dataset.

Firm location information from land transactions. The primary data, which comprises the universe of industrial land transactions, is sourced from the official website administered by the Ministry of Natural Resources[9]. Each observation represents an announcement of a land transaction from the website, as illustrated in Figure B.1. These announcements provide comprehensive information about the land's characteristics, including the sale price, total area, auction type, use type, land quality, and address. To geocode each land parcel, I rely on its address to obtain the corresponding coordinates[10]. Most of these sites are leased by so-called *upstream* firms and are located within industrial parks planned by local governments. To enhance this land dataset, I also collect data on land use, population, road density, and nighttime light at a fine-granularity level (grids measuring less than 1km x 1km). The land use data is sourced from the Copernicus Climate Change Service, population data from WorldPop, road density data from Peking University's geographic data platform, and nighttime light data from the Earth Observation Group.

Firm characteristics information from the business registration record. I combine these land transactions with an additional firm dataset from Qichacha (`qcc.com`). The Qichacha dataset records all the manufacturing companies registered in the industrial and commercial registration. This dataset encompasses not only firms that have engaged

[9]These are all successful transactions. I collect a sample of land auction data from 2010 to 2016. The sample includes not only successful transactions but also unsuccessful ones. This sample reveals that, on average, 20% of land parcels in Jiangsu had no firms show up during the auctions to lease them. The reason for this might be unreasonable starting prices set by local governments or slow demand. See Table C.1 in the appendix for details.

[10]It is important to note that, unlike home addresses, the address information from land transactions often includes approximate locations, such as "the north side of XX Road, west side of YY Road, ZZ District." This is because these sites are typically brand new in the auction stage. Therefore, when geocoding each land parcel, I also incorporate the winning firm's name into the search engine to obtain more accurate coordinates. This allows the search engine to identify the precise plant location.

in land transactions (*upstream* firms) but also firms that have either not commenced operations or operate from family workshops, thus not requiring dedicated land (*down-stream* firms). This database provides information on firms' operating sectors, registered capital, establishment date, and other relevant details.

City characteristics. I compile a comprehensive list of city-level characteristics from various data sources. The first source is the Chinese political elite database, which records the career paths, ages, and education levels of city leaders, including both city mayors and city party secretaries. The second source consists of textual data from annual government work reports. Each city releases its government reports every year, detailing its accomplishments from the past year and plans for the upcoming year. Researchers have used the proportion of specific words in these reports to assess the strength of regulations (Cao et al., 2021). The third source encompasses city fiscal and economic characteristics sourced from the China City Statistical Yearbook.

3.2 Descriptive Statistics

I choose Jiangsu province as the main study area for three important reasons: first, all 13 cities in Jiangsu have consistently ranked among the top 100 cities in terms of their total GDP. Additionally, over the past decade, the value-added of the manufacturing industry in Jiangsu increased from 2.3 trillion yuan to 4.2 trillion yuan, accounting for 35.8% of the province's GDP, the highest proportion in the country. Third, Jiangsu's landscape is predominantly flat, with plains covering 68 percent of its total area. This dense distribution of land parcels within the province ensures a reasonable sample size for our empirical analysis and brings land parcels near the city border in close proximity to each other in terms of driving distance. Therefore, the policy index can be accurately estimated[11].

There are several pieces of institutional details worth noting. First, firms typically register before acquiring a land parcel, which means they can register without actually

[11]I show terrain in Jiangsu and Fujian (a province with many mountains) in Figure B.4a, as well as a snapshots of manufacturing plant distributions in these provinces in Figure B.5a. Due to Jiangsu's flat terrain, it also gives this province a unique advantage in constructing many factories compared to other provinces (see spatial distribution of manufacturing plants in Jiangsu, Figure 2 and other provinces in China, Figure B.6b).

commencing operations. Second, some manufacturing firms might not require land to operate, such as small-scale workshop-style manufacturing firms. Therefore, the firms that appear in the land transactions are those that are likely to start operating soon (upstream firms)[12]. The firms appearing in the business registrations include those in the land transactions, firms that have registered but not yet acquired land, as well as small-scale firms that operate without the need for land (downstream firms). The study focuses on the location choice of upstream firms, while downstream firms complement it to provide a full picture of the industrial landscape in Jiangsu.

During 2010-2018 in Jiangsu, there are more than 4,000 industrial land parcels covering more than 10,000 hectares land area transacted each year. Industrial land parcels in Jiangsu province take up around 13% of national transactions[13]. During the same period, the number of newly registered manufacturing firms increases from 40,000 to more than 130,000, as shown in Figure 1. Figure 2 is a China city-level map, with the circled part being the spatial distribution of new industrial land in Jiangsu province during 2010-2018. In addition, more new industrial firms are setting up plants in more developed cities, as shown in Figure 3. In total, a one-standard-deviation increase in GDP is associated with a 0.24-standard-deviation increase in the share of new industrial plants. Figure 4 illustrates that the majority of land parcels are operated by private firms, while state-owned firms operate less than 1 percent of the land parcels.

From Table 1, we can see that among the 48,544 land parcels acquired by upstream firms during the sample period, the general equipment sector, metal products sector, and specialized equipment sector are the top manufacturing sectors with the largest number of plants. Similarly, the business registration data shows that the top sector among 718,602 downstream firms is general equipment sector. The combination of these two panels demonstrates that all of the top 10 manufacturing sectors in Jiangsu province do not rely on local natural resources and can operate anywhere.

During the period of 2010-2018, there were 44 mayors and 40 party secretaries in 13 cities in Jiangsu Province. Most of them were males, with only 3 female mayors and 3

[12]The Chinese central government mandates that firms commence construction immediately upon purchase and complete it within two years; failure to do so may result in a takeover by local governments (Nian and Wang, 2023).

[13]Yearly national industrial land transaction is shown in Figure B.2b

female party secretaries. Additionally, the majority of them held a master's or doctorate degree (36 mayors and 30 party secretaries), while the rest had a bachelor's degree. Table 2 shows that leaders generally served in their positions for 3-4 years. The average age of mayors at inauguration was 50 years old, while party secretaries typically started in their positions at a slightly older age, around 52 years old. This pattern also held true when they left office, with party secretaries being slightly older compared to mayors. During the sample period, 13 cities were governed by 3-5 different mayors and 2-5 different party secretaries.

4 Model

I use a discrete choice model[14] to rationalize firms' location choices and combine it with a border design to derive the local policy index. I then integrate this policy index into a tournament competition model to understand how it is determined in equilibrium and identify the primary incentive force shaping the decision-making process of local leaders. In the following model, firms consider local policies c_i as given and then make their plant location decisions. Once a firm f decides to locate in city i, their profit π_{fi} is realized. I assume there are $i \in \mathcal{R} := \{1, ..., R\}$ cities[15]. Each of them sets local policies c_i, taking into account their competitors' choice c_{-i}.

4.1 Location Choice Model for Firms

The objective function of firm f located in city i is:

$$\begin{aligned} \pi_{fi} &= V_{fi} + \varepsilon_{fi} \\ &= \beta x_{fi} - \alpha p_{fi} + \xi_i + \varepsilon_{fi} \\ &= \beta x_{fi} + c_i - \alpha p_{fi} + u_i + \varepsilon_{fi}. \end{aligned} \tag{1}$$

[14] Arauzo-Carod et al. (2010) provides a detailed discussion on the pros and cons of model choices for industrial location.

[15] I will use Jiangsu province as a case study. This province has 13 cities, all of which are ranked among the top 100 cities in China based on their GDP in 2018 according to sohu.

where V_{fi} captures the deterministic component of firm's utility, and ε_{fi} are idiosyncratic preferences for choices, which follow type I extreme value distribution. x_{fi} denote observed location characteristics for firm f located in city i, such as the size of the plant, land quality, etc. p_{fi} is the land price that firm f needs to purchase in city i. ξ_i stands for unobserved characteristics in that location, and it can be decomposed into two parts. One captures unobserved policies c_i, such as tax, subsidy, environmental regulation stringency, free labor training, etc. The other one captures unobserved factors u_i, such as distance to the labor force, seasonal weather, local economic activity, etc.

Firm f chooses to enter city i such that for all j where $j \neq i$: $\pi_{fi} > \pi_{fj}$. The probability of firm f deciding to locate in city i is[16]:

$$\begin{aligned} Pr(f \text{ chooses } i) = s_i &= \frac{exp(V_{fi})}{\sum_{j=1}^{R} exp(V_{fj})} \\ &= \frac{exp(\beta x_{fi} + c_i - \alpha p_{fi} + u_i)}{\sum_{j=1}^{R} exp(\beta x_{fj} + c_j - \alpha p_{fj} + u_j)}. \end{aligned} \tag{2}$$

Furthermore, taking the derivative of the share of firms in city i (s_i) with respect to their own policies (c_i), land price (p_{fi}), and neighboring city's policies (c_j) would yield the following:

$$\frac{\partial s_i}{\partial c_i} = s_i(1 - s_i) > 0, \quad \frac{\partial s_i}{\partial p_{fi}} = -\alpha s_i(1 - s_i) < 0, \quad \frac{\partial s_i}{\partial \alpha_j} = -s_i s_j < 0.$$

These relationships reveal that a greater emphasis on pro-business policies (represented by larger c_i) would increase a firm's likelihood of establishing a plant in city i. A higher land price (represented by larger p_i) would decrease a firm's likelihood of establishing a plant in city i (given a positive value of α). Furthermore, if a neighboring city c_j promotes more pro-business policies, firm f is less likely to choose city i.

4.1.1 Interpretation of Policy Index c_i

What is the economic interpretation of one unit of c_i? In equation 2, the firm's choice remains unchanged with an increase of $\frac{x}{\alpha}$ in p_{fi} and a x-unit rise in c_i. In other words,

[16]Notice that I do not consider the firm's outside option of not opening a plant. Therefore, the probability here should be interpreted as the probability of entering city i conditional on opening a plant.

to maintain the status quo, firms are willing to pay an extra $\frac{x}{\alpha}$ dollars for land price if the policy index increases by x units. To provide a concrete example, assume that $c_1 = 0$ in Nanjing and $c_2 = 0.5665$ in Nantong, with $\alpha = 0.0005$ in 2010. Relative to City 1 (Nanjing), the policies in City 2 (Nantong) is valued at $\frac{0.5665}{0.0005} \times 10,000 = 11,330,000RMB$, which is equivalent to 162 million in dollars.

It is vital to understand how policies c_i affect a firm's plant location decision. Often, policy data is either unavailable or incomplete. Without loss of generality, assume the complete policies include 2 policy variables: tax and environment regulation[17]. Researchers may only have access to one of these variables, such as tax data (c_{1i}). The policy term c_i in equation 2 can be decomposed as follows.

$$c_i = \gamma_1 c_{1i} + \gamma_2 c_{2i}. \tag{3}$$

It is fine if c_{1i} and c_{2i} are not correlated with each other. However, in reality, local officials often decide on them together. If local officials aim to leverage both policy tools to maintain a pro-business environment, they may set both a low tax, c_{1i}, and loose environmental regulations, c_{2i}, simultaneously. When using only tax data, the positive correlation between them could overestimate the effect of tax on firm's plant selection. Conversely, it is also possible that c_{1i} and c_{2i} are negatively correlated. This might occur when local officials face budge deficits and aim to generate revenue from taxes. In such cases, they could set loose environmental regulations in the hope of encouraging firms to produce more output while setting high taxes to collect more revenue. When relying solely on tax data, the negative correlation between them could likely underestimate the effect of tax on firm's plant selection.

Given the reasons mentioned above, having a comprehensive list of policies is crucial for understanding how firms respond with and without policies. Unfortunately, many studies, particularly those focusing on developing countries, encounter difficulties in accessing complete policy data. Furthermore, adding a fixed-effect dummy term in equation 2 cannot disentangle whether the observed effect is due to policy c_i or the influence of local factors u_i. In the following section, I propose a method to extract c_i using a border

[17]For n policy variables, the similar interpretation would apply. $c_i = \gamma_1 c_{1i} + \gamma_2 c_{2i} + \gamma_3 c_{3i} + ... + \gamma_n c_{ni}$.

design.

4.1.2 Extracting Policy Index c_i through Border Design

Following Holmes (1998); Black (1999); Bayer et al. (2007); Dell (2010); Barwick et al. (2021a); Chi et al. (2023), the border design relies on the following assumption. When the distance to the border is small enough, unobserved factors u_i are identical:

$$u_{i|Border} = u_{j|Border}. \tag{4}$$

The ideal scenario would involve a distance closer to zero.[18] Let *Border* denote region close to the city border. For firms located in the border region, the reason they choose one side over the other is the favorable policies c_i, which can be estimated through the firms' choices[19]. That is:

$$\begin{aligned} Pr(f \text{ chooses } i|Border) &= \frac{exp(V_{fi})}{exp(V_{fi}) + exp(V_{fj})} \\ &= \frac{exp(\beta x_{fi} + c_i - \alpha p_{fi})}{\sum_{k=i,j\in Border} exp(\beta x_{fk} + c_k - \alpha p_{fk})}. \end{aligned} \tag{5}$$

Comparing the above equation 5 with equation 2, the term representing the unobserved factor cancels out due to the border design assumption. Furthermore, when conditioning on residing in the border region, firms' choice set consists of only two neighboring cities: city i and city j. This can be observed in the denominator of equation 5.

4.2 Tournament Competition Model

The incentive system governing Chinese local officials, known as promotion tournaments, is a vital source of motivation for boosting the local economy and intensifying competition among local governments. Local leaders' payoffs depend not only on their political career promotions but also on their political career reputation. Given the institutional background in China discussed in section 2, the total output generated by

[18] In the appendix, I discuss the reasons for choosing a 10 km cutoff and present results using other distance measures as robustness checks.

[19] There exists land parcels with less demand. According to a sample of land auction data from 2010 to 2016 in Jiangsu, an average of 20% of these parcels received no bids during the auctions. For detailed information, please refer to Table C.1 in the appendix.

industrial firms directly contributes to local economic performance. While a healthy budget balance might not directly increase their chances of promotion, it does provide more funds for public spending and for the next leader to manage.

Therefore, I assume that a city leader's payoffs consist of a weighted average of political career promotion, as represented by the city's output performance, and political career reputation, as measured by the city's budget balance[20]. The goal is to capture the main trade-off for city leaders: when local governments implement more pro-business policies, they attracts more businesses. However, these pro-business policies do not come without costs, as local leaders need to make efforts, including sacrificing their budgets. In addition, when local leaders make decisions on policies (c_i), they take other leaders' decisions on their policies (c_{-i}) as given. Local leader in city i maximizes his/her objective function by choosing policies c_i:

$$\max_{c_i} \pi_i \equiv \lambda_i \cdot \underbrace{\triangle F \cdot s_i \cdot Output}_{\text{Change of Total Output}} + (1-\lambda_i) \cdot \underbrace{\triangle F \cdot s_i \cdot Budget_i}_{\text{Change of Total Budget}} \tag{6}$$

where λ_i is the weight on output performance, $0 < \lambda_i < 1$. Following Wang et al. (2020), I assume that this weight is positively related to the city leader's career-advancement incentives[21]. $1 - \lambda_i$ is the weight on total budget. $\triangle F \cdot s_i$ is the total number of new firms in city i. $\triangle F$ is the total number of new firms in the economy[22]. s_i is the share, which is derived from firm entry condition $s_i = \frac{exp(\beta x_{fi} + c_i - \alpha p_{fi} + u_i)}{\sum_{j=1}^{R} exp(\beta x_{fj} + c_j - \alpha p_{fj} + u_j)}$. $Output$ denotes outputs per firm. $Budget_i$ stands for the local government's net revenue. Since c_i is the net benefit provided by local governments to each firm, $Budget_i = -c_i$.

From the previous section, we know that $\frac{\partial s_i}{\partial c_i} = s_i(1 - s_i) > 0, \quad \frac{\partial s_i}{\partial c_j} = -s_i s_j < 0$. This modelling approach captures the main trade-off: an increase in city i's policies c_i results in a higher number of firms $\triangle F \cdot s_i$, but it leads to a decrease in net revenue $Budget_i$. Additionally, a strategic interplay exists across cities, where an increase in neighboring

[20] It has been documented that GDP is a crucial factor in determining the promotion prospects of local leaders (Zhou, 2007; Xu, 2011), and it is worth noting that total outputs contribute significantly to GDP.

[21] In Wang et al. (2020), the city leader's career-incentive intensity is measured by their predicted ex ante promotion likelihood based on their start age and start hierarchical level.

[22] Please note that this paper does not focus on modeling the change in the total number of firms within the province; instead, it focuses on the distribution of these new firms across cities. Thus, $\triangle F$ is considered as a given value, and it does not directly affect the way local leaders decide on policies c_i.

city's policies c_j $(j \neq i)$ leads to a reduction in the number of firms $\triangle F \cdot s_i$.

Local leaders maximize profits π_i by selecting an optimal policy level c_i. The first-order condition of equation 6 for c_i yields the following:

$$c_i = \frac{\lambda_i}{1-\lambda_i} Output - \frac{1}{1-s_i}. \tag{7}$$

Rearrange terms, the equation can be written as:

$$\lambda_i = \frac{\frac{c_i + \frac{1}{1-s_i}}{Output}}{1 + \frac{c_i + \frac{1}{1-s_i}}{Output}}. \tag{8}$$

Equation 8 illustrates a one-to-one relationship between the policy variable c_i and the leader's career-advancement weight λ_i. In other words, the level of c_i uniquely determines λ_i. In the estimation section, I extract the value of c_i from the available data. Subsequently, I can calculate the corresponding λ_i using this equilibrium equation.

5 Estimation

I utilize a sample of firms located within a 10 km buffer zone from the city border to estimate the unobserved policies. In this stage, I assign each firm f to its nearest border, denoting it as B. For example, firms highlighted in yellow within city 1 and city 2 are assigned to the border region B_{12} as illustrated in Figure 5. As an alternative location choice, firms may opt to establish a plant in a bordering city. For instance, firms located in city 1 within the border region B_{12} may alternatively select city 2 as their location, while those in city 1 within the border region B_{13} may alternatively choose city 3. In the subsequent step, I then employ the data of firms located beyond the 10 km buffer zone, represented by hollow circles in Figure 5, to estimate their entry decisions.

