Political Selection, Resource Allocation, and Economic Growth Potential

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Abstract

Political institutions influence resource allocation and economic development. However, the connections between political incentives, resource allocation, and macroeconomic growth remain unclear in existing literature. This paper develops a model to explore resource misallocation within a political promotion system. It identifies two types of efficiency losses: "institutional failure," where principals' political incentives lead them to formulate policies that deviate from the optimal economic allocation, and "agency failure," where local leaders' optimal political resource allocations do not align with those of the principal. The model predicts an "amplifying effect," wherein institutional failure exacerbates agency failure, causing a greater deviation from the optimal economic allocation. By analyzing the career incentives of both prefecture and provincial leaders in China, this study confirms such an amplifying effect. This paper establishes the connections between political institutions, resource allocations, and economic development.

Keywords: Information Asymmetry; Political Selection; Resource Allocation, China Politics

1 Introduction

Scholars have demonstrated that societies with institutions that allocate resources more efficiently experience better economic growth. If this is the case, then why do countries misallocate resources, even though their economies could benefit from more appropriate allocation? The state-of-the-art answer in the literature suggests the important role of

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political incentives in explaining public resource misallocation (Acemoglu, Johnson and Robinson, 2005; Mani and Mukand, 2007). However, the micro-mechanisms linking political incentives, resource misallocation, and economic growth remain unclear in the existing literature.[1] This chapter contributes to the literature by providing both a theoretical model and empirical analysis of how political promotion incentivizes subnational leaders to distort resource allocations, consequently undermining the potential for long-term economic growth.

The study of resource misallocation is important because it is a crucial factor in understanding spatial inequality within a nation (Hsieh and Moretti, 2019), productivity differences across sectors (Adamopoulos et al., 2022), and income differences across countries (Jones, 2011). Recognizing the significant role that governments play in determining resource allocation, it is imperative to examine how political incentives influence leaders to deviate from the optimal allocation of resources.

Theoretically, I develop a model in which political principals must rely on economic performance to evaluate subnational leaders' abilities in the face of information asymmetry. Subnational leaders need to make trade-offs when allocating resources between two types of development investment that contribute to economic growth differently. The first type is high-quality investment, encompassing development policies with future benefits, such as education, health, and research and development (R&D), which increase productivity and contribute to long-term growth potential. However, these require significant time to achieve their goals and involve complex coordination between governments and the private sector. The second type is low-quality investment (e.g., real estate investment), which stimulates short-term economic growth but has a limited ability to sustain long-term economic development.

[1] A large body of literature studies the political logic of public service delivery and resource allocations. For a theoretical treatment, see De Mesquita et al. (2005), Acemoglu and Robinson (2006), Jones (2011), Bonfiglioli and Gancia (2013); for empirical work, see Stasavage (2005), Harding and Stasavage (2014), Gulzar and Pasquale (2017), Williams (2017), Toral (2022), Raffler (2022).

Within this context, the model predicts that as information asymmetry between subnational leaders and their principals increases, the former allocate more resources to low-quality investment to directly increase their promotion chances, while allocating fewer resources to high-quality investment that contribute to long-term growth potential. Moreover, the model predicts that the impact of information asymmetry is magnified by the career incentives of local leaders.

More importantly, the model reveals a second layer of efficiency loss within the political promotion system, termed "institutional failure," where the political incentives of principals drive them to craft policies that diverge from optimal economic allocation. Moreover, when principals have institutionalized mechanisms to influence the decision-making processes of their subordinates, it creates an "amplifying effect." This effect occurs as institutional failure intensifies agency failure, causing a more substantial deviation from optimal economic allocation. Consequently, the combination of institutional and agency failures leads to significant distortions in resource allocation, hindering localities from achieving their developmental potential.

I test the theoretical predictions in the context of China, where the career advancement of prefecture leaders is decided by provincial governments based on their performance (Li and Zhou, 2005; Xi, Yao and Zhang, 2018). Economic decentralization ensures that prefecture leaders have the authority to allocate public resources within their jurisdictions, while political centralization ensures that their policies remain aligned with the broader objectives set by higher-level governments (Xu, 2011).