5.1 Estimation of the Policy Index

I use maximum likelihood to estimate the following equation:

$$
\begin{aligned}
Pr(f \text{ chooses } i|Border) &= \frac{exp(V_{fi})}{exp(V_{fi}) + exp(V_{fj})} \\
&= \frac{exp(\beta x_{fi} + c_i - \alpha p_{fi})}{\sum_{k=i,j \in Border} exp(\beta x_{fk} + c_k - \alpha p_{fk})} \\
&= \frac{exp(\beta x_{fi} + c_i - \alpha p_{fi})}{exp(\beta x_{fi} + c_i - \alpha p_{fi}) + exp(\beta x_j + c_j - \alpha p_j)}.
\end{aligned} \tag{9}
$$

For firms located in city i, their alternative choice, city j, would provide them with x_{fj}, c_j, and p_{fj} if they choose to locate in city j. I use the average values of x_j, p_j in the border region to replace x_{fj}, p_{fj}. Similarly, for firms located in city j, they face x_i, p_i when considering their alternative choice, city i.

5.1.1 Identification Assumption

As shown in equation 4, the underlying assumption of the border design is that unobserved factors are identical for bordering cities within a small buffer zone[23]. Land use, population, nighttime light, and road density are among the potential unobserved factors that could affect a firm's plant decision. And these unobserved factors are generally not easily accessible to researchers. To test this assumption, I collect data on these variables at a fine-granularity level (1km x 1km) and use it to generate a balance table. The results, as shown in Table 3, reveal that the pro-business side of the city border has slightly lower population, smaller nighttime light, and is further away from the highway. Importantly, these differences are not statistically significant among these potential unobserved factors. In addition, the pro-business side features lower land price, smaller land size, and better land quality. Once again, these differences are not statistically significant. Equally important is demonstrating that plants in the border region are similar to those outside the border region. This can be seen in Table 4, where comparisons between plants within and outside the 10km city border region show no statistical differences in transaction prices, land size, or quality. Moreover, the percentages of general equipment plants are similar within and outside the 10km border region, both hovering around 12-14%.

[23] In other words, unobserved factors change continuously across the border.

5.1.2 Results of Policy Index Estimation

I plot the estimated coefficients $\hat{c}_i$ in Figure 6. In the figure, the city of Nanjing, labeled as a star, serves as the reference point, with policy indexes for other cities being relative to this base city. The darker colors on the map represent relatively pro-business policies, while the lighter colors represent relatively anti-business policies. These maps reveal a tendency for geographically close cities to implement similar policies. Figures 7a and 7b illustrate the temporal variation in estimated policies. The y-axis represents the re-scaled policy index, calculated as the difference between the estimated policy index and its median for each year. It quantifies the relative deviation of each city's policy index from its median, capturing policy divergence within specific years. The upper plot displays temporal variation over the entire sample period, with decreasing divergence since 2013[24]. The lower plot zooms in on the period between 2013 and 2018, revealing that the divergence is still not close to zero. Moreover, an intriguing pattern emerges as shown in Figure E.1: Prior to the anti-corruption campaign[25], more developed cities located in the south tended to adopt pro-business policies. However, this pattern shifted afterward. Instead, less developed cities located in the north began to adopt pro-business policies.

Validation 1: Hypothesis Validity

Following Juhász et al. (2022), I validate the estimated policy index using a "hypothesis validity" approach. As shown in the shaded region of Figure 8, a noticeable discontinuous gap can be observed between Nanjing and all other cities in the year 2014. The estimated policy index, generated from upstream land transactions, reveals a significant anti-business shock in Nanjing[26]. To verify this, I conduct a "hypothesis validity" check using registration information from downstream manufacturing firms, employing an event study design. If Nanjing did indeed experience an anti-business shock as identified by the policy index, we should expect to see a decrease in the number of newly registered

[24] Several factors could contribute to the temporal trend, especially the divergence observed in 2013. One factor is the change in central leadership during that year, which led to alterations in local leaders' interactions. Another factor is the massive national anti-corruption campaign, which also had an impact on local leaders' behavior in the same year.

[25] While the national campaign began in 2013, the central government sent inspection teams to investigate corruption cases in Jiangsu in 2014, marking the start of Jiangsu's anti-corruption shock.

[26] Readers might be curious about the events that led to such a significant policy gap between Nanjing and other cities. I discuss potential drivers of this shock in the appendix.

manufacturing firms. To test this hypothesis, I assign Nanjing as the treated city and the other 12 cities as control cities. The year 2014 is set as the treated year. As shown in Figure 9, relative to the other 12 cities in Jiangsu, the number of newly registered firms in the treated city, Nanjing decreases after 2014, and this impact persists. On average, Nanjing sees a 18% decrease in the number of newly registered manufacturing firms[27].

Validation 2: Text Analysis

I further validate the policy index by examining its correlation with the frequency of pro-business and anti-business words in city government work reports. Each year, city mayors release government work reports detailing their accomplishments in the past year and their plans for the upcoming year. These reports follow a standard format, with the first half focusing on past-year achievements and the second half on new-year plans.

I select pro-business words based on their relevance to the manufacturing industry. I find that when city mayors mention terms such as "manufacturing industry", "industrialization", "subsidy", "tax reduction", "attract capital", "industrial park", "development zone", "industrial", "investment promotion", "manufacturing", "manufacturing firm", "industrial production", "bringing in" in the first half of the government work reports, it indicates their support for the manufacturing industry or their efforts to attract new manufacturing firms. On the other hand, anti-business policies are reflected in the stringency of environmental regulations to some extent. Anecdotal evidence suggests that regions with more stringent of the environmental regulations are less attractive to manufacturing firms. Following Cao et al. (2021), I use the frequency of terms such as "emission reduction", "pollution discharge", "low carbon", "environmental protection", "air", "green", "ecosystem", "pollution", "PM2.5", "chemical oxygen demand", "carbon dioxide", "PM10", "sulfur dioxide", "energy consumption" in government work reports to assess the level of environmental regulations and, consequently, anti-business policies in different localities.

The descriptions in the first half of the government work reports consist of factual

[27]Before 2014, the average number of firms in each sector was 388. After 2014, there was an estimated drop of 70 firms. Importantly, if the policy index measures industrial policies, we would not anticipate significant changes in other types of firms. In Figure E.2 in the appendix, I present not only the changes in manufacturing firms but also in agricultural firms. It shows that the number of newly registered agricultural firms has remained stable in Nanjing relative to the other 12 cities after 2014. The corresponding difference-in-differences estimation procedure is shown in equation 13.

information. Therefore, when these reports mention pro-business words frequently in the first half, it indicates efforts to promote manufacturing businesses. If my policy index accurately reflects actual manufacturing policies, I would expect to observe a positive correlation with the frequency of pro-business words and a negative correlation with the frequency of anti-business words. In Figure 10a, a 1 standard deviation increase in the frequency of pro-business words corresponds to a 0.07 standard deviation increase in the policy index. Conversely, as shown in Figure 10b, a 1 standard deviation increase in the frequency of anti-business words corresponds to a 0.12 standard deviation decrease in the policy index. This confirms the alignment between my policy index and the written statements of local governments.

5.2 Estimation of Firm Plant Location Decisions

After obtaining the de facto policy indexes, the next task is to understand how firms decide on their plant locations. Importantly, when they decide whether to set up plants, they form an expectation of land parcels, local policies, and local characteristics that they might face. I use an overline notation to denote such expected perceptions. Using observed land transactions outside the 10 km buffer zone, estimated policies, and a list of city-level characteristics, I leverage maximum likelihood estimation to estimate the parameters of this probability distribution.

5.2.1 Estimation Steps of Plant Location Decisions

The probability of firm f deciding to enter city i is:

$$
\begin{aligned}
Pr(f \text{ chooses } i) &= \frac{exp(\bar{V}_{fi})}{\sum_{j=1}^{R} exp(\bar{V}_{fj})} \\
&= \frac{exp(\beta\bar{x}_{fi} + \bar{c}_i - \alpha\bar{p}_{fi} + \bar{u}_i)}{\sum_{j=1}^{R} exp(\beta\bar{x}_{fj} + \bar{c}_j - \alpha\bar{p}_{fj} + \bar{u}_j)} \\
&= \frac{exp(\beta x_{fi} + \hat{c}_i - \alpha p_{fi} + u_i)}{\sum_{j=1}^{R} exp(\beta\bar{x}_{fj} + \hat{c}_j - \alpha\bar{p}_{fj} + u_j)}.
\end{aligned} \tag{10}
$$

where I use the actual characteristics of land transactions as the options firms consider when deciding to establish plants in chosen cities. This choice is based on the fact that, when making plant location decisions, firms observe the announcement of land parcels, which include detailed land characteristics[28]. Moreover, the expected policies are estimated policies that I retrieved in the previous section, denoted as $\bar{c}_i$, which is equivalent to $\hat{c}_i$. Additionally, I use the average characteristics of land transactions in other cities as the options firms face.

$$\begin{aligned} \bar{x}_{fj} \equiv x_j = \frac{1}{F_j}\sum_{f=1}^{F_j} x_{fj} \\ \bar{p}_{ji} \equiv p_j = \frac{1}{F_j}\sum_{f=1}^{F_j} p_{fj}. \end{aligned} \tag{11}$$

The probability of firm f deciding to enter city i becomes:

$$Pr(f \text{ chooses } i) = \frac{exp(\beta x_{fi} + \hat{c}_i - \alpha p_{fi} + u_i)}{\sum_{j=1}^{R} exp(\beta \bar{x}_j + \hat{c}_j - \alpha \bar{p}_j + u_j)}. \tag{12}$$

5.2.2 Estimation Results of Plant Location Decisions

Table 5 presents the estimation results. In column (1), only the price is included as the explanatory variable. The results show that the higher the land price, the less likely firms are to enter the city. However, when the policy index and other location characteristics that affect firm entry, such as land size and quality, are added in column (2), the price effect becomes less pronounced. Additionally, land size does not appear to significantly affect site selection while land quality does matter; firms prefer to locate in places with better land quality[29]. Furthermore, firms tend to prefer locations with larger populations and more existing firms because these regions typically offer a larger labor force and greater agglomeration effects.

Specification 1 uses the actual land transaction characteristics as the options firms face

[28] Alternatively, I can use the average land transaction characteristics as the options firms consider when determining plant locations. The rationale for this specification is that, when deciding on plant locations, firms form expectations about the characteristics of potential land parcels they might acquire. To form these expectations, they use the average land characteristics in cities as a proxy. I employ both specifications in the estimation, and they yield similar results.

[29] Larger values for land quality indicate worse land quality.

when deciding to set up plants in chosen cities. This choice is based on the rationale that, when making plant location decisions, firms observe the announcement of land parcels, which include detailed land characteristics. Therefore, using the actual characteristics provides a more accurate basis for the estimation process. On the other hand, Specification 2 employs average land transaction characteristics as the options firms consider when deciding to establish plants in chosen cities. The rationale for this specification is that, when determining plant locations, firms form expectations about the characteristics of potential land parcels they might acquire. To form these expectations, they use the average land characteristics in cities as a proxy. Columns (3) and (4) of the results show that the coefficients have similar signs to those in columns (1) and (2), with only minor differences in magnitude.

5.2.3 Model Fit for Plant Location Patterns

Figure 11 illustrates the overall goodness of fit between the predicted number of new plants and the actual number of new plants in each city. Overall, the correlation between the predicted number of new plants and the actual one is 0.80. The R-squared, generated from regressing the predicted number of new plants on the actual number of new plants, is 0.63. This means that the predicted values can explain 63% of the variation in the actual data. The model demonstrates strong performance by closely aligning with the real data, as evidenced by the bar plot in Figure E.3. This bar plot shows the correspondence between the predicted and actual rankings of total plant numbers. However, a significant deviation becomes apparent in the case of Xuzhou, located in northwestern Jiangsu. Here, the model over-predicts the number of plants by over 1000. Additionally, the model under-predicts plant numbers in cities with the highest concentrations and over-predicts in cities with the lowest numbers of plants.

5.3 Policy Choice and Leaders' Characteristics

The model section demonstrates that the model primitive, leaders' assigned weights on total outputs (career-advancement incentives) λ_i, is a function of city policy indexes, $\lambda_i = \frac{\frac{c_i+\frac{1}{1-s_i}}{Output}}{1+\frac{c_i+\frac{1}{1-s_i}}{Output}}$. The relationship between policies and weights on outputs (career-advancement incentives) is depicted in Figure 12. When local leaders have stronger incentives for promotion, they are more likely to enact pro-business policies. This is because attracting firms can significantly impact GDP, which is a key factor directly affecting their chances of promotion. However, when the incentives are relatively weak, as reflected by low weights on outputs (below 0.7), a unit difference in city leaders' incentives results in similar policies. In contrast, with strong incentives (weights on outputs above 0.7), a unit difference in city leaders' incentives leads to significantly different policies.

Scholars have shown that leaders' socializing experiences (e.g., education level) and ascriptive traits (e.g., age, gender) can explain their behavior or policy choices (Krcmaric et al., 2020). The Chinese leaders have largely adhered to the age ceiling for decades. "The Retirement Age Requirements for Cadres"[30], as clarified in Table 6, stipulate that leaders at or below the deputy provincial-ministerial level should retire at the age of 60. In addition, they can only be nominated for a higher position if they are 58 years old or younger. Therefore, age norms have played a central role in determining political leadership. It is important to note that, as seen in Table 2, most leaders in Jiangsu left their positions before reaching the age of 60. On average, city Mayors left their positions at the age of 53, and city party secretaries left theirs at the age of 55, making Jiangsu a very interesting case to study because the majority of them had a high ex ante chance of getting promoted. Term limits should also be considered. "The Interim Provisions on the Term of Office for Cadres"[31] stipulate that leaders serving in people's governments at the county level and above have a tenure of 5 years, and the tenure of related party positions is also set at 5 years. However, in reality, most city mayors and city party secretaries had tenures shorter than 5 years. Table 2 shows that the majority of city mayors and party secretaries in Jiangsu had tenures of less than 5 years.

Motivating by the above facts, I begin by examining the association between observed city officials' characteristics and the model estimates. Specifically, I focus on officials' age and their term (measured by years since leaving their current position) [32]. I also include leaders' fixed effects to control for any unobserved time-invariant char-

[30] "The Retirement Age Requirements for Cadres"(党政领导干部职务任期暂行规定)

[31] "The Interim Provisions on the Term of Office for Cadres"(老干部离休退休的年龄规定)

[32] When officials leave their current position, they may be promoted, terminated, or retired. In Jiangsu province, during 2010-2018, most city leaders were not terminated while in office; instead, the majority of them were promoted.

acteristics that might affect their policy choices and their assigned weights on outputs (career-advancement incentives)[33]. As shown in Table 7, the results indicate that the characteristics of city mayors demonstrate a stronger correlation, both in terms of statistical significance and magnitude, with policy indexes compared to party secretaries. This pattern aligns with the conventional wisdom that city mayors have greater control over day-to-day city management, while city party secretaries primarily handle personnel control (Xu, 2011; Yao and Zhang, 2013). Furthermore, younger city mayors are more likely to propose pro-business policies, which aligns with the reality that younger city mayors, further from retirement, have higher incentives to find ways to attract businesses and boost the local economy. These results also reveal that city leaders with shorter term are more likely to propose pro-business policies as they approach the end of their term, while city leaders with longer terms are less likely to propose pro-business policies as they near the end of their tenure.

6 Counterfactual Analysis

In the current status quo, local leaders, driven by different promotion incentives, compete with each other, as can be observed in Figure E.4. Their promotion incentives vary significantly among these cities, resulting in various industrial policies proposed within their respective jurisdictions. In 2019, the Central Committee of the Communist Party of China issued the "Regulations on the Selection and Appointment of Party and Government Leading Cadres," which outlines several mandatory rules for selecting local leaders. For example, one rule stipulates that individuals appointed to county-level or higher leadership positions should have experience serving in two or more positions at the next lower level. Another rule states that appointments to county-level or higher leadership positions, when promoted from a deputy position to a full position, require a minimum of two years of service in the deputy position. When promoted from a lower-level full position to a higher-level deputy position, a minimum of three years of service in the lower-level full position is required. With more stringent rules, it is possible

[33] The information of gender and education level is also available, but with leaders' fixed effects, there is no need to include them as controls.

that local leaders with similar demographics and backgrounds are selected, resulting in identical promotion incentives.

What if these cities were assigned local leaders with the same promotion incentives? How would this affect local policies, assuming other factors remain unchanged? Would this, in turn, lead to different location decisions for firms? Using the estimated policy index and the tournament competition model, I can now compare the current state to a scenario in which all leaders share the same career-advancement incentives, represented as a constant λ, across all 13 cities. This scenario can be understood as the provincial-level government assigning leaders with the same incentive to all 13 cities. In this exercise, my focus is on the consequences of assigning city leaders with identical promotion incentives, rather than on understanding how provincial-level leaders select these city leaders. However, it is possible that their promotion incentives are similar due to their shared ages and education levels. It is also possible that provincial-level leaders establish promotion rules in such a way that, regardless of age or their prior experiences, city leaders have the same ex ante probability of getting promoted.

The left plot of Figure 13a shows that under a uniform leader's career incentive model applied across all 13 cities, we observe a significant convergence in policy formulation. It becomes apparent that when motivated by a common objective, the policies of these diverse cities become similar. Importantly, this counterfactual scenario produces the same policy outcomes as the scenario in which provincial-level leaders directly restrict policy competition by instructing all city leaders to propose identical policies.

When policies are similar in different locations, how do firms decide on setting up manufacturing plants? The right plot of Figure 13a shows that firms are now more evenly distributed across these cities. In total, 23 percent of firms change their location under the cooperative scheme. Figure 14 illustrates that most of these changes involve firms moving from coastal cities in the status quo to inland cities in the counterfactual world.

This raises a critical policy question: Does intense competition, driven by asymmetric city leaders' promotion motives under the status quo, truly yield significantly superior outcomes, or could cooperation hold equal promise? Intriguingly, my findings suggest that the difference between asymmetric competition and cooperation may not be as pronounced as previously thought. 77 percent of firms appear content to maintain their current locations when faced with similar policies across diverse regions. This leads to a reconsideration of the fundamental role of current competition in the pursuit of economic prosperity.

7 Conclusion

This paper delves into the impact of local government competition on firms' location choices and explores how leaders' promotion motives intensify this competition. Local governments engage in competition through a range of city-wide policies, including tax reductions, subsidies, financial support, and relaxed environmental regulations. It is worth noting that the disparity between de facto (practical) and de jure (official) policies is substantial, and many of these policies remain hidden due to limited data access. Even when policy data is available, current literature tends to model local government competition focusing on a single policy dimension, such as taxes or subsidies, while overlooking other policy aspects.