I construct an information asymmetry index by integrating the geographical distances between localities and their provincial capitals with topographic data, specifically terrain ruggedness along the route. The underlying assumption is that the farther a locality is from political centers, the more pronounced the information asymmetry problem becomes, and conversely, the closer it is, the lesser the issue. This rationale aligns with research on how

geographical distance from capitals affects governance quality (Stasavage, 2010; Campante and Do, 2014). Additionally, I select the total real estate investments as indicators of low-quality investment, while education expenses are selected to represent development initiatives that contribute to long-term growth potential. In line with Vandenbussche, Aghion and Meghir (2006), I adopt total factor productivity (TFP) as an indicator of long-term economic growth potential. TFP reflects improvements in efficiency, innovation, and technological progress; these improvements are essential for sustained economic growth over the long term.

The empirical analysis unfolds in four steps. Initially, I offer empirical evidence showing that increased investment in the real estate sector correlates with reduced productivity, while increased investment in human capital correlates with an increase in productivity in China from 2000 to 2015. Using a fixed-effects model, I show that a standard deviation increase in real estate investment lowers productivity by 0.018, whereas a comparable increase in education investment increases productivity by 0.041. Subsequently, I explore the influence of political incentives on resource allocation. The analysis reveals that real estate investment rises by 0.036 standard deviation and education investment falls by 0.044 standard deviation when the information asymmetry index goes up by 1 standard deviation. Further, estimates from a difference-in-discontinuities design demonstrate that career incentives prompt local leaders to allocate resources more heavily toward the real estate sector. Finally, I present empirical evidence of the "amplifying effect." I show that the career incentives of provincial leaders lead to an additional 0.043 standard deviation increase in real estate investment and an additional 0.093 standard deviation decrease in education investment within prefectures.

Taken together, this chapter makes significant contributions to several distinct literatures. First, it contributes to the large literature on the institutional determinants of economic growth by providing micro mechanisms of how the selection of politicians in a

multi-layer government influences their incentives for resource allocations and its negative consequences on economic development (North, 1989; Acemoglu, Johnson and Robinson, 2002; Baum and Lake, 2003; Przeworski, 2004; Acemoglu et al., 2019). Second, it provides direct empirical evidence on the effects of information asymmetry on public service delivery (Fearon, 1999; Stasavage, 2005; Gulzar and Pasquale, 2017; Grossman and Michelitch, 2018).

2 Theory

This section presents a theoretical model that captures the political logic of resource allocation within a political promotion system and sheds light on testable hypotheses in the context of China. The model extends the work of Dewatripont, Jewitt and Tirole (1999*a*,*b*) and Mani and Mukand (2007) by incorporating career incentives and performance evaluation in a non-electoral setting and establishing the link between micro-mechanisms and macroeconomic development. Meanwhile, differing from the focus on how the intrinsic differences in "observability" or "visibility" of public goods affect their provision, I explore the impact of differences in contributions to economic growth on politicians' strategic allocation of resources.

2.1 Model Setup

I consider two types of development policies $i \in [H, L]$, where H represents high-quality development policies that contribute to long-term economic growth potentials, g_H, such as investment in education, R&D, and health, while L denotes low-quality investments that contribute to short-term economic growth, g_L, such as real estate and roads. x_H and x_L represent the amount of resources local leaders invest in high- and low-quality investment, respectively. For simplicity, we assume $x_H + x_L = 1$.

Economic Growth. GDP growth g_i is a composition of a local leader's ability a, which comes from a normal distribution, $a \sim N(\bar{a}, \sigma_a^2)$, the amount of investment in either high quality- or low-quality investment x_i, and a noisy term ϵ_i, which is drawn from a normal distribution $\epsilon_i \sim (0, \sigma_i^2)$. Specifically, the growth function is:

$$g_i = a + x_i + \epsilon_i \tag{1}$$

To capture the fact that high-quality development policies take longer time and more resources and involve more complex input coordination than low-quality investment, I have $\sigma_H^2 \gg \sigma_L^2$.

Production Function. To simplify the discussion, I use a Cobb-Douglas production function where resources only need to be allocated between x_H and x_L.

$$Y_j = x_H^{\rho} x_L^{1-\rho} \tag{2}$$

$$C(x_H, x_L) = \frac{1}{2}(C_H x_H^2 + C_L x_L^2) - k x_H x_L \tag{3}$$

where Y_j is the total output for city j. The cost function, $C(\bullet)$, is a symmetric and twice continuously differentiable function; it ensures that $C^{'} > 0$ and $C^{''} > 0$. k indicates whether high- or low-quality investments are complements or substitutes, with $k \in [-\sqrt{c_H c_L}, \sqrt{c_H c_L}]$. A negative k means these two types of investments are substitutes.

Principal's Utility. A principal derives utility from growth based on both types of development investment, with a preference for high-quality investment measured by λ:

$$U_P = \lambda g_H + (1 - \lambda) g_L \tag{4}$$

In an environment with no information asymmetry, a principal can effectively monitor local leaders' allocation of resources and enforce the allocation based on their preference.

$$U_P = \lambda(a + x_H + \epsilon_H) + (1 - \lambda)(a + x_L + \epsilon_L) - C(x_H, x_L) \tag{5}$$

Promotion Rule. I assume the principal cares about the agents' abilities and prefers to select agents with the highest ability. However, in an environment with asymmetric information between the two, the former cannot directly observe the latter's ability. One solution for principals is to use an observable performance measure to predict agents' abilities. In the context of my study, the principals rely on GDP growth to update their prior beliefs regarding agents' abilities. A subnational leader, A, obtains a promotion if her expected ability is greater than the expected ability of B; mathematically, I have $E(a_A \mid \boldsymbol{g}_A, \boldsymbol{x}^*_A) - E(a_B \mid \boldsymbol{g}_B, \boldsymbol{x}^*_B) \geq \eta$, where $E(a_j \mid \boldsymbol{g}_j, \boldsymbol{x}^*_j)$ is the principals' expected posterior assessment of local leaders' abilities based on their observed growth vector $\boldsymbol{g}_j$ and investment vector $\boldsymbol{x}^*_j$, and $j \in [A, B]$. The probability of promotion can be defined as follows:

$$P = Pr[E(a_A \mid \boldsymbol{g}_A, \boldsymbol{x}^*_A) - E(a_B \mid \boldsymbol{g}_B, \boldsymbol{x}^*_B) \geq \eta] \tag{6}$$

The posterior distribution, based on Bayesian updating, is $P\left(a \mid \boldsymbol{g}, \boldsymbol{x}^*\right) = \frac{P(\boldsymbol{g}|a, \boldsymbol{x}^*)P(a)}{P(\boldsymbol{g}|\boldsymbol{x}^*)}$. The larger the positive difference between A and B, the more likely it is that the local leader in A will be promoted. Meanwhile, I assume $\eta \sim Uniform(0, \eta_0)$. It is important to note that this promotion rule also applies to multiple players by considering B as the best person among a group of candidates, excluding A.

Therefore, I can calculate the promotion probability using the cumulative density function of the uniform distribution:

$$P = \frac{1}{\eta_0}(E(a_A \mid \boldsymbol{g}_A, \boldsymbol{x}^*_A) - E(a_B \mid \boldsymbol{g}_B, \boldsymbol{x}^*_B)) \tag{7}$$

Because the prior $p(a)$ and the likelihood function $P\left(\boldsymbol{g} \mid a, \boldsymbol{x}^*\right)$ are both normally distributed, the posterior distribution is also a normal distribution, with the mean as follows and $\tau_w = \frac{1}{\sigma^2_w}$, $w \in [H, L, a]$ (see Gelman et al., 2013, Ch. 5):

$$E(a_A \mid g_{i,A}, x_A^*) = \frac{\tau_H(a_A + x_{H,A}) + \tau_L(a_A + x_{L,A}) + \tau_a \bar{a}}{\tau_H + \tau_L + \tau_a} \tag{8}$$