To address this limitation, I introduce an innovative method to capture the net effect of the diverse policies proposed by local governments. This net effect is estimated through a model of firm location decisions and a spatial border design. The results reveal a tendency for geographically proximate cities in Jiangsu, China, to adopt similar industrial policies. Moreover, the attributes of city mayors exhibit a more pronounced correlation with policy indexes when contrasted with those of party secretaries. This observation aligns with the understanding that mayors are accountable for the day-to-day administration of the city, whereas party secretaries primarily manage personnel matters.

Furthermore, this paper presents a policy competition framework to understand how policies are determined in equilibrium and how, in turn, they influence firms' location decisions. Counterfactual exercises demonstrate that the difference between asymmetric competition and cooperation may not be as pronounced as previously thought. 77 percent of firms appear content to maintain their current locations when faced with similar policies across diverse regions. This prompts a reevaluation of the essential role that current competition plays in the quest for economic prosperity.

Policy choices under leaders' career-advancement incentive systems are not restricted to the industrial sectors. When designing policies to attract industrial firms, local leaders also take into account the trade-offs between boosting the industrial sector and enhancing residential development. Approximately 75% of the revenue generated from public land auctions is derived from the sale of residential land. Local officials have the option to increase fiscal revenue by offering long-term leaseholds for residential land, thereby securing resources for public infrastructure development and subsequently enhancing economic performance. Wang et al. (2020) primarily focuses on residential development driven by career incentives of city leaders. In contrast, my research centers on the political motivations behind attracting industrial businesses. Future work should consider the complexities of the trade-offs between residential and industrial development under the promotion incentive systems.

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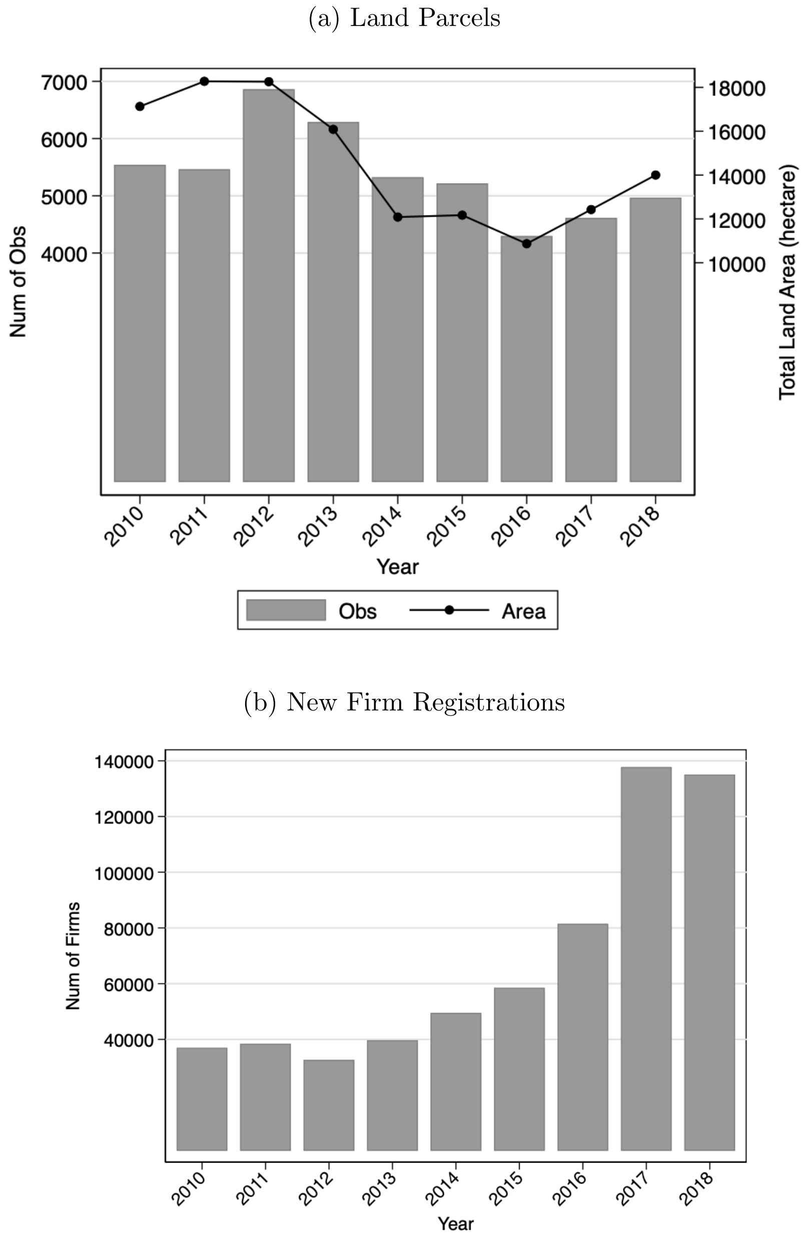
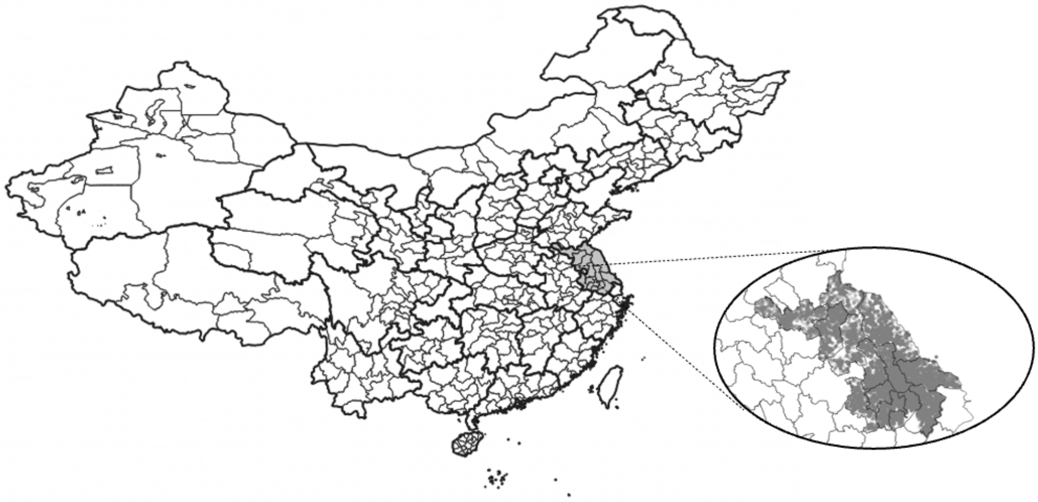
Figure 1. Land Transactions and Firm Registrations



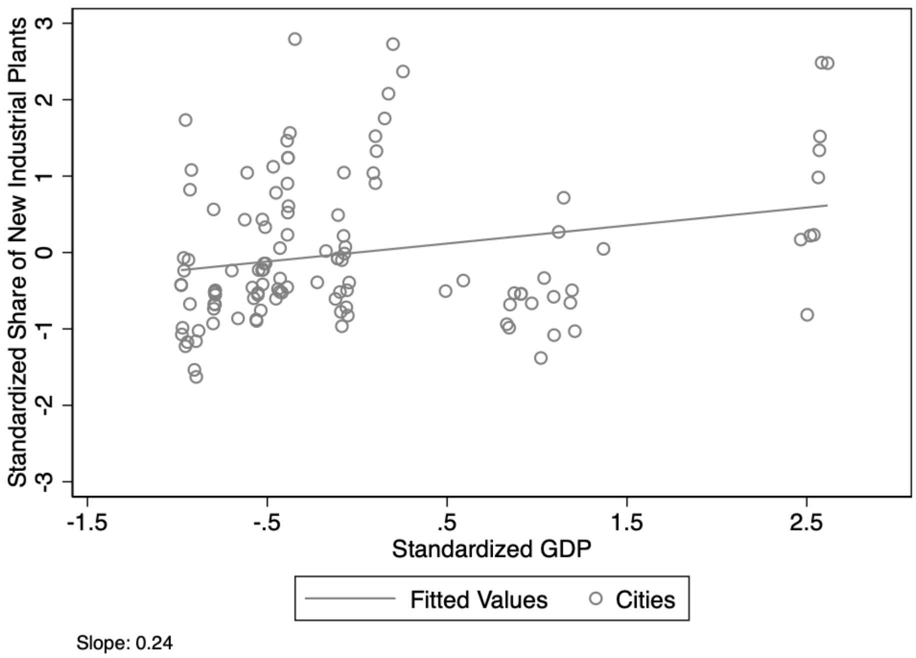
Note: The left plot shows the total number and the total area of all transacted land parcels during 2010-2018. The left y-axis denotes the number, and the right y-axis denotes the area. The right plot shows the total number of newly registered manufacturing firms during 2010-2018.

Figure 2. Spatial Distribution of Industrial Land



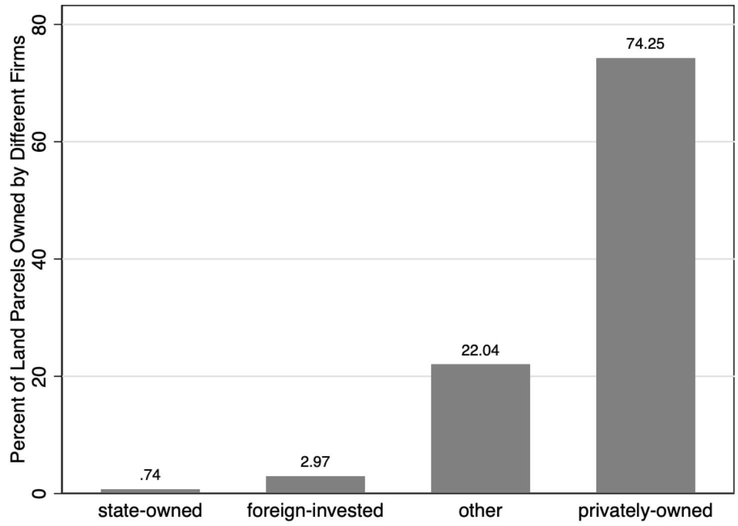
Note: This is a China city-level map, with the circled part being the spatial distribution of industrial land in Jiangsu province during 2010-2018. The bold black line denotes the province boundary.

Figure 3. Correlation between Share of New Industrial Plants and City GDP



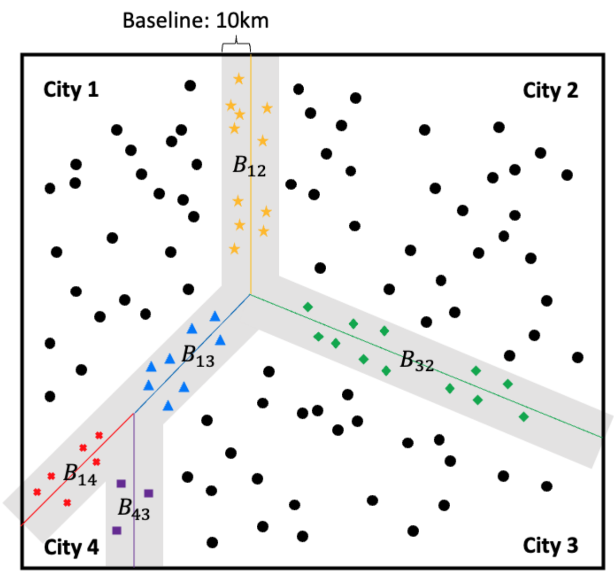
Note: This figure depicts the correlation between the standardized share of new industrial plants and standardized city GDP. It shows that a one-standard-deviation increase in GDP is associated with a 0.24-standard-deviation increase in the share of new industrial plants.

Figure 4. Percentage of Land Parcels Owned by Different Firms



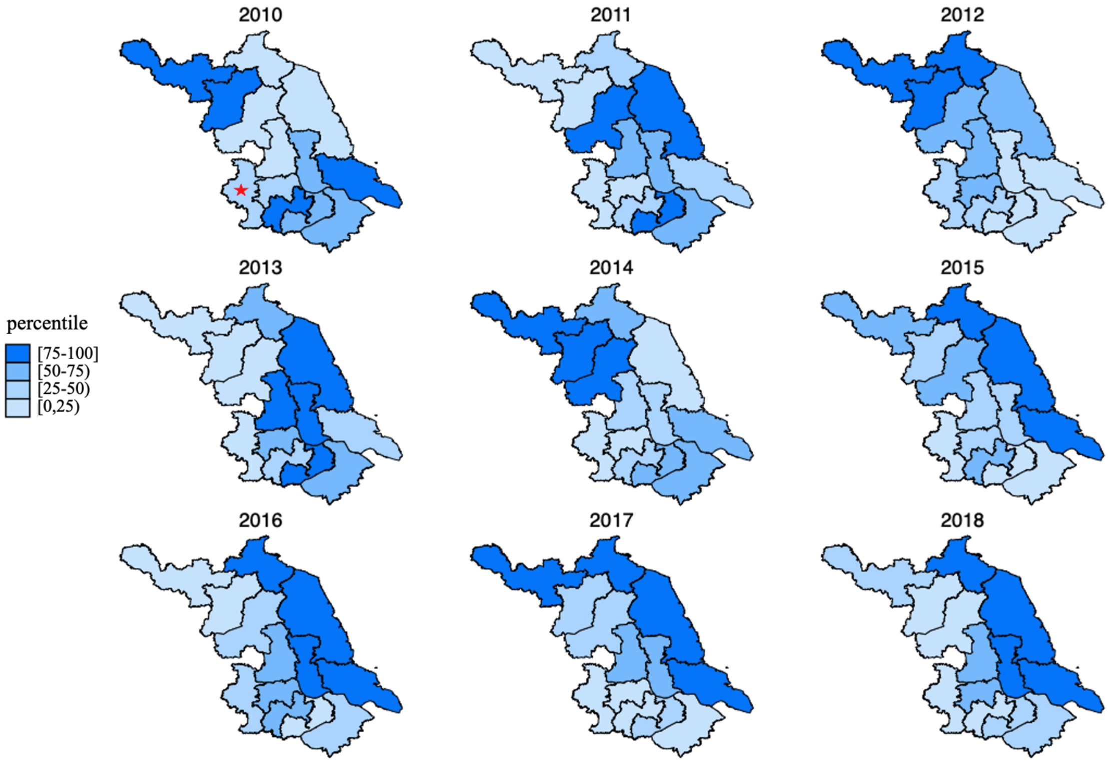
Note: This bar graph shows the percentage of land parcels owned by various types of firms. It illustrates that the majority of land parcels are operated by private firms, while state-owned firms operate less than 1 percent of the land parcels. The category "other" includes land parcels operated by individuals and firms without a public record.

Figure 5. Illustrative Example



Note: Icons denote the firm's plant locations. Icons with the same shapes represent plants located in specific border pairs. For example, firms denoted by star icons in city 1 and city 2 are assigned to border region B_{12}.

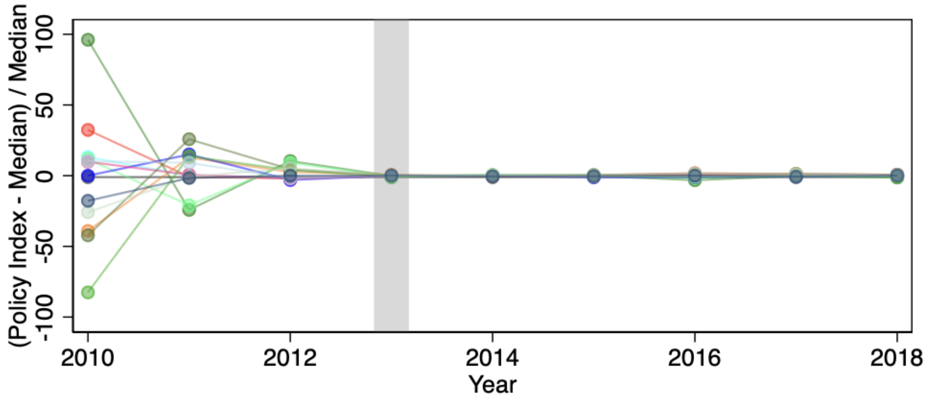
Figure 6. Spatial Variation: Percentage Distribution of Estimated Policies $\hat{c}_i$



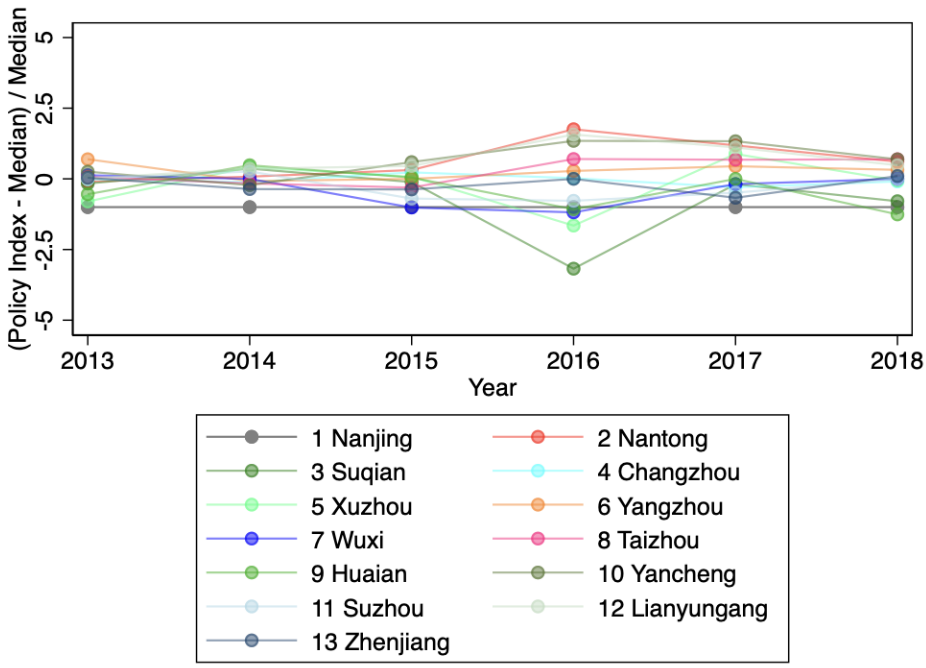
Note: The city of Nanjing, labeled as a star, serves as the reference point, with policy indexes for other cities being relative to this base city. The darker colors on the map represent relatively pro-business policies, while the lighter colors represent relatively anti-business policies. These maps reveal a tendency for geographically close cities to implement similar policies.

Figure 7. Temporal Variation: Estimated Policies $\hat{c}_i$

(a) Years 2010-2018

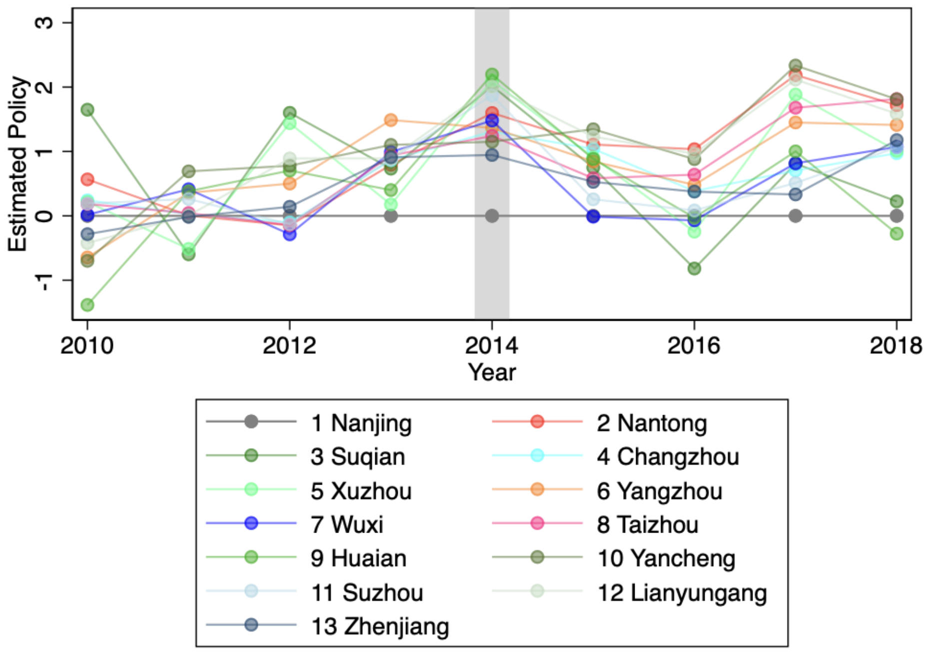


(b) Years 2013-2018



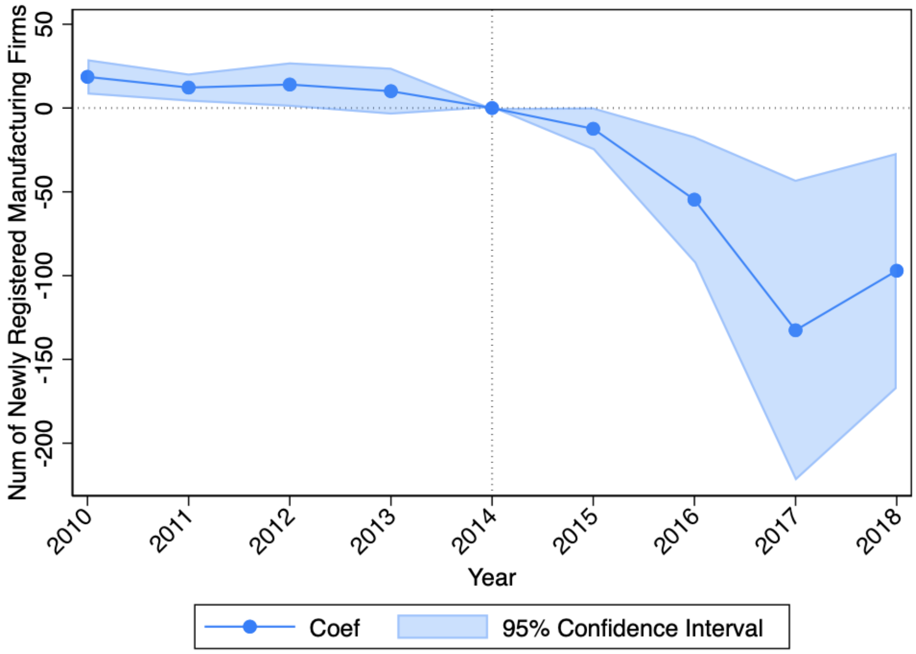
Note: These figures illustrate the temporal variation in estimated policies. The y-axis represents the re-scaled policy index, calculated as the difference between the estimated policy index and its median for each year. It quantifies the relative deviation of each city's policy index from its median, capturing policy divergence within specific years. The upper plot displays temporal variation over the entire sample period, with decreasing divergence since 2013. The lower plot zooms in on the period between 2013 and 2018, revealing that the divergence is still not close to zero.

Figure 8. Validation: Yearly Estimated Policies $\hat{c}_i$



Note: This figure plots the yearly trend of estimated policies. Nanjing serves as the base city, with an estimated policy index of zero throughout the sample period. Policy indexes for other cities are relative to this base city. As shown in the shaded region of this figure, a noticeable discontinuous gap can be observed between Nanjing and all other cities in the year 2014.

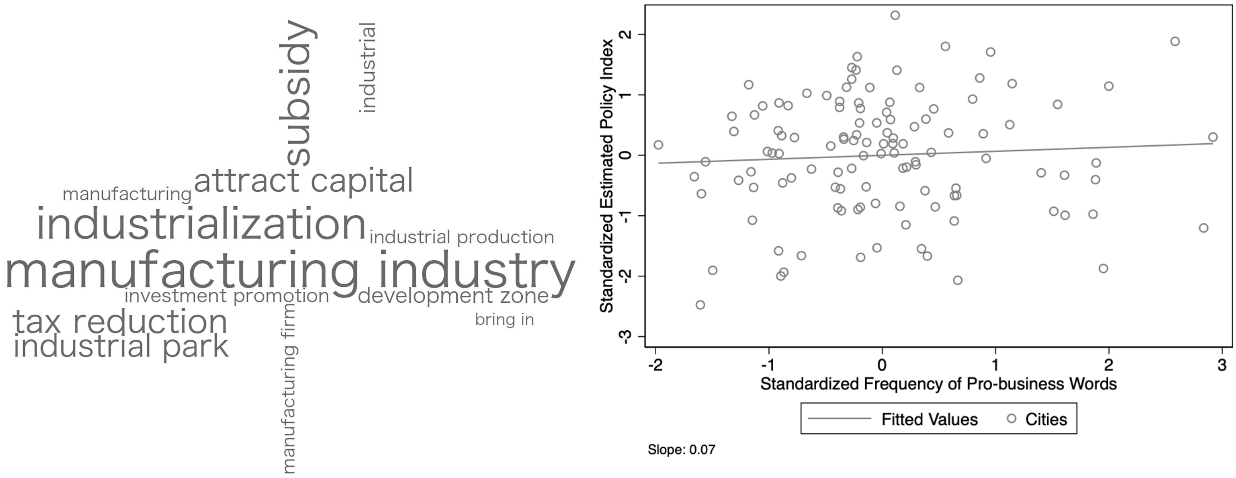
Figure 9. Validation: Newly Registered Manufacturing Firms



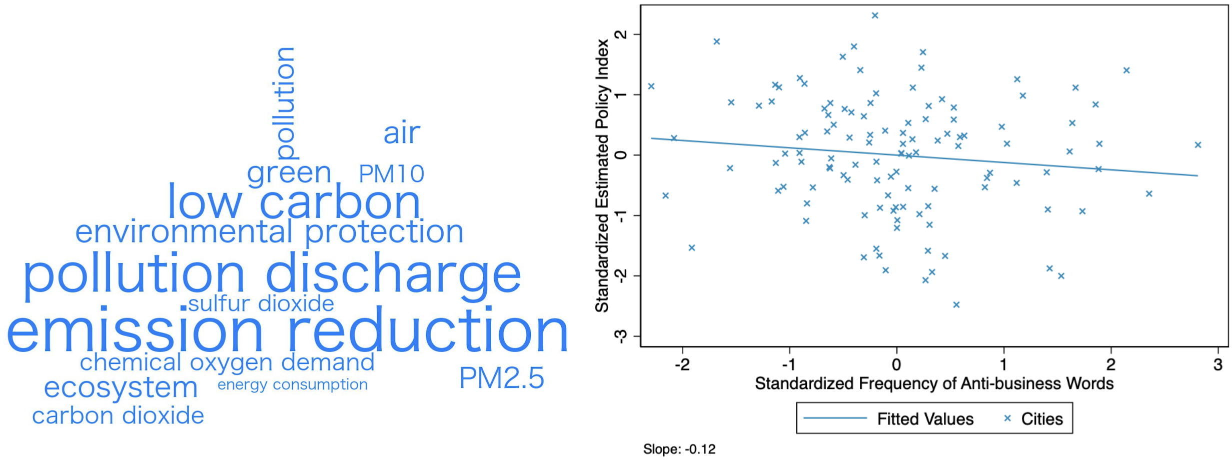
Note: This figure illustrates an event study design. It is based on observations collected at the city-year-sector level. I assign Nanjing as the treated city and the other 12 cities as control cities. The year 2014 is set as the treated year. Relative to the other 12 cities in Jiangsu, the number of newly registered firms in the treated city, Nanjing decreases after 2014, and this impact persists. On average, Nanjing sees a 18% decrease in the number of new manufacturing firms.

Figure 10. Validation: Policy Index and Frequency of Pro/Anti-Business Words

(a) Pro-Business

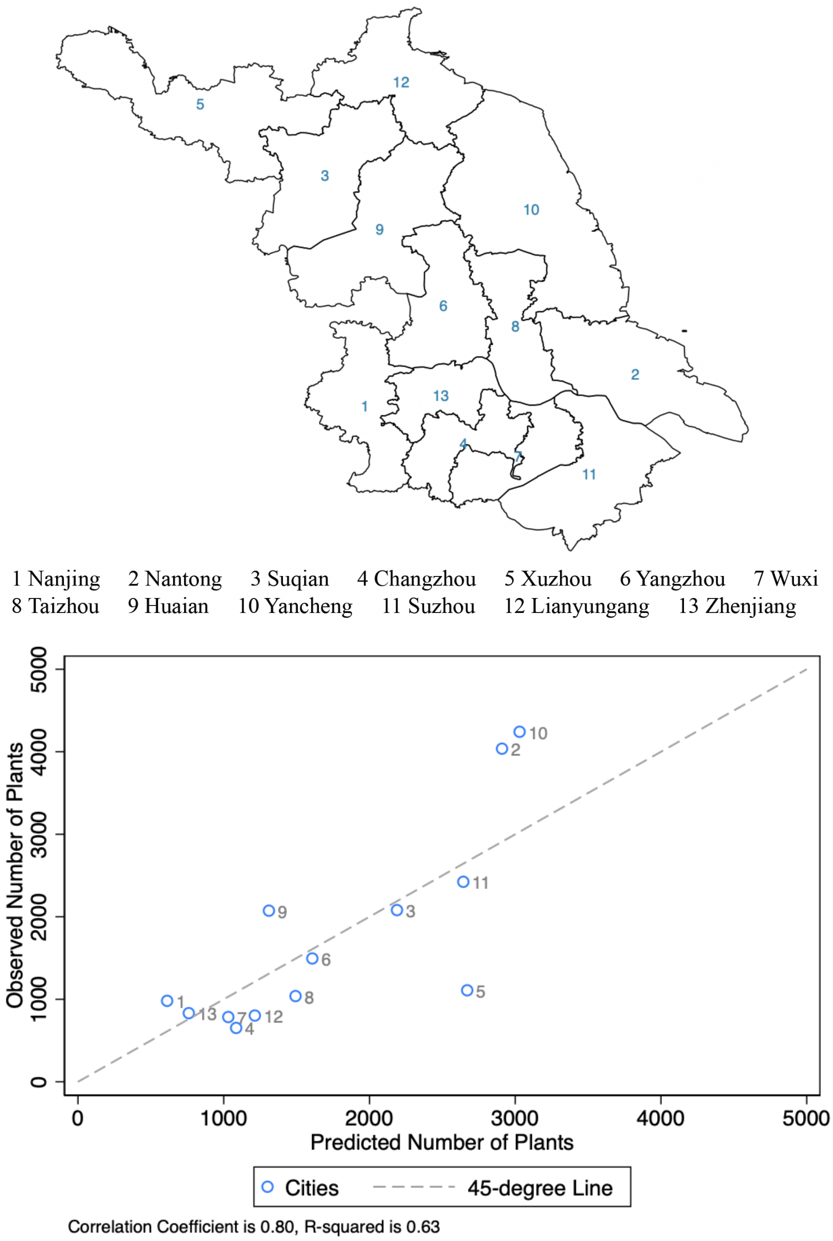


(b) Anti-Business



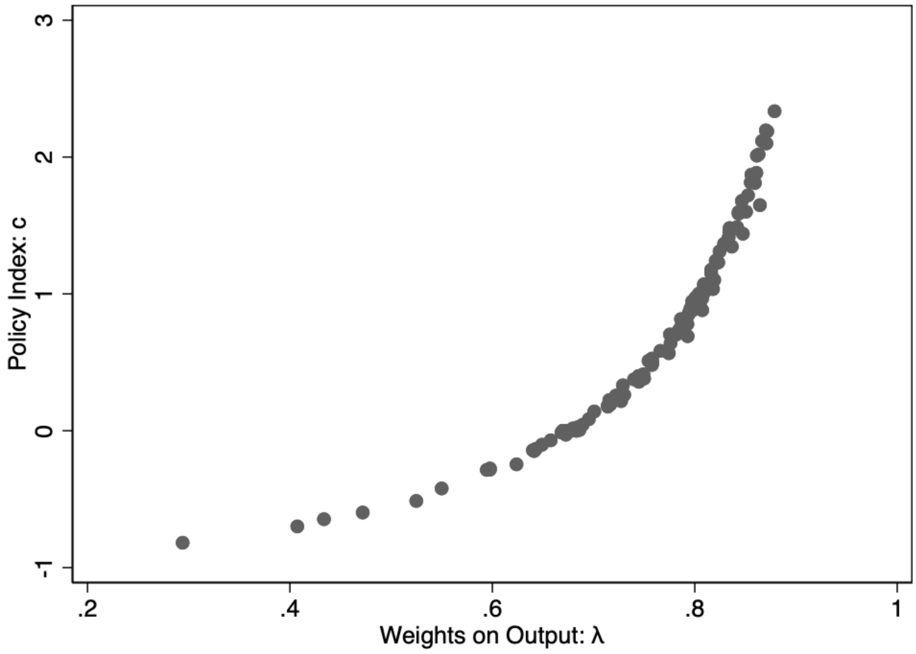
Note: This figure shows the correlation between the estimated policy index and the frequency of pro-business and anti-business words in city government work reports. Pro-business words include "manufacturing industry", "industrialization", "subsidy", "tax reduction", "attract capital", "industrial park", "development zone", "industrial", "investment promotion", "manufacturing", "manufacturing firm", "industrial production", "bringing in". Anti-business words include "emission reduction", "pollution discharge", "low carbon", "environmental protection", "air", "green", "ecosystem", "pollution", "PM2.5", "chemical oxygen demand", "carbon dioxide", "PM10", "sulfur dioxide", "energy consumption".

Figure 11. Model Fit: Industrial Firm Location Pattern



Note: This figure illustrates the overall goodness of fit between the predicted number of new plants and the actual number of new plants in each city.

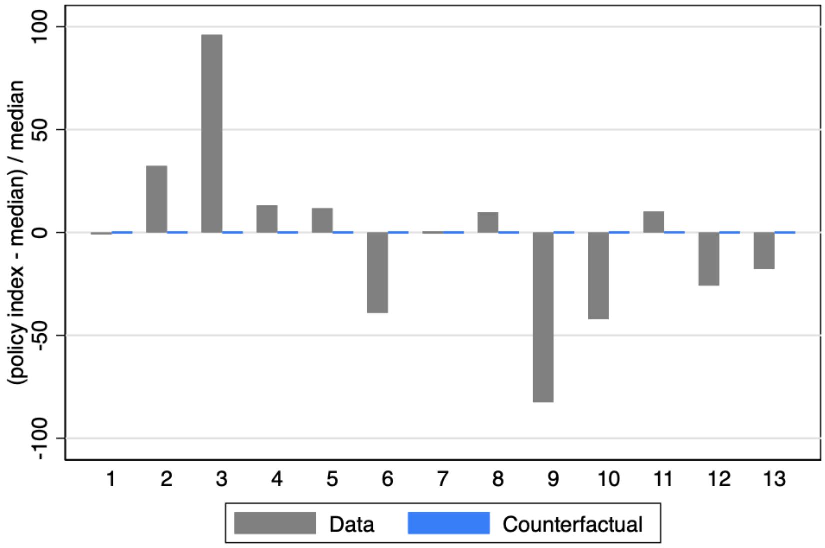
Figure 12. Relationship between Policies c_i and Weights on Outputs λ_i



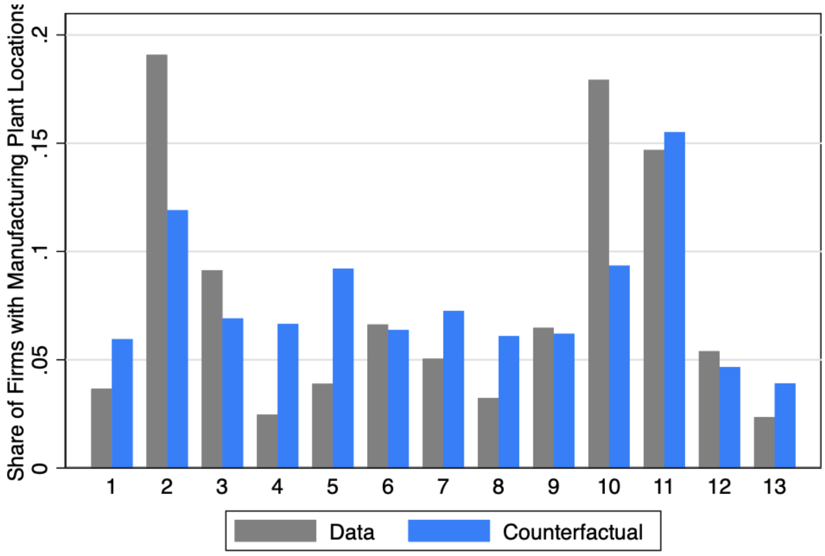
Note: This figure shows the relationship between policies c_i and weights on outputs λ_i based on equation 8. The results suggest that local leaders with stronger promotion incentives are more likely to enact pro-business policies. Furthermore, this relationship exhibits convexity, as the rate of increase in pro-business policies in response to changes in promotion incentives accelerates with higher values of promotion incentives.