Local Political Leader's Utility. Local political leaders derive utility from three parts. First, they receive utility V_p if they get promotions with a probability P. Second, if they fail to get promotions, which the probability is $1 - P$, they obtain V_{np}. Finally, they receive a utility gain, B, from investing in high-quality development projects, where $\delta \in [0, 1]$ measures their preferences for long-term economic development. Formally, the local leader's expected payoff is:

$$U_S = (1 - \delta)[PV_p + (1 - P)V_{np}] + \delta B - C(x_L, x_H) \tag{9}$$

Substituting equations 3 and 7 into 9 and letting $\triangle = V_p - V_{np}$; local political leader A intends to maximize the following utility function:

$$U_S = (1 - \delta_A)[\frac{\triangle_A}{\eta_0}(E(a_A \mid \boldsymbol{g}_A, \boldsymbol{x}_A^*) - E(a_B \mid \boldsymbol{g}_B, \boldsymbol{x}_B^*)) + V_{np,A}] + \delta_A B - C_A(x_L, x_H) \tag{10}$$

Table 1: Summary of Mathematic Notations

Notation	Definition
a	Subnational leaders' ability, which draws from $a \sim N(\bar{a}, \sigma_a^2)$
$C(\bullet)$	Cost function for different investment
g_i	Growth equation
x_H	Amount of high-quality investment
x_L	Amount of of low-quality investment
x	Proportion of low-quality investment
σ_i^2	Variances for different investment
λ	Principal's preferences for high-quality investment
τ_w	Inverse of the σ^2
V_p	Local leaders' utility gain of getting promotion
δ	Local leaders' preference for high-quality development
$\triangle$	Differences in utility between receiving a promotion and not receiving one
MC_i	Marginal cost of different investment
$A(x)$	Total factor productivity

2.2 Analysis

Local political leaders choose the amounts of investments across two types of development policies to maximize their perceived abilities, $E(a_j \mid \boldsymbol{g}_j, \boldsymbol{x}_j^*)$, and their expected payoff as specified in equation 10. Because the strategies for local leaders in A and B are symmetric, I can fix leader B's strategy and focus on how leader A strategically allocates resources to maximize her utility.

By taking the first order condition for equation 10, I have:

Proposition 1 *The optimal allocation of high-quality and low-quality development investments is given by:*

$$\boldsymbol{x}_{H,A}^* = \frac{\partial U_S}{\partial x_{H,A}} = \frac{(1-\delta_A)\triangle_A}{\eta_0}\frac{\tau_H}{\tau_H+\tau_L+\tau_{\bar{a}}} - c_H x_{H,A} + k x_{L,A} \tag{11}$$

$$\boldsymbol{x}_{L,A}^* = \frac{\partial U_S}{\partial x_{L,A}} = \frac{(1-\delta_A)\triangle_A}{\eta_0}\frac{\tau_L}{\tau_H+\tau_L+\tau_{\bar{a}}} - c_L x_{L,A} + k x_{H,A} \tag{12}$$

Proposition 1 provides leader A's optimal allocation of resources across x_H and x_L. The allocations depend on four factors; first, the leader's preference for high-quality investment, δ; second, the expected difference in obtaining a promotion, $\triangle$; third, the variances associated with high- and low-quality investment and leaders' abilities; and finally, the marginal cost of two types of investment.

The following comparative statics can be derived from Proposition 1. Proposition 2.1 shows that increasing the variance of high-quality development investment, σ_H^2, leads to a decrease in allocation of such investment, $\boldsymbol{x}_{H,A}^*$, yet an increase in allocation of low-quality investment, $\boldsymbol{x}_{L,A}^*$. Intuitively, this means local leaders allocate more resources to developmental policies that can promote economic growth with greater certainty, thereby increasing their chances of promotion.

Proposition 2 (Comparative Statics)

2.1 When σ_H^2 *increases, it can be obtained that* $\frac{\partial \boldsymbol{x}_{H,A}^*}{\partial \sigma_H^2} < 0$ *and* $\frac{\partial \boldsymbol{x}_{L,A}^*}{\partial \sigma_H^2} > 0$.