Figure 13. Counterfactual Results: Policy Index and Share of New Firms

(a) Counterfactual Policy Index

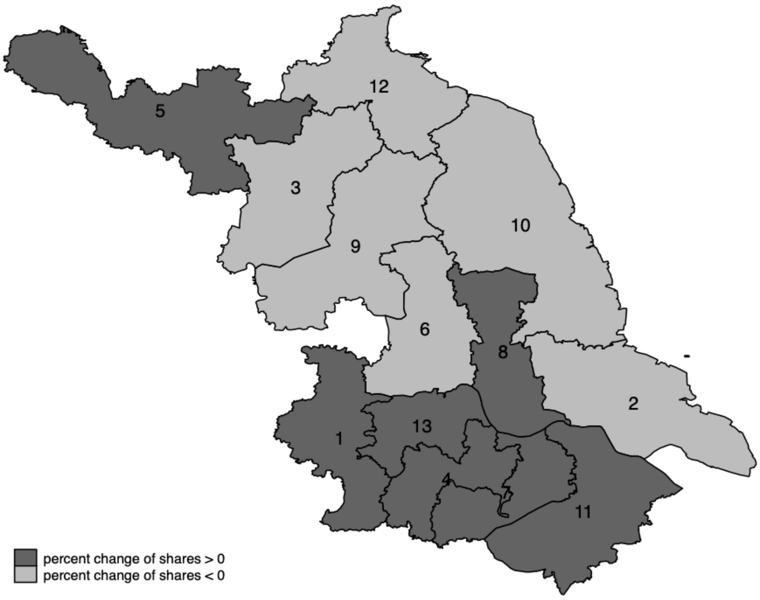


(b) Counterfactual Share of New Firms



Note: The upper plot demonstrates that under a uniform leader's career incentive model applied across all 13 cities, there is a significant convergence in policy formulation. It becomes apparent that, when motivated by a common objective, the policies of these diverse cities become similar. The lower plot shows a change in the distribution of firms, where firms are distributed more evenly across these 13 cities. I demonstrate the change using the year 2010 as an example. Results for other years are similar and are included in the appendix. On average, 23 percent of firms change their location under the homogeneous incentive scheme.

Figure 14. Counterfactual Results: Percent Change of Shares



Note: The plot illustrates that, under the homogeneous incentive scheme, most changes involve firms moving from cities with lower total GDP in the status quo to more developed cities in the counterfactual world. The relationship between the percent change of shares and GDP can be found in Figure E.7. I demonstrate the change using the year 2010 as an example. Results for other years are similar and are included in the appendix.

Table 1. Top 10 Industrial Sectors in Jiangsu Province

Sectors	Observations	Percent	Rank by Percent
Land Transactions (Upstream Firms)			
Unspecified	13,317	27.43	1
General Equipment	6,130	12.63	2
Metal Products	4,156	8.56	3
Specialized Equipment	3,982	8.2	4
Chemical Products	2,071	4.27	5
Warehouse	1,964	4.05	6
Plastic Products	1,478	3.04	7
Textile	1,400	2.88	8
Telecommunications Equipment	1,287	2.65	9
Food Processing	1,269	2.61	10
Other	11,490	23.68	-
Business Registrations (Upstream and Downstream Firms)			
General Equipment	127,393	17.73	1
Metal Products	70,008	9.74	2
Textile	65,696	9.14	3
Specialized Equipment	58,371	8.12	4
Unspecified	40,689	5.66	5
Electrical Machinery	31,204	4.34	6
Non-Metallic Mineral Products	27,402	3.81	7
Plastic Products	24,846	3.46	8
Wood Processing	23,991	3.34	9
Food Processing	22,413	3.12	10
Other	226,589	31.53	-

Note: This table shows the top 10 sectors for newly transacted industrial land and newly registered businesses in Jiangsu Province during the period 2010-2018. In the land transactions data, "unspecified" means that the land's usage has not been determined, and it could be used in any sector.

Table 2. Leaders Characteristics

City	Years in Office	Age at Inauguration	Age at Departure	Number of Different Leaders
		Mayor		
Nanjing	4	52	55	3
Nantong	6	49	54	3
Suqian	3	48	49	4
Changzhou	3	49	52	4
Xuzhou	3	50	51	3
Yangzhou	3	50	52	3
Wuxi	4	53	56	4
Taizhou	2	51	52	3
Huaian	4	50	56	3
Yancheng	2	52	54	4
Suzhou	6	50	53	3
Lianyungang	2	50	51	5
Zhenjiang	3	51	54	4
Average	3	50	53	4
Min	2	48	49	3
Max	6	53	56	5
		Party Secretary		
Nanjing	2	53	55	5
Nantong	7	52	59	3
Suqian	3	50	53	4
Changzhou	5	51	53	4
Xuzhou	5	54	57	3
Yangzhou	2	47	51	2
Wuxi	4	50	52	4
Taizhou	5	51	53	3
Huaian	5	52	57	2
Yancheng	5	54	59	3
Suzhou	3	56	60	3
Lianyungang	4	53	57	4
Zhenjiang	2	51	52	5
Average	4	52	55	3
Min	2	47	51	2
Max	7	56	60	5

Note: This shows the characteristics of city mayors and party secretaries in 13 cities in Jiangsu, China. The average tenure for mayors ranges from 2 to 6 years, while party secretaries' average tenure ranges from 2 to 7 years. Mayors typically assume their positions at an average age of 50 and leave at an average age of 53. In contrast, party secretaries begin their roles at approximately 52 years old and conclude them at around 55. On average, cities in this province have had 4 different mayors and 3 different party secretaries between 2010 and 2018.

Table 3. Balance Table

	High-Policy Index Side "Pro-business"			Low-Policy Index Side "Anti-business"			
	N	Mean	SD	N	Mean	SD	Diff
Land Use	11,025	87.01	83.39	8,778	89.17	83.96	-2.17
Population	10,910	14.03	22.08	8,685	14.17	21.44	-0.14
Nighttime Light	11,025	8.26	9.09	8,778	8.64	9.99	-0.38
Distance to Highway	11,025	20.60	31.01	8,778	18.41	27.07	2.19
Land Price	11,025	652.07	1285.47	8,778	707.14	1435.66	-55.07
Land Size	11,025	2.58	4.92	8,778	2.69	5.52	-0.10
Land Quality	8,675	7.29	3.13	6,789	7.37	2.98	-0.08

Note: I compare the values of land use, population, nighttime light, distance to highway, land price, size, and quality for firms located on the high-policy index side and the low-policy index side of the city border (within 10km). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The table indicates that there are no statistically significant differences among the variables on either side of the city border. 20, 190, and 10 are the three most common land use codes (more than 95%), which correspond to cropland, urban areas, and grassland, respectively. The unit for population is the total number of people per $100m \times 100m$ area. 208 (1%) locations cannot be matched with population data. The unit for nighttime light is $nW/cm^2/sr$ (average). The availability of nighttime light data is limited to the time frame of 2012 to 2018; therefore, I assign values from 2012 to the years 2010-2011. The unit for distance to highway is km. Highway density data is available for years 2009, 2016, 2018; hence, I assign the 2009 value to the years 2010-2015, the 2016 value to the years 2016-2017, and the 2018 value to the year 2018. The unit for land price is 10,000 RMB. The unit for plant size is hectare (or 10,000 square meters). The smaller the unit of the quality measure, the higher the quality of the plant.

Table 4. Plants within and outside the 10km Buffer Zone

	Outside 10km			Within 10km			
	N	Mean	SD	N	Mean	SD	Diff
Land Price	28,774	584.78	1234.29	19,803	676.48	1354.34	-91.71
Land Size	28,774	2.75	5.54	19,803	2.63	5.19	0.12
Land Quality	22,043	7.05	3.25	15,464	7.33	3.07	-0.27
% of General Equipment	28,774	0.12	0.32	19,803	0.14	0.34	-0.02

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The table shows that there are no statistically significant differences between the variables within a 10km radius of the city border and those outside the city border region. The unit for land price is 10,000 RMB. The unit for plant size is hectare (or 10,000 square meters). The smaller the unit of the quality measure, the higher the quality of the plant. There are 11,070 plants with unknown land quality.

Table 5. Firm Plant Location Decision

	(1)	(2)	(3)	(4)
	Specification 1		Specification 2	
Land price p_{fi}	-0.0006***	-0.0005***	-0.0008***	-0.0007***
	(0.00006)	(0.00011)	(0.00002)	(0.00004)
Land Size x_{fi1}		0.0309		0.0159
		(0.02348)		(0.01028)
Land Quality x_{fi2}		-0.0186***		-0.0239***
		(0.00476)		(0.00295)
Population u_{i1}		0.0012***		0.0012***
		(0.00005)		(0.00004)
Num. of Firms u_{i2}		0.0001***		0.0001***
		(0.00001)		(0.00000)
Policy Index Included	No	Yes	No	Yes
Num. of Plant Choices	293,215	293,215	293,215	293,215
Num. of Final Plant Decisions	28,774	28,774	28,774	28,774

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. In Specification 1, the actual land transaction characteristics are used as the options firms face when deciding to set up plants in the chosen cities. Specification 2, on the other hand, utilizes the average land transaction characteristics as the options firms face when deciding to set up plants in the chosen cities. Moreover, both specifications use the average characteristics of land transactions in other cities where they do not set up plants as the options firms face.

Table 6. Age Norms in Chinese Politics

Leader Level	Retirement Age	Nomination Age Norm	Specific Positions
National	No requirement but usually ≤ 75	≤ 67	Politburo Standing Committee
Deputy national	No requirement but usually ≤ 70	≤ 67	Politburo, State Councilor, Vice Premiers, President of the Supreme People's Court, etc.
Provincial	65	≤ 63	Provincial Party Secretaries, Governors, Ministers, etc.
Deputy provincial	60	≤ 58	Provincial Standing Committee, Vice Ministers, etc.
Other	60 (Male) 55 (Female)	-	Director-General, County Chief, Division Chief, etc.

Note: This table is compiled by macropolo.org and sourced from "The Retirement Age Requirements for Cadres" (老干部离休退休的年龄规定).

Table 7. Model Estimates and City Leader Characteristics

	(1)	(2)	(3)	(4)
	Policy Index		Weights on Output	
	Mayor	Party Secretary	Mayor	Party Secretary
Age	-0.0876***	0.0709	-0.0095**	0.0129
	(0.0213)	(0.0570)	(0.0038)	(0.0131)
Years left*Short tenure	-0.2313**	-0.0493	-0.0210*	-0.0138
	(0.0859)	(0.1264)	(0.0107)	(0.0252)
Years left*Long tenure	-0.0099	0.0510	-0.0022	0.0040
	(0.0938)	(0.1053)	(0.0099)	(0.0253)
Year FE	Yes	Yes	Yes	Yes
Leader FE	Yes	Yes	Yes	Yes
Observations	117	117	117	117
R-squared	0.53	0.50	0.47	0.48
Variation by Leader FE	0.48	0.45	0.45	0.38

Note: Robust standard errors in parentheses (clustered at city level) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Short tenure is defined as 1 if city leaders' tenure is 3 years or less for city mayors and is 4 years or less for city party secretaries. Conversely, Long tenure is defined as 1 if their tenure exceeds 3 years for city mayors and 4 years for city party secretaries.

Appendix

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A Additional Institutional Details

A.1 Examples of Government Policy Announcements

Figure A.1 is a screenshot of an announcement published in 2018 from the Nanjing Municipal Bureau of Commerce. It includes the first four terms out of a total of one hundred terms. Their translations are included below:

1. 工商登记更便捷。工商注册登记、印章刻制、领取税票、银行开户3个工作日内办结。全面推行网上登记、企业全程电子化登记、个体工商户手机APP登记。可在"银政合作"网点办理工商登记，并提供银行开户、由企业指定刻章单位后提供预约公章送达等服务事项。（责任单位：市工商局、市公安局、市税务局，人民银行南京分行营管部，市江北新区管委会、各区政府。完成时限：2018年9月）

1. Enhancing the convenience of business registration. Business registration, seal engraving, tax invoice issuance, and bank account opening are complete within three working days. Comprehensive online registration, full electronic registration for enterprises, and mobile app registration for individual businesses are fully implemented. Business registration can be completed at 'Bank-Government Cooperation' branch, where services such as bank account opening and appointment-based delivery of official seals designated by the enterprise are provided. (Responsible Units: Municipal Bureau of Industry and Commerce, Municipal Public Security Bureau, Municipal Taxation Bureau, People's Bank of China Nanjing Branch's Regulatory Division, Municipal Jiangbei New Area Management Committee, and various district governments. Deadline: September 2018)

2. 减少企业申办材料。新办企业申办材料一单清，除涉及前置审批事项外，只需向工商部门提交6项材料：公司登记（备案）申请书；《指定代表或者共同委托代理人授权委托书》及指定代表或委托代理人的身份证件复印件；全体股东签署的公司章程；全体股东的主体资格证明或者自然人身份证件复印件；公司法定代表人、董事、监事和经理的任职文件及身份证件复印件；公司住所（经营场所）使用证明及经营性市场主体住所（经营场所）登记承诺书。（责任单位：市工商局，市江北新区管委会、各区政府。完成时限：2018年9月）

2. Reducing the required materials for business applications. For new businesses, the application materials are streamlined. Apart from matters requiring prior approval, only six documents need to be submitted to the industry and commerce department: application for company registration (filing); 'Authorization Letter for Designated Representative or Co-Appointed Agent' and photocopies of the ID documents of the designated representative or appointed agent; company articles of association signed by all shareholders; qualifications certificate of all share-

holders or photocopies of their ID documents for natural persons; appointment documents and photocopies of ID documents of the legal representative, directors, supervisors, and managers of the company; proof of company address (place of business) usage and a commitment letter for registering the business address (place of business) in an operational market. (Responsible Units: Municipal Bureau of Industry and Commerce, Municipal Jiangbei New Area Management Committee, and various district governments. Deadline: September 2018)

3. 企业名称自主确定。作为全国名称自主申报城市试点，率先开展除涉及前置审批事项外，取消以"南京"作为行政区划的企业名称预先核准，申请人可以自主申报的企业名称与设立登记一并办理。以"江苏"作为行政区划的企业名称0.5个工作日完成报省审核。（责任单位：市工商局。完成时限：2018年9月）

3. Granting autonomy of enterprises to determine their own names. As a pilot city for nationwide autonomous name declaration, we take the lead in eliminating the pre-approval requirement for enterprise names that do not involve prior approvals, with 'Nanjing' as part of the administrative division. Applicants can handle the declaration of enterprise names independently along with the establishment registration. Enterprise names that include 'Jiangsu' as part of the administrative division will undergo provincial review and be completed within 0.5 working days. (Responsible Unit: Municipal Bureau of Industry and Commerce. Deadline: September 2018)

4. 提供"新办企业套餐"服务。全面实行"三十证合一、一照一码"，在全市各政务服务中心，结合网上集中政务服务方式，为开办企业打通全流程服务各环节，实现材料一窗受理、信息一网采集、过程一并流转、结果一次推送的"一窗通办"服务模式。（责任单位：市工商局、市政务办，以及市其他相关部门，市江北新区管委会、各区政府。完成时限：2018年9月）

4. Providing the 'New Business Startup Package' service. We comprehensively implement the 'consolidation of thirty certificates into one, and one license, one code' approach. Across all government service centers in the city, combined with centralized online government service methods, we connect all stages of service for starting a business, realizing a 'One-Stop' service model with single-window acceptance of documents, comprehensive information gathering, streamlined process handling, and unified result delivery. (Responsible Units: Municipal Bureau of Industry and Commerce, Municipal Government Affairs Office, as well as other relevant municipal departments, Municipal Jiangbei New Area Management Committee, and various district governments. Deadline: September 2018)

Figure A.1. Policies to Optimize the Business Environment in Nanjing

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南京市优化营商环境100条（全文）

责任编辑： 文章来源： 发布时间：2018-09-10 17:03 阅读次数：1588

中共南京市委 南京市人民政府

关于印发《南京市优化营商环境100条》的通知

（宁委发〔2018〕31号）

各区委和人民政府，市委各部委，市府各委办局，市各直属单位：

现将《南京市优化营商环境100条》印发给你们，请结合实际认真贯彻落实。

中共南京市委 南京市人民政府

2018年9月3日

为进一步转变政府职能，提高政务服务效能，加快形成法治化、国际化、便利化的营商环境，打造全国营商环境最优的示范城市，更好地服务企业发展，激发市场活力和创新动力，现制定我市优化营商环境100条。

一、开办企业

1．工商登记更便捷。工商注册登记、印章刻制、领取税票、银行开户3个工作日内办结。全面推行网上登记、企业全程电子化登记、个体工商户手机APP登记。可在“银政合作”网点办理工商登记，并提供银行开户、由企业指定刻章单位后提供预约公章送达等服务事项。（责任单位：市工商局、市公安局、市税务局，人民银行南京分行营管部，市江北新区管委会、各区政府。完成时限：2018年9月）

2．减少企业申办材料。新办企业申办材料一单清，除涉及前置审批事项外，只需向工商部门提交6项材料：公司登记（备案）申请书；《指定代表或者共同委托代理人授权委托书》及指定代表或委托代理人的身份证件复印件；全体股东签署的公司章程；全体股东的主体资格证明或者自然人身份证件复印件；公司法定代表人、董事、监事和经理的任职文件及身份证件复印件；公司住所（经营场所）使用证明及经营性市场主体住所（经营场所）登记承诺书。（责任单位：市工商局，市江北新区管委会、各区政府。完成时限：2018年9月）

3．企业名称自主确定。作为全国名称自主申报城市试点，率先开展除涉及前置审批事项外，取消以“南京”作为行政区划的企业名称预先核准，申请人可以自主申报的企业名称与设立登记一并办理。以“江苏”作为行政区划的企业名称0.5个工作日完成报省审核。（责任单位：市工商局。完成时限：2018年9月）

4．提供“新办企业套餐”服务。全面实行“三十证合一、一照一码”，在全市各政务服务中心，结合网上集中政务服务方式，为开办企业打通全流程服务各环节，实现材料一窗受理、信息一网采集、过程一并流转、结果一次推送的“一窗通办”服务模式。（责任单位：市工商局、市政务办，以及市其他相关部门，市江北新区管委会、各区政府。完成时限：2018年9月）

Note: This is a screenshot of an announcement about 100 terms for optimizing the business environment from the Nanjing Municipal Bureau of Commerce. A complete list of 100 terms can be found in this link.

A.2 Local Policies and Other Industries

This study is specifically focused on industrial policies and the operations of manufacturing firms. The deliberate choice to concentrate solely on this industry is rooted in its unique characteristics. Combining the analysis of the manufacturing industry with other commercial sectors, such as retail and hospitality, would yield less informative results. The locations of these commercial establishments are more likely to be influenced by local economic factors, such as population size, tourist attractions, or traveler traffic. Furthermore, it is not feasible to group public service sectors, such as education and social security, with the manufacturing industry. These sectors are predominantly driven by local development plans and often managed by state-owned agencies.