2.2 The cross-partial derivative $\frac{\partial \boldsymbol{x}_{H,A}^*}{\partial \sigma_H^2 \partial \triangle_A} < 0$ *and* $\frac{\partial \boldsymbol{x}_{L,A}^*}{\partial \sigma_H^2 \partial \triangle_A} > 0$.

2.3 The cross-partial derivative $\frac{\partial \boldsymbol{x}_{H,A}^*}{\partial \sigma_H^2 \partial \delta_A} > 0$ *and* $\frac{\partial \boldsymbol{x}_{L,A}^*}{\partial \sigma_H^2 \partial \delta_A} < 0$.

The last two propositions in Proposition 2 elucidate the political logic behind resource allocations between high-quality and low-quality development investments. Proposition 2.2 can be viewed as a conditional effect of career incentives, describing how the effects of the variance of high-quality development investment are influenced by local leaders' expected differences in obtaining a promotion. Local leaders allocate fewer resources to $\boldsymbol{x}_H^*$ and more to $\boldsymbol{x}_L^*$ when the expected difference increases. Proposition 2.3 demonstrates that conditional on the noise for high-quality development projects, increasing a local leader's preference for long-term economic growth incentivizes her to invest more in $\boldsymbol{x}_H^*$ and fewer in $\boldsymbol{x}_L^*$.

It is important to note that a principal can adjust a local leader's preference for long-term economic growth, δ, by changing her own preference, λ. For example, if the principal cares more about education investment, she could include education investment in the agent's performance evaluation to incentivize the latter to focus more on education expenses.

2.3 Discussion

The above model yields one important result worthy of separate discussion. North et al. (1990) and Acemoglu, Johnson and Robinson (2005) demonstrated that institutions shape the incentives of political actors and cause differences in economic development across countries. They further argue that societies with institutions resulting in the efficient allocation of resources tend to enjoy persistent economic development. The theoretical model presented above helps me identify two potential efficiency losses in a political promotion

system by comparing the optimal economic allocation of resources, the principal's best allocation, and the optimal political combination of resources for subnational leaders.

Let MC_H and MC_L represent the marginal cost of investing in high and low-quality projects. The optimal economic combination of resources can be calculated by combining equations 2 and 3 and taking the first-order condition. Meanwhile, define MC_i^P as the marginal cost for each type of investment under the principal's preferred optimal allocation. Then, the principal's best allocation is calculated by taking the derivative of equation 5. Lastly, the local leader's optimal political allocation is obtained based on Proposition 1, and I use MC_i^A to represent the marginal cost for each type of investment for local leaders. I present resource combinations under each condition as the following.

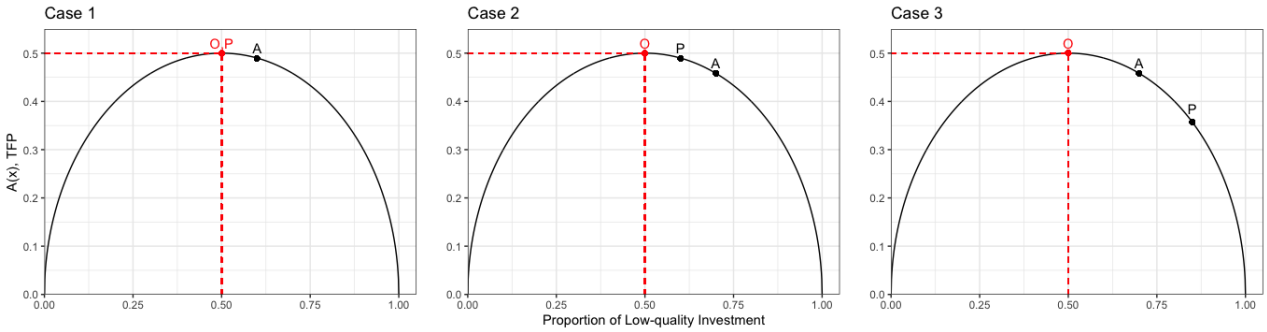
- Optimal Economic Allocation: $\frac{\rho}{1-\rho}\frac{x_L}{x_H} = \frac{MC_H}{MC_L}$
- Principal's Best Allocation: $\frac{\lambda}{1-\lambda} = \frac{MC_H^P}{MC_L^P}$
- Optimal Political Allocation: $\frac{\tau_H}{\tau_L} = \frac{MC_H^A}{MC_L^A}$