B Additional Data Details

Figure B.1 is a screenshot of an announcement from the official government website, which is run by the Ministry of Natural Resources. It includes several characteristics of land parcels. Their translations are included below:

(1) Administrative Region: Jiangsu Province, Taizhou City, Jiangyan County

(2) Project Name: Jiangsu Jinyang Stainless Steel Products Co., Ltd. Factory Building

(3) Project Location: Dushuzhi Village, Qintong Town

(4) Area (cubic meters): 1376.00

(5) Land Use: Industrial Land

(6) Transaction Method: Public Listing for Sale

(7) Land Use Term: 50 years

(8) Industry Classification: Metal Products Industry

(9) Land Grade: Grade Five

(10) Transaction Price (10,000 RMB): 31

(11) Land Use Rights Holder: Jiangsu Jinyang Stainless Steel Products Co., Ltd

(12) Contract Signing Date: 2015-05-06

Figure B.1. Land Transaction Announcement Screenshot

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结果详情 地块信息

供地结果信息

(1) 行政区：	江苏省泰州市姜堰市	电子监管号：	3212842015B00257
(2) 项目名称：	江苏锦阳不锈钢制品有限公司厂房		
(3) 项目位置：	溱潼镇读书址村		
(4) 面积(㎡)：	1376.00		
(5) 土地用途：	工业用地	(6) 供地方式：	挂牌出让
(7) 土地使用年限：	50	(8) 行业分类：	金属制品业
(9) 土地级别：	五级	(10) 成交价格(万元)：	31
分期支付约定：	支付期号	约定支付日期	约定支付金额 备注
(11) 土地使用权人：	江苏锦阳不锈钢制品有限公司		
约定容积率：	下限： 0.7 上限： 1.2	约定交地时间：	2015-05-30
约定开工时间：	2015-06-30	约定竣工时间：	2016-06-30
实际开工时间：	—	实际竣工时间：	—
批准单位：	姜堰区	(12) 合同签订日期：	2015-05-06

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主办：自然资源部不动产登记中心（自然资源部法律事务中心） 指导单位：自然资源部自然资源开发利用司

邮箱：landchina7845@163.com 邮编：100034

地址：北京市西城区阜成门内大街88号 联系电话：010-66557845 传真：010-66558844

技术支持：杭州瑞豚科技有限公司 技术服务热线：4008718218 邮箱：landchina@hzre

服务热线：0571-87676972

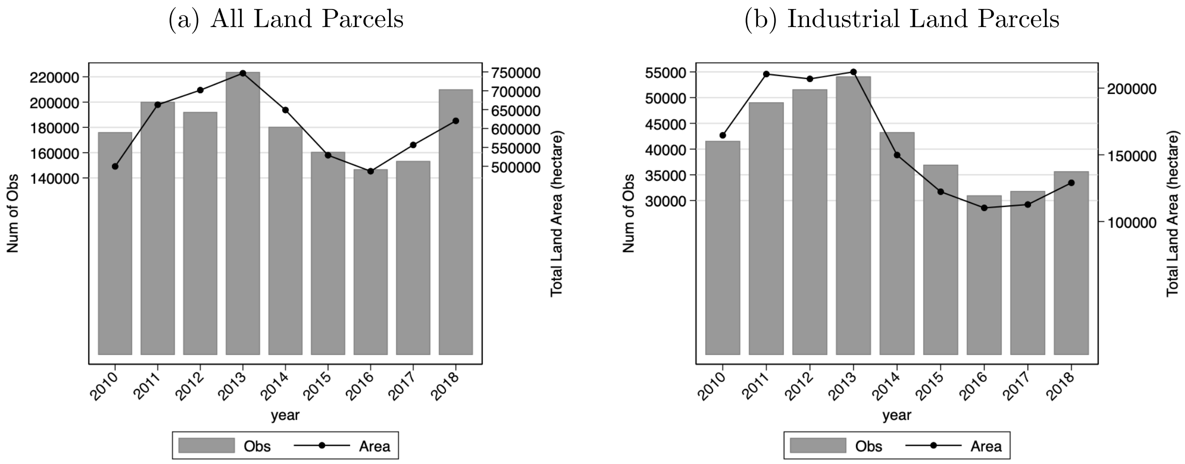
京ICP备12039414号-4 京公网安备11010200066(2)

Note: This is a screenshot of an announcement from the official government website, which is run by the Ministry of Natural Resources.

The original land transaction data ranges from 2000 to 2019. However, there are not many land parcels being transacted before 2007. Because in the late 20th century China, local governments transferred land use right mostly through negotiation. Only until 2007, a stringent requirement in the land transaction market was written into Property law: all profit-oriented land parcels have to be transferred using auctions. The volume is relatively low before 2007, and there are a high proportion of missing value for location information (more than 50%). The quality of the data has improved since 2010, with a lower percentage of missing information on location. I am not able to retrieve the location information in earlier years, which could be due to the change of road or street name. Thus, in my main analysis, I focus on years 2010 onward. Figure B.2a shows the total number/area of all transacted land parcels nationwide, and Figure B.2b displays the total number/area of transacted industrial land parcels nationwide during 2010-2018.

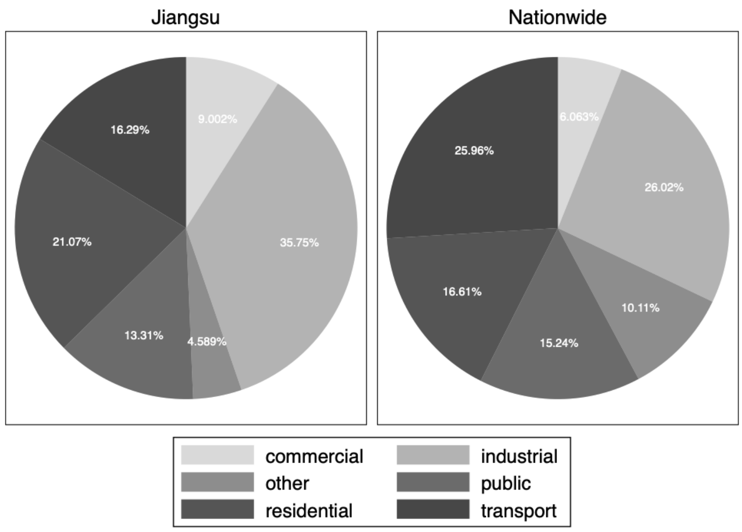
I compare the percentage of land types in Jiangsu with the whole country in Figure B.3. Notice that industrial land parcels take up the most area among all land types in both Jiangsu and the whole country (35.75% in Jiangsu, 26.02% nationwide). Furthermore, the ranking of amounts of land types in Jiangsu reflects that in the whole country. Understanding the behaviors of local governments and industrial firms in Jiangsu province has important policy implications for the entire country. Figure B.6a and Figure B.6b are China city-level maps. The former one includes all land parcels and the latter one includes industrial land parcels transacted during 2010-2018. We can see land parcels are evenly distributed across the country.

Figure B.2. Number/Area of Land Parcels Nationwide



Note: This left plot shows the total number and the total area of all transacted land parcels nationwide during 2010-2018. The right plot shows the total number and the total area of transacted industrial land parcels nationwide during 2010-2018. The y-axis on the left denotes the number, and the y-axis on the right denotes the area.

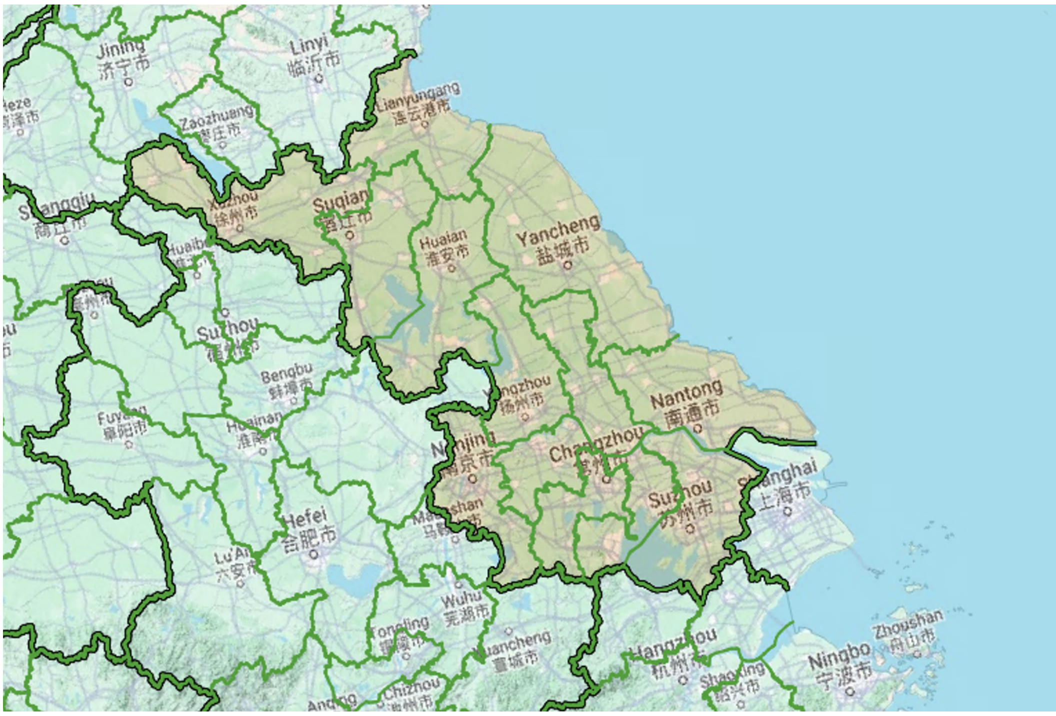
Figure B.3. Percent of Land Types in Jiangsu vs. Nationwide



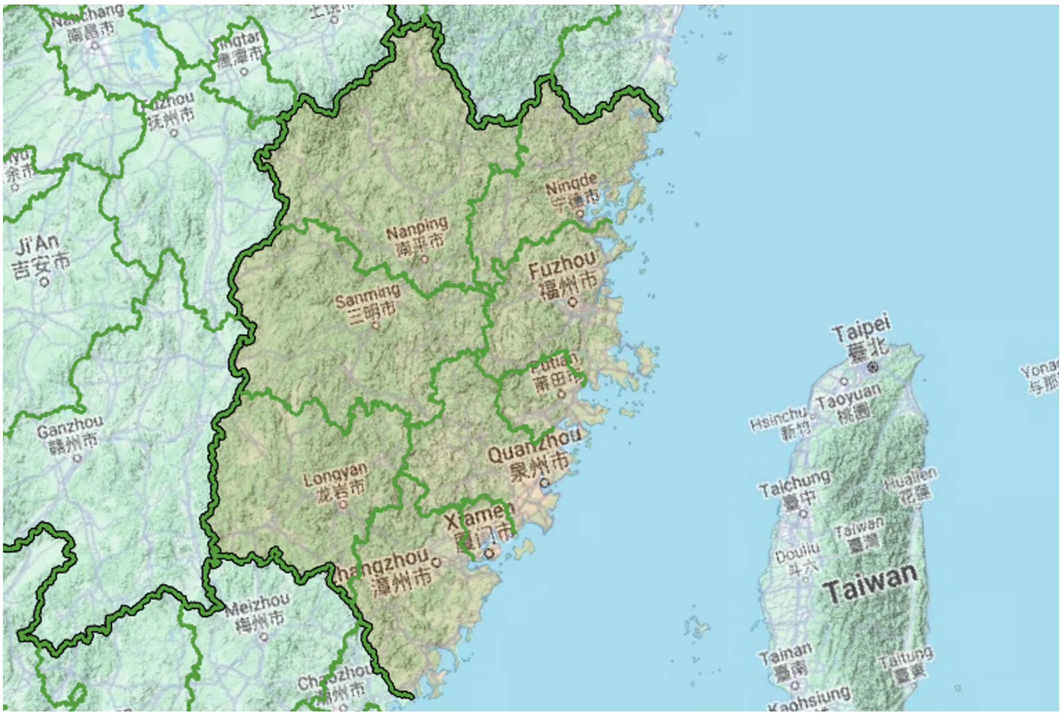
Note: The left plot shows the percentage of the total size of different land types in Jiangsu during 2010-2018. The right plot shows the same figure for the whole country during 2010-2018.

Figure B.4. Terrain in Jiangsu and Fujian

(a) Jiangsu



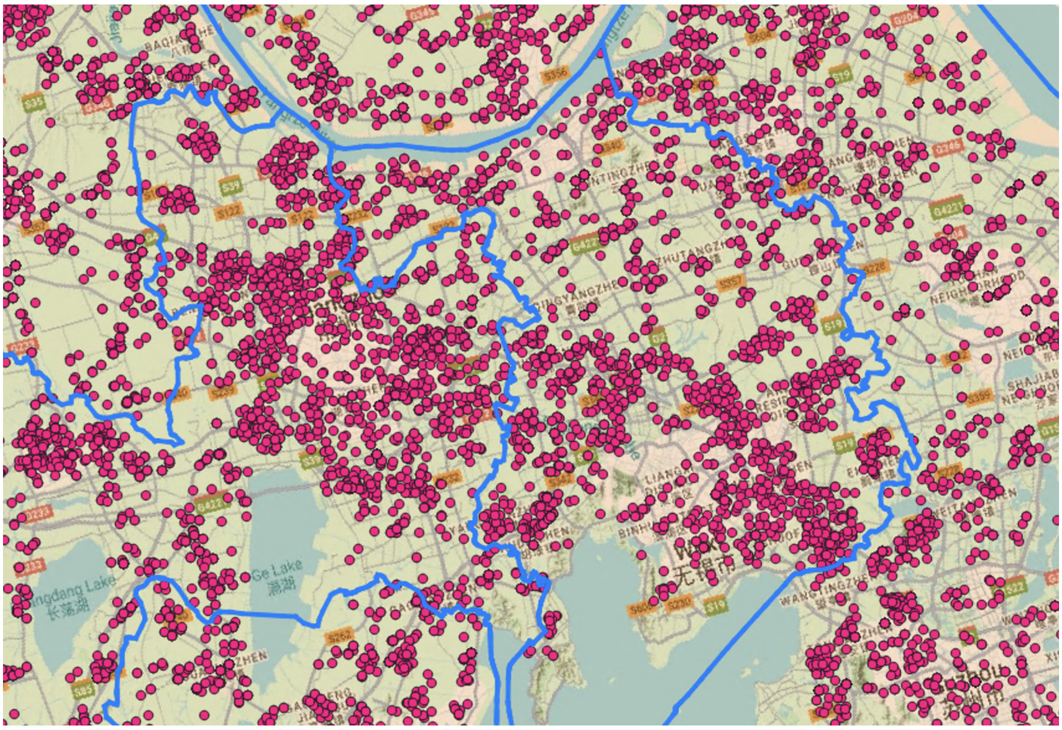
(b) Fujian



Note: The upper plot displays the terrain in Jiangsu, and the lower plot depicts Fujian's terrain, where we can observe numerous rolling mountains. This comparison highlights Jiangsu's flatness in contrast to Fujian's mountainous terrain.

Figure B.5. Manufacturing Plants in Jiangsu and Fujian

(a) Changzhou, Jiangsu

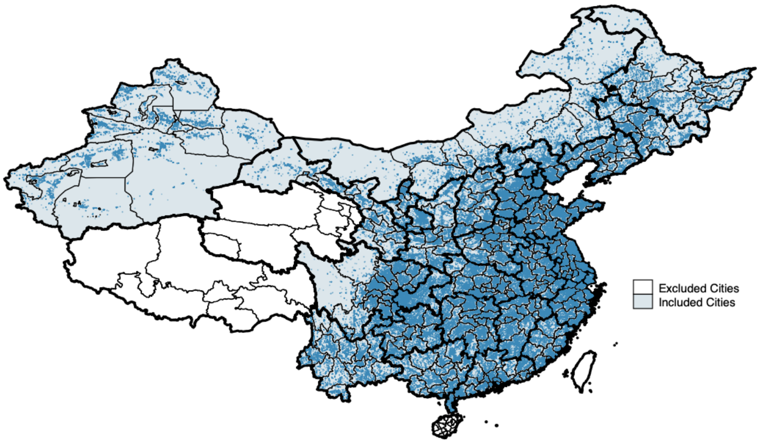


(b) Putian, Fujian

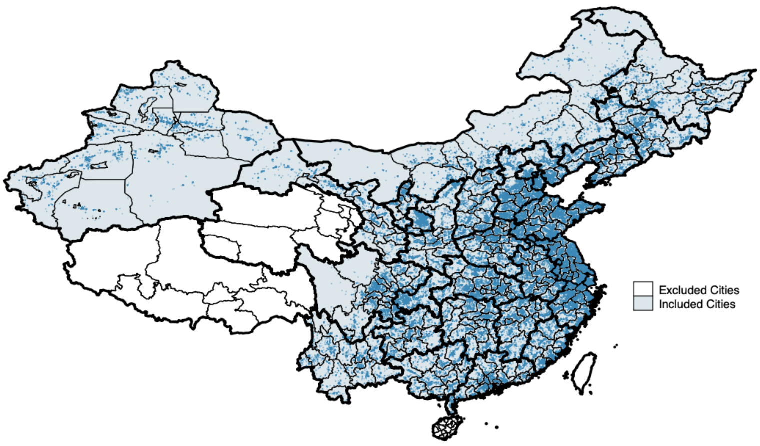
Note: The upper plot shows a snapshot of the spatial distribution of manufacturing plants in Jiangsu, and the lower plot depicts a snapshot of the spatial distribution of manufacturing plants in Fujian. It is evident that land parcels are more densely distributed in Jiangsu due to its flat terrain, which gives this province a unique advantage in constructing many factories.

Figure B.6. Spatial Distribution of Land Parcels

(a) All Land Parcels



(b) Industrial Land Parcels



Note: The upper plot shows the spatial distribution of all transacted land during 2010-2018. The lower plot shows the spatial distribution of industrial land during 2010-2018. Shaded light blue color denotes cities that are included in the original land data. Blue points stand for transacted land parcels. Bold black line denotes the province boundary.