To establish a link between resource allocation and long-term economic growth potential, I build upon the theoretical framework presented by Jones (2011) on resource allocation and productivity, the latter being identified as a key determinant of long-term economic growth potential. Let $x = \frac{x_H}{\bar{x}}$ and $\bar{x} = x_L + x_H$. Substituting x and $\bar{x}$ to equation 2, I obtain the following equation, where $A(x)$ is the total factor productivity (TFP).

$$A(x) = x^{\rho}(1-x)^{1-\rho} \tag{13}$$

Equation 13 illustrates the relationship between the level of TFP and resource allocations. It can be demonstrated that the highest TFP is achieved when resources are utilized in the optimal economic combination. Any deviation from this optimal allocation results in a reduction of TFP.

Figure 1: Resouce Allocation and TFP



Building on this relationship, I identify two potential sources of efficiency loss stemming from a multi-layered government structure and visualize them in Figure 1. O represents the optimal economic allocation, P stands for principal preferred allocation, and A represents the agent's preferred allocation. The first source of efficiency loss is due to the classic "agency failure," as illustrated in all cases of Figure 1, where the local leaders' preferred allocation of resources does not align with the preferences of their principal. Even in instances where the principal's preferences do coincide with the optimal economic allocation of resources (as shown in Case 1), the political incentives of local leaders can lead them to allocate more of resource x_L, consequently reducing TFP.

The second is "institutional failure." In the model, the principals oversee the promotion of their subordinates, and their preference for low-quality investment directly influences the agents' resource allocation (which can be achieved by changing δ). Because there are no guarantees that the principal's preferred allocation aligns with the optimal economic allocation. When the principal also favors allocating more resources to x_L, as depicted in Case 2 of Figure 1, such preferences combined with the political incentives of local leaders motivate the latter to depart even further from the optimal economic allocation. For example, suppose the optimal economic allocation of investment to the real estate sector is 50% of a society's total resources, but the principal prefers 60% and uses that as a performance

measure to evaluate subordinates. Then, based on proposition 2.1, subnational leaders would be incentivized to invest more than 60%, leading to an even greater deviation from the optimal allocation.

A counter-intuitive finding is that economic efficiency can sometimes be improved by reducing the principal's influence over their subordinates' decisions, especially when the principal's preferences significantly diverge from both the optimal allocation and the agents' preferred allocation. This is illustrated in Case 3 of Figure 1. For example, if the principal prefers allocating 85% of resources to x_L, while agents prefer a 70% allocation, increasing the principal's authority to monitor and punish agents could pull the agents' allocation to a point below P. However, granting agents more autonomy in their decision-making can, in fact, lead to an allocation that results in higher TFP.

2.4 Testable Hypotheses

Based on the above theoretical discussion, I formulate the following testable hypotheses:

Hypothesis 1 (Proposition 2.1): *When the principal's allocation preference is fixed, local leaders tend to invest more in low-quality investments and less in high-quality investments as the information asymmetry between local leaders and their principals increases.*

$\triangle$ represents the difference in utility for local leaders between being promoted and not being promoted. This suggests that when local leaders have strong career incentives, they perceive this difference as significant; conversely, when career incentives are weak, they perceive the difference as small. Based on this understanding, I propose the following hypothesis.

Hypothesis 2 (Proposition 2.2): *Conditional on the level of information asymmetry, increasing local leaders' career incentives motivates them to invest more in low-quality investments, but less in high-quality investments.*

Finally, δ quantifies local leaders' preference for high-quality investment. The model assumes that this parameter can be influenced by the principal's resource allocation preferences. Therefore, when a principal favors low-quality investment over high-quality investment, I propose the following hypothesis.