C Additional Details for Model

C.1 Additional Details for Location Choice Model for Firms

Table C.1. Success Rate of Land Transactions

City Num	City	Mean	Std. Dev. industrial	Freq.	Mean	Std. Dev. non-industrial	Freq.
1	Nanjing	0.85	0.36	1,980	0.87	0.34	1,925
2	Nantong	0.78	0.41	5,798	0.82	0.39	4,681
3	Suqian	0.77	0.42	3,219	0.73	0.44	1,998
4	Changzhou	0.82	0.39	3,064	0.83	0.38	3,189
5	Xuzhou	0.80	0.40	2,094	0.79	0.41	2,901
6	Yangzhou	0.84	0.37	2,456	0.80	0.40	1,995
7	Wuxi	0.91	0.29	2,503	0.88	0.33	2,277
8	Taizhou	0.73	0.44	2,919	0.71	0.45	2,352
9	Huaian	0.71	0.45	2,787	0.72	0.45	2,701
10	Yancheng	0.77	0.42	4,381	0.70	0.46	4,731
11	Suzhou	0.85	0.35	6,099	0.86	0.35	4,764
12	Lianyungang	0.80	0.40	1,246	0.81	0.39	1,763
13	Zhenjiang	0.89	0.31	1,922	0.86	0.34	1,734
-	Total	0.81	0.40	40,468	0.80	0.40	37,011

Note: This table presents a sample of land auction data in Jiangsu from 2010 to 2016, sourced from the China Stock Market Accounting Research Database (CSMAR). It reveals that both industrial and non-industrial land parcels had an unsuccessful transaction rate of 20%. The reasons behind these unsuccessful transactions may include unreasonable starting prices set by local governments or slow demand.

C.2 Additional Details for Tournament Competition Model

The main competing force among local governments comes from the fact that the more pro-business policies a city's competitors propose (c_{-i}), the less firms this city would attract (city i). When local governments compete with each other, each of them maximize the following objective function:

$$\max_{c_i} \pi_i \equiv \lambda_i \cdot \triangle F \cdot s_i \cdot Output + (1 - \lambda_i) \cdot \triangle F \cdot s_i \cdot Budget_i$$

where s_i is the share derived from the firm entry condition $s_i = \frac{exp(\beta x_{fi} + c_i - \alpha p_{fi} + u_i)}{\sum_{j=1}^{R} exp(\beta x_{fj} + c_j - \alpha p_{fj} + u_j)}$. $Budget_i$ stands for the local government's net revenue. Since c_i is the net benefit provided by local governments to each firm, $Budget_i = -c_i$. Local leaders face a trade-off: proposing more pro-business policies, a higher c_i, attracts more firms (captured by $\frac{\partial s_i}{\partial c_i} = s_i(1 - s_i) > 0$); however, a higher c_i also comes with a cost for them, reflecting in a lower total budget ($\triangle F \cdot s_i \cdot Budget_i$). Plugging in these terms to the above objective function, we now have:

$$\max_{c_i} \pi_i \equiv \lambda_i \cdot \triangle F \cdot s_i \cdot Output + (1-\lambda_i) \cdot \triangle F \cdot s_i \cdot (-c_i).$$

FOC with respect to c_i:

$$\triangle F \cdot s_i \cdot (\lambda_i - 1) + \triangle F \cdot \frac{\partial s_i}{\partial c_i} \cdot [\lambda_i \cdot Output + (1-\lambda_i) \cdot (-c_i)] = 0$$
$$\triangle F \cdot \lambda_i \cdot \frac{\partial s_i}{\partial c_i} \cdot Output - \triangle F \cdot (1-\lambda_i) \cdot (s_i + \frac{\partial s_i}{\partial c_i} \cdot c_i) = 0$$

Substitute $\frac{\partial s_i}{\partial c_i}$ with $s_i(1-s_i)$, we have:

$$\triangle F \cdot \lambda_i \cdot s_i(1-s_i) \cdot Output - \triangle F \cdot (1-\lambda_i) \cdot [s_i + s_i(1-s_i) \cdot c_i] = 0$$

Divide both sides of the equation by $\triangle F \cdot (1-\lambda_i) \cdot s_i(1-s_i)$, we get:

$$\frac{\lambda_i}{1-\lambda_i} Output - (\frac{1}{1-s_i} + c_i) = 0$$

Proposition 1. For each i, holding $c_{-i} = (c_1, c_2, ..., c_{i-1}, c_{i+1}, ..., c_R)$ constant, c_i is uniquely increasing with respect to λ_i in the equation: $\frac{\lambda_i}{1-\lambda_i} Output = \frac{1}{1-s_i} + c_i$.

Proof. Fixed c_{-i}, rewrite the above equation to be

$$f(\lambda_i) \cdot Output = g(c_i)$$

where $f(\lambda_i) = \frac{\lambda_i}{1-\lambda_i}$, $f(\lambda_i)$ is uniquely increasing with λ_i, because $\frac{d}{d\lambda_i}[\frac{\lambda_i}{1-\lambda_i}] = \frac{1}{(1-\lambda_i)^2} > 0$. The left-hand side of the above equation, $f(\lambda_i) \cdot Output$, is uniquely increasing with λ_i.

To prove c_i is uniquely increasing with λ_i, we next need to show the right-hand side of the equation, $g(c_i) = \frac{1}{1-s_i} + c_i$, is uniquely increasing with c_i, which is to show $\frac{1}{1-s_i}$ is uniquely increasing with c_i.

$$\frac{\partial \frac{1}{1-s_i}}{\partial c_i} = \frac{1}{(1-s_i)^2} \cdot \frac{\partial s_i}{\partial c_i} = \frac{1}{(1-s_i)^2} \cdot s_i(1-s_i) > 0$$

□

Proposition 2. For each i, holding $c^*_{-i} = (c^*_1, c^*_2, ..., c^*_{i-1}, c^*_{i+1}, ..., c^*_R)$ constant, the objective function attains its maximum at c^*_i if $(\frac{\lambda_i}{1-\lambda_i} Output - c^*_i)(1 - 2s^*_i) < 2$.

Proof. Fixed c^*_{-i}, the objective function for i attains its maximum if the second-order condition is negative near c^*_i, which means:

$$\triangle F \cdot \lambda_i \cdot \frac{\partial^2 s_i}{\partial c_i^2}|_{c^*_i} \cdot Output - \triangle F \cdot (1 - \lambda_i) \cdot (\frac{\partial s_i}{\partial c_i}|_{c^*_i} + \frac{\partial^2 s_i}{\partial c_i^2}|_{c^*_i} \cdot c^*_i + \frac{\partial s_i}{\partial c_i}|_{c^*_i}) < 0$$

Since $\frac{\partial^2 s_i}{\partial c_i^2}|_{c^*_i} = s^*_i(1 - s^*_i)(1 - 2s^*_i)$ and $\frac{\partial s_i}{\partial c_i}|_{c^*_i} = s^*_i(1 - s^*_i)$, we have:

$$\triangle F \cdot \lambda_i \cdot s^*_i(1-s^*_i)(1-2s^*_i) \cdot Output - \triangle F \cdot (1-\lambda_i) \cdot [s^*_i(1-s^*_i) + s^*_i(1-s^*_i)(1-2s^*_i) \cdot c^*_i + s^*_i(1-s^*_i)] < 0$$

Rearrange terms, we get:

$$\triangle F s^*_i(1 - s^*_i) \cdot \{\lambda_i \cdot (1 - 2s^*_i) \cdot Output - (1 - \lambda_i) \cdot [2 + (1 - 2s^*_i) \cdot c^*_i]\} < 0$$

By default, we have $\triangle F s^*_i(1 - s^*_i)(1 - \lambda_i) > 0$. Dividing both sides of the inequality by this term yields[34]:

$$(\frac{\lambda_i}{1 - \lambda_i} Output - c^*_i)(1 - 2s^*_i) - 2 < 0$$

Therefore, if $(\frac{\lambda_i}{1-\lambda_i} Output - c^*_i)(1 - 2s^*_i) < 2$, the objective function attains its maximum at c^*_i.

□

[34] It is not easy to obtain a closed-form solution for the above inequality because $s_i = \frac{exp(\beta x_{fi} + c_i - \alpha p_{fi} + u_i)}{\sum_{j=1}^{R} exp(\beta x_{fj} + c_j - \alpha p_{fj} + u_j)}$, but I can numerically test whether the above condition is satisfied. In the empirical part, all numerical values near c^*_i satisfy the above condition.

D Additional Details for Empirical Strategy

D.1 Assignment of City Border

I use QGIS to delineate each city border on the China city map. The model can be downloaded from https://plugins.qgis.org/models/22/. In this step, I obtain 1017 city borders on the China city map. Next, I associate each land parcel with its nearest border using the "Join attributes by nearest" toolbox. This process not only provides the nearest border label for each land parcel but also calculates the distance to its nearest border. I can use this distance measure in the regression analysis to compare estimated city-wide policies across different border thresholds, such as 10km and 8km.

D.2 Robustness Checks for Varying Border Design Bandwidths

There are trade-offs when selecting the bandwidth for the border design. Table D.1 demonstrates that as the bandwidth increases, it becomes less likely for the assumption to be satisfied. The differences in the full sample, as compared to the sub-sample within 10km border region, tend to be larger. However, as the bandwidth decreases, the number of observations also decreases. The sub-sample within 5km border region consists of only 10,260 plants, which is half the size of the sub-sample within the 10km border region. The choice of a 10km bandwidth is determined not only by the above reasons but also by the fact that a 10km distance typically takes around 15 minutes to drive and is generally considered close for most manufacturing firms.

To determine if results are robust to minor bandwidth adjustments, I analyzed the estimated policy index values at 8km and 12km bandwidths compared to a 10km bandwidth. Figure D.1a illustrates this comparison. The x-axis represents the estimated policy index at a 10km bandwidth, while the y-axis shows those at 8km or 12km. The policy index values at 8km and 12km are close to the 10km benchmark, with the 8km results aligning more closely with the main study's selected 10km bandwidth. The alignment with the 45-degree line indicates this proximity. Figure D.1a also demonstrates that the estimated policy index distributions for the different bandwidths are tightly clustered.

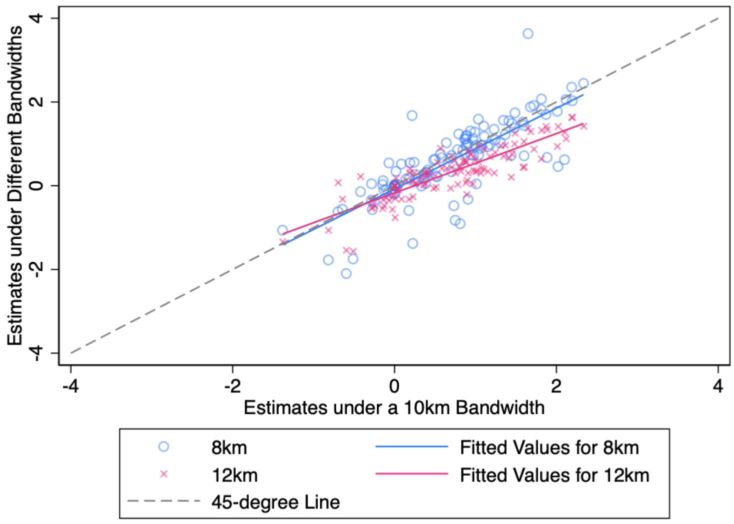
Table D.1. Balance Table

	High-Policy Index Side "Pro-business"			Low-Policy Index Side "Anti-business"			
	N	Mean	SD	N	Mean	SD	Diff
full sample							
Land Use	21,130	87.44	83.40	15,822	90.24	83.89	-2.80
Population	20,818	15.06	26.39	15,474	15.29	28.50	-0.23
Nighttime Light	21,130	8.50	9.65	15,822	9.00	10.37	-0.50
Distance to Highway	21,130	23.59	39.68	15,822	18.91	29.10	4.68
Land Price	21,130	597.07	1212.06	15,822	670.81	1436.82	-73.74
Land Size	21,130	2.66	5.21	15,822	2.80	6.17	-0.14
Land Quality	16,791	7.35	3.28	12,165	7.34	3.12	0.01
within 10km border region							
Land Use	11,025	87.01	83.39	8,778	89.17	83.96	-2.17
Population	10,910	14.03	22.08	8,685	14.17	21.44	-0.14
Nighttime Light	11,025	8.26	9.09	8,778	8.64	9.99	-0.38
Distance to Highway	11,025	20.60	31.01	8,778	18.41	27.07	2.19
Land Price	11,025	652.07	1285.47	8,778	707.14	1435.66	-55.07
Land Size	11,025	2.58	4.92	8,778	2.69	5.52	-0.10
Land Quality	8,675	7.29	3.13	6,789	7.37	2.98	-0.08
within 5km border region							
Land Use	5,812	85.86	83.19	4,448	87.69	83.80	-1.84
Population	5,728	13.35	18.58	4,383	14.01	18.61	-0.66
Nighttime Light	5,812	7.20	8.16	4,448	6.80	8.11	0.40
Distance to Highway	5,812	20.65	31.03	4,448	19.55	28.91	1.10
Land Price	5,812	656.01	1244.18	4,448	675.10	1482.49	-19.10
Land Size	5,812	2.68	4.93	4,448	2.61	5.95	0.06
Land Quality	4,563	7.31	3.13	3,514	7.43	3.01	-0.12

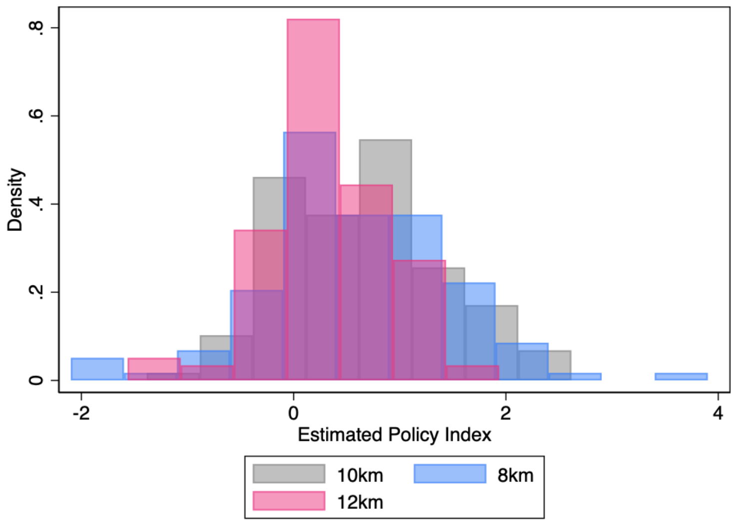
Note: I compare the values of land use, population, nighttime light, distance to highway, land price, size, and quality for firms located on the high-policy index side and the low-policy index side of the city border. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The table indicates that there are no statistically significant differences among the variables on either side of the city border. 20, 190, and 10 are the three most common land use codes (more than 95%), which correspond to cropland, urban areas, and grassland, respectively. The unit for population is the total number of people per $100m \times 100m$ area. The unit for nighttime light is $nW/cm^2/sr$ (average). The availability of nighttime light data is limited to the time frame of 2012 to 2018; therefore, I assign values from 2012 to the years 2010-2011. The unit for distance to highway is km. Highway density data is available for years 2009, 2016, 2018; hence, I assign the 2009 value to the years 2010-2015, the 2016 value to the years 2016-2017, and the 2018 value to the year 2018. The unit for land price is 10,000 RMB. The unit for plant size is hectare (or 10,000 square meters). The smaller the unit of the quality measure, the higher the quality of the plant.

Figure D.1. Estimated Policy Index under Different Bandwidths

(a) Alignment with 45-degree Line



(b) Distribution of Estimated Policy Index

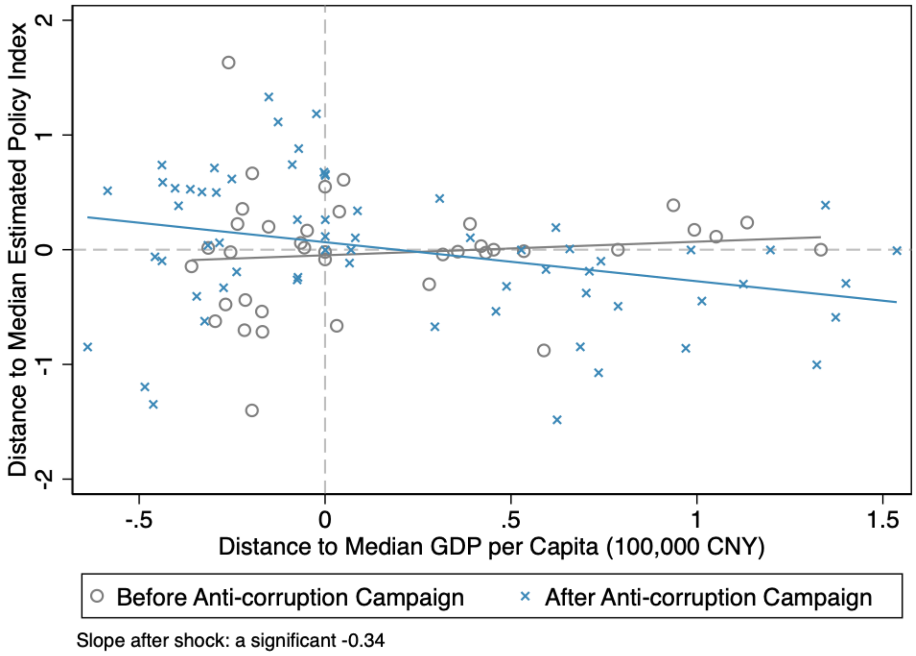


Note: The upper plot shows the comparison of estimates under different bandwidths and estimates under a 10km bandwidth. The fitted values are compared with the 45-degree line. The lower plot shows the distribution of the estimated policy index under different bandwidths.

E Additional Details for Estimation

E.1 Additional Estimation Results

Figure E.1. Relationship between Estimated Policies and GDP per Capita



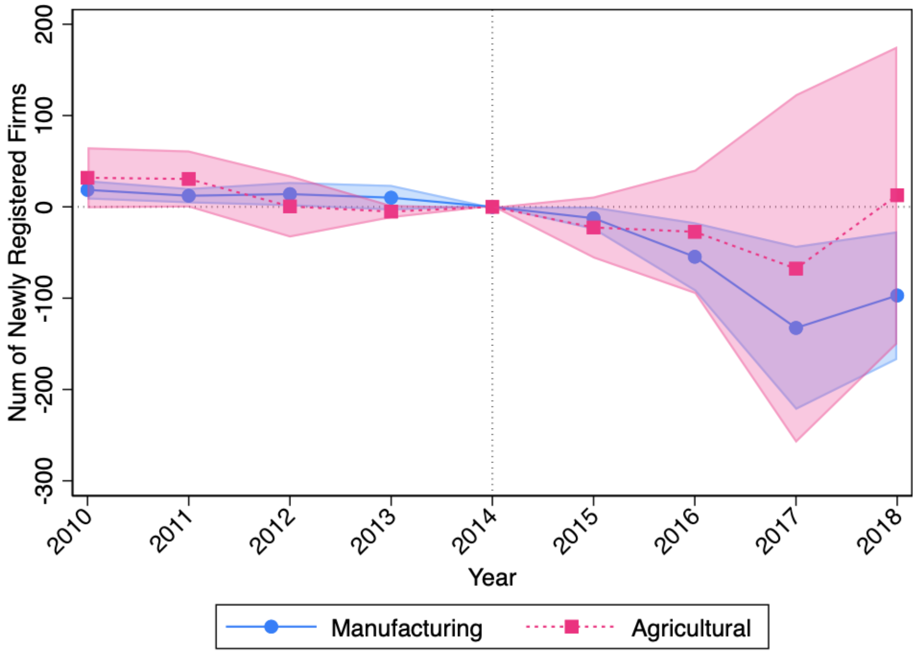
Note: This figure shows that, prior to the anti-corruption campaign, more developed cities located in the south tended to adopt pro-business policies. However, this pattern shifted afterward. Instead, less developed cities located in the north began to adopt pro-business policies.