Hypothesis 3 (Proposition 2.3): *Conditional on the level of information asymmetry, an increase in principals' preference for low-quality investments encourages local leaders to allocate more resources to low-quality investments and fewer resources to high-quality investments.*

3 Geographic Distance and Information Asymmetry

The variances of the two types of investment are key elements in the theoretical model. Therefore, it is important to discuss how to identify their variation.

It should be noted that the variances in development investment capture the precision of information that local leaders can use to signal their capabilities. Therefore, the higher the information asymmetry between local leaders and their principals, the lower the precision of information from high-variance development investments. Accordingly, I can leverage the intensity of information asymmetry to identify the variation in the precision of information across different development investments.

Building on the literature on geography, political accountability, and development, I employ the distance between a locality and its regional political capital to measure information asymmetry (Stasavage, 2010; Campante and Do, 2014; Brinkerhoff, Wetterberg and Wibbels, 2018). Intuitively, the geographic distance between localities where lower-level politicians conduct their daily work and the places where their superiors are located captures the extent of information asymmetry. When regions are farther from political centers, the problem of information asymmetry becomes more severe, while shorter distances result

in fewer issues caused by information asymmetry.

Specifically, geographical distance impacts information asymmetry through at least two channels. The first is media coverage. Newspapers are more likely to cover political issues in areas closer to capitals, while regions farther away receive less attention (Campante and Do, 2014). As a result, principals are often better informed about issues in their immediate surroundings and less knowledgeable about the true economic conditions and activities in more distant localities.

The second channel involves the cost of monitoring and communication (Müller-Crepon, 2021). Principals frequently employ a mix of incentives and sanctions to control their subordinates. However, both methods depend on effective monitoring and clear communication. The greater the geographical distance between a principal and their agents, the more resources the former must invest in enhancing monitoring capabilities. Information asymmetry becomes particularly problematic when a principal lacks the resources to adequately monitor agents, which is a common scenario in developing countries (Stasavage, 2005; Krishna and Schober, 2014). Although advances in modern communication technologies have significantly lowered the cost of accessing information, they have also increased the challenges of verifying information and discerning its accuracy. Consequently, the overall cost of acquiring reliable information may still be prohibitively high.

4 Development Policies

Considering the impact of economic performance on promotion chances, local political leaders are motivated to strategically direct economic resources towards activities capable of fostering rapid economic growth, thus effectively signaling their competencies. One approach to achieving this is by investing in fixed assets, with a particular emphasis on real estate. Real estate investment significantly contributes to local economic growth through

various channels. First, the real estate sector is labor-intensive, creating numerous employment opportunities. Second, a thriving real estate market boosts the demand for construction materials, thereby benefiting various sectors of the economy. Lastly, the real estate market attracts investment from outside, as investors search for property market opportunities. This influx of external capital can substantially enhance the local economy, driving its growth and development.

I use human capital investment, measured by education expenses per capita, as a form of high-quality development investment. Human capital investment is vital for increasing long-term economic growth potential, notably for its role in facilitating research and innovation, which, in turn, boosts productivity (Aghion and Howitt, 2008). Despite its importance, political economists often view human capital investment as less appealing to subnational leaders due to the significant time investment required, the need for complex coordination across various sectors, and the challenge of linking the outcomes directly to specific local leaders (Stasavage, 2005; Mani and Mukand, 2007; Harding and Stasavage, 2014).

5 Data and Variables

Independent Variable: The main independent variable is the *intensity of information asymmetry* between city and provincial leaders. To measure this information asymmetry, I use the distance between a city and its provincial capital as a proxy variable. Moreover, to add within-group variation for cities with the same distance to their respective provincial capitals, I also incorporate the average terrain ruggedness between cities and provincial capitals into the information asymmetry measure. The rationale behind this is that, for cities that share the same distances to provincial capitals, the areas of greater ruggedness are harder to access, thus leading to increased information asymmetry.