E.2 Additional Details for Hypothesis Validity

Two events were the likely causes of the anti-business shock identified from the policy index. One event was the arrest of city leaders in Nanjing. During the national anti-corruption campaign, Nanjing's mayor and city party secretary were suspected of serious disciplinary and legal violations while in office. Notably, Nanjing's mayor was the sole mayor under investigation during the entire sample period in Jiangsu province. In the same period, only two party secretaries were under investigation while in office, one from Nanjing and the other from Lianyungang. Nanjing's mayor came under investigation at the end of 2013, and its party secretaries faced investigation in mid-2014, creating a natural shock in 2014. This can be attributed to the new leaders in Nanjing dedicating more efforts to investigating and addressing corruption cases related to the previous corrupt leaders. Consequently, fewer resources were allocated to attracting businesses and competing with other cities. The other event was the hosting of the Summer Youth Olympics in Nanjing. It was a global event, and Nanjing invested significant effort in building a positive international image. According to the annual government report, it emphasized the importance of hosting a successful Youth Olympics. Following that, the government highlighted the importance of ecological civilization, cultural presence, social governance, and people's well-being.

The following figure presents an event study design involving two types of firms: manufacturing firms and agricultural firms. If Nanjing did indeed experience an anti-business industrial shock relative to the other 12 cities, as identified by the policy index, we would expect to observe changes, likely a decreasing trend, in the number of newly registered manufacturing firms. Importantly, if the policy index measures industrial policies, we would not anticipate seeing significant changes in other types of firms. Therefore, in the following figure, I present not only the changes in manufacturing firms but also agricultural firms. Relative to the other 12 cities in Jiangsu, the treated city, Nanjing, experienced a 18% decrease in the number of newly registered manufacturing firms after 2014, and this impact has persisted. However, the number of newly registered agricultural firms has remained stable.

Figure E.2. Newly Registered Firms



Note: This figure illustrates an event study design. It is based on observations collected at the city-year-sector level. I assign Nanjing as the treated city and the other 12 cities as control cities. The year 2014 is set as the treated year. Relative to the other 12 cities in Jiangsu, the number of newly registered manufacturing firms in the treated city, Nanjing decreases after 2014, and this impact persists. However, the number of newly registered agricultural firms remains the same.

The following equation is the difference-in-differences estimation procedure, corresponding to the event study design shown in Figure E.2.

$$Firm_{ijt} = \beta_0 + \beta_1 Treated_{ij} + \beta_2 Treated_{ij} \times After_t + \delta_t + (\delta_j) + \epsilon_{ijt} \tag{13}$$

where $Firm_{ijt}$ denote the number of newly registered firms in city i in sector j in year t. $Treated_{ij} = 1$ for Nanjing and $Treated_{ij} = 0$ for other cities in Jiangsu province. $After_t$ is the indicator for the period after 2014. δ_t, δ_j are year fixed effects and sector fixed effects, respectively. ε_{ijt} are standard errors clustered at the city level.

Table E.1. Difference-in-differences Results for Newly Registered Firms

	(1) 13 Cities	(2) 13 Cities	(3) 10 Cities	(4) 10 Cities
	Panel A: Manufacturing Firms			
Treated	-32.42	-29.63	-36.03	-33.62
	(21.23)	(21.54)	(28.25)	(28.79)
Treated * After	-69.85***	-73.08***	-78.54**	-81.63**
	(21.88)	(22.10)	(28.38)	(28.75)
Observations	3,619	3,619	2,789	2,789
R-squared	0.06	0.31	0.06	0.30
	Panel B: Agricultural Firms			
Treated	30.02***	30.02***	25.71*	25.71*
	(9.61)	(9.65)	(12.59)	(12.65)
Treated * After	-35.40	-35.40	-79.60	-79.60
	(54.54)	(54.74)	(66.63)	(66.94)
Observations	702	702	540	540
R-squared	0.14	0.37	0.15	0.39
Year FE	Yes	Yes	Yes	Yes
Sector FE	No	Yes	No	Yes

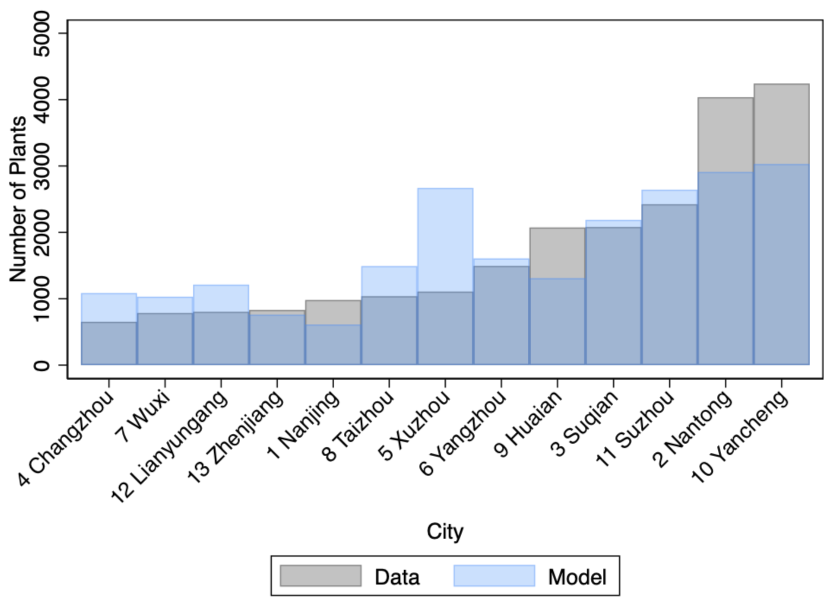
Note: Table E.1 reports the estimates corresponding to Equation 13. The table is based on observations collected at the city-year-sector level. Columns (1) and (2) include all 13 cities in Jiangsu province. Columns (3) and (4) exclude Nanjing's neighboring cities (Yangzhou, Zhenjiang, Changzhou) to alleviate biases caused by the potential spillover effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ Standard errors are clustered at the city level and are reported in parentheses.

Table E.1 demonstrates that after 2014, Nanjing experiences a significant drop in newly registered manufacturing firms, while its agricultural sector does not show significant changes in newly registered agricultural firms. When using all 12 other cities as the control group, as shown in columns (1) and (2), the number of newly registered manufacturing firms in Nanjing significantly decreases by 70-74 firms, while the number of newly registered agricultural firms does not exhibit a significant change. Concerns may arise regarding the use of neighboring cities as the control group; therefore, I exclude Nanjing's neighboring cities to mitigate potential biases caused by spillover effects. As shown in columns (3) and (4), similar patterns emerge. Only the manufacturing firms respond by not registering in Nanjing, while the agricultural firms do not exhibit a change in the pattern before and after the identified industrial shock.

E.3 Additional Details for Model Fit

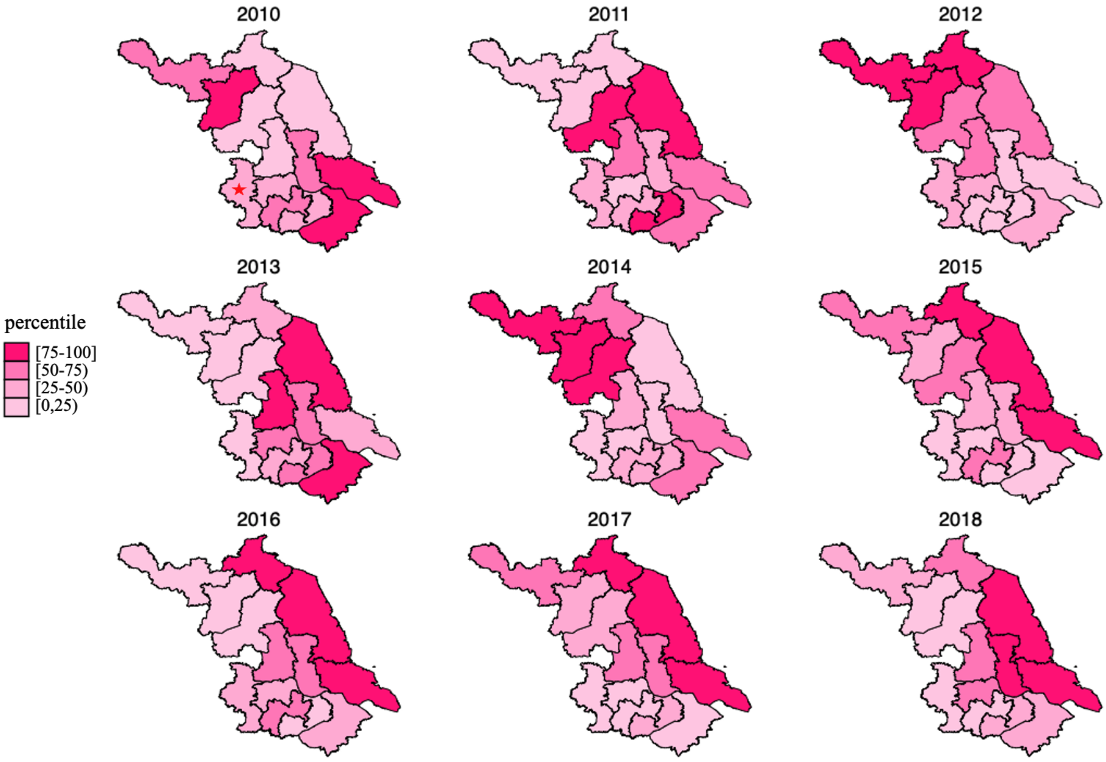
The model demonstrates strong performance by closely aligning with the real data, as evidenced by the correspondence between the predicted and actual rankings of total plant numbers in the following figure.

Figure E.3. Model Fit: Difference between the Predicted and Actual Values



Note: This figure complements Figure 11 to show the overall goodness of fit between the predicted number of new plants and the actual number of new plants in each city.

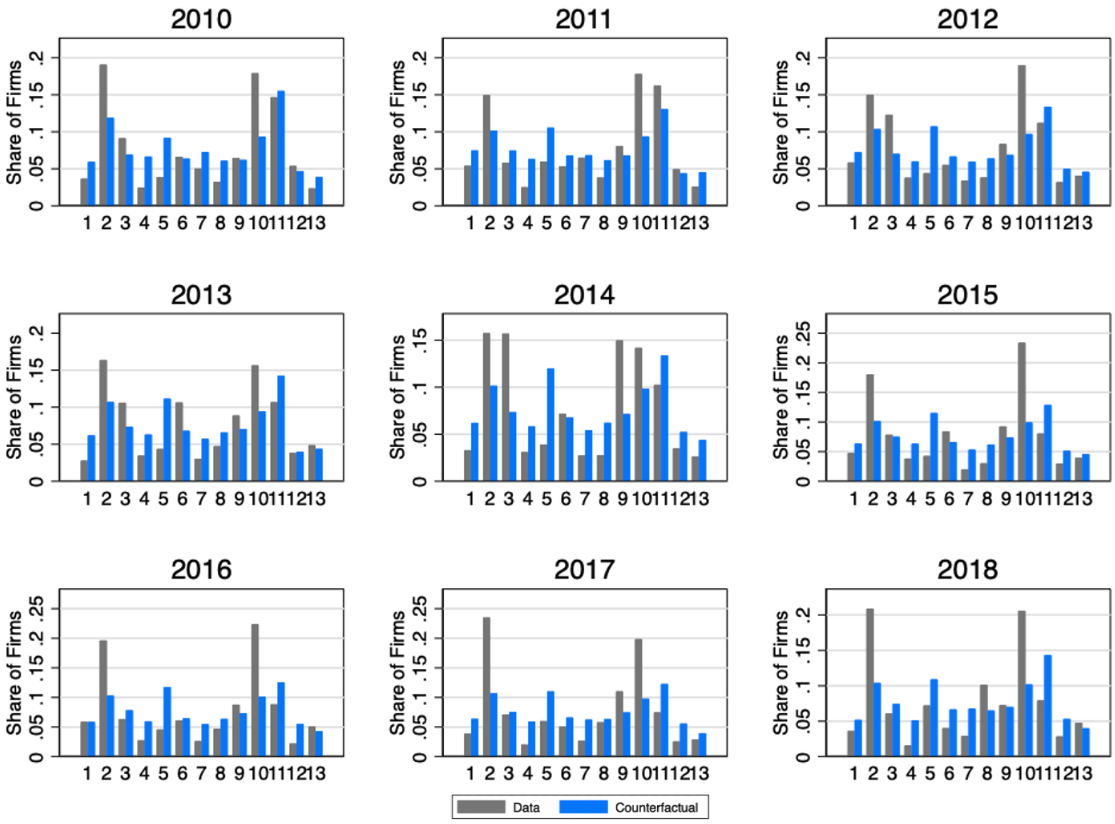
Figure E.4. Percentage Distribution of Estimated Weights on Outputs $\hat{\lambda}_i$



Note: These maps display the estimated weights on outputs (career-advancement incentives), $\hat{\lambda}_i$, which are positively correlated with leaders' career advancement incentives. The darker color indicates stronger career-advancement incentives. Cities that are geographically closer to each other appear to have leaders with similar promotion incentives.

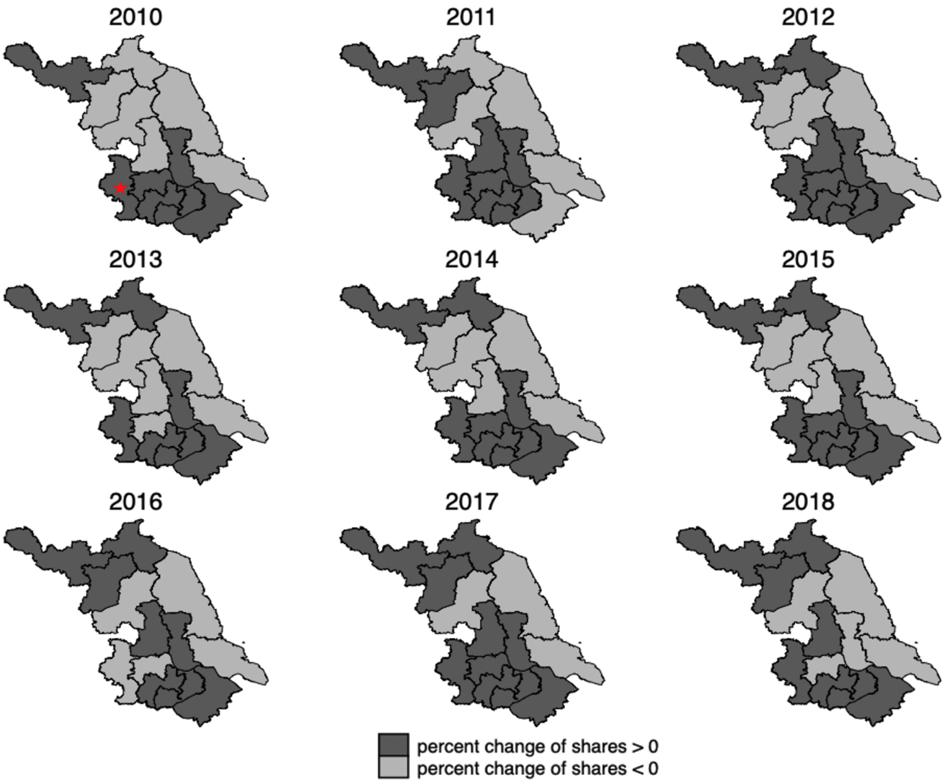
E.4 Additional Details for Counterfactual Results

Figure E.5. Counterfactual Results: Shares of New Firms with Manufacturing Plants



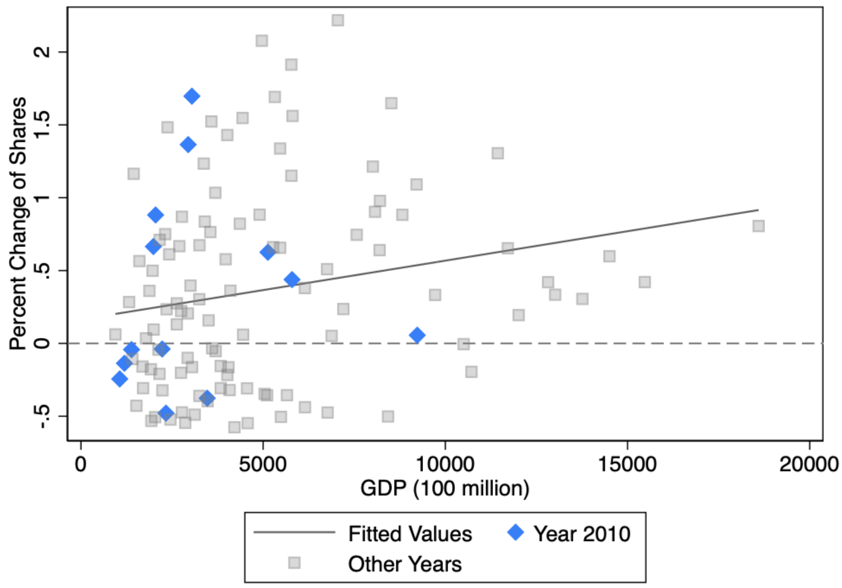
Note: These plots show the comparison between the actual shares of new firms with manufacturing plants and the counterfactual shares over years.

Figure E.6. Counterfactual Results: Percent Change of Shares



Note: These plots show the change in shares of new industrial firms with manufacturing plants over years.

Figure E.7. Counterfactual Results: Change of Shares and GDP



Note: This figure illustrates that, under the homogeneous incentive scheme, most changes involve firms moving from cities with lower total GDP in the status quo to more developed cities in the counterfactual world.