To construct this variable, I first obtained raw elevation raster for the Chinese territory from NASA's Shuttle Radar Topography Mission (SRTM). It has a resolution of 3 arc-seconds (approximately representing a grid cell about 66 meters wide by 93 meters tall at a latitude of 45^0.) and each grid cell on the raster contain the elevation above sea level in meters. I then use the open source GIS software, QGIS, to calculate the Terrain Ruggedness Index (TRI) for each cell based on its adjacent 8 cells. Next, I map the distance from a city to its provincial capital to the raster that contains TRI and extract TRI along the route. Finally, I calculate the average TRI along the path and multiply it by the distance between cities' and capitals' centroids, and take the logarithm. This means areas of greater ruggedness with longer distances experience higher information asymmetry. The left side of Figure A1 shows the TRI profile for different distances and the right side shows the intensity of information asymmetry when distance increases. Generally, this proxy variable captures the idea that the longer the distance, the higher the information asymmetry.

To construct the career incentives of provincial and prefecture-level party secretaries, I collect their biographical information from Jiang (2018). As discussed in Chapter 1, prefecture party secretaries become ineligible for promotion once they reach the age of 57. For provincial-level leaders, the age of ineligibility for promotion is 63. These age thresholds serve as indicators of shifts in the career incentives of political leaders. Therefore, I define two dummy variables to be equal to one when a provincial and a prefecture party secretary are under the ages of 63 and 57, respectively.

Dependent Variable: The first dependent variable is total factor of productivity, measured by Malmquist Productivity Index. This index is calculated based on the data envelopment analysis frontier, as suggested by Ray and Desli (1997), and is commonly employed to evaluate the performance of firms, industries, or countries. The core concept involves estimating the distance of a unit's performance over time in comparison to a best

practice frontier. A Malmquist Productivity Index greater than 1 signifies a productivity improvement, laying the foundation for sustained economic expansion over time. A value less than 1 indicates a decline. A value of exactly 1 means that productivity has remained unchanged over the analyzed period. Figure A1 in the Appendix shows the distribution of estimated productivity.

To measure investment in the real estate sector and education, I utilize real estate investment per capita and education expense per capita. These metrics are constructed based on data from prefectures' Statistical Yearbooks. The investment in real estate includes investment in construction and investment in equipment and tools for construction, representing the completed investment in real estate development for a given year. The investment in education encompasses items such as the construction and maintenance of schools, teacher salaries, and scholarships and financial aid for students.

I also construct a battery of control variables on city leaders' personal characteristics, such as age, education, years of party membership, sex, and ethnicity. In addition, I control for prefecture-level economic variables in various model specifications such as GDP per capita, population, FDI, and fiscal revenue. I am able to collect political and economic information on roughly 320 of China's 333 prefecture-level jurisdictions between 2000 and 2015. Table A.1 and A.2 in the Appendix provide summary statistics.

6 Empirical Results

This section presents empirical evidence supporting the theoretical arguments. First, I establish that real estate investment has a negative impact, whereas education investment has a positive impact on local productivity between 2002 and 2015. Second, I provide empirical evidence on "agency failure," showing that, with provincial leaders' preferences held constant, prefecture leaders tend to invest more in the real estate sector to stimulate

short-term economic growth and less in education expenses fostering long-term growth when information asymmetry increases. Third, I demonstrate the career incentive effects of local politicians. Finally, I provide empirical evidence on the "amplifying effect." I illustrate how changes in principals' preferences for low-quality investment directly affect local resource distribution.

6.1 Determinants of Productivity

To investigate the influence of different types of development policies on productivity, I use the following fixed effect model.

$$\text{Productivity}_{c,t} = \beta_1 \text{Investment}_{c,t} + \Gamma X_{c,t} + \lambda_c + \mu_t + \epsilon_{c,t} \tag{14}$$

The productivity of city c in year t is measured by Malmquist Productivity Index. $\text{Investment}_{c,t}$ denotes the investment in either the real estate sector or education for city c in year t at the per capita level. $X_{c,t}$ represents a set of city-level control variables, including the percentage of primary industrial output in total GDP, the total population, and fixed asset investment. λ_c and μ_t represent city and year fixed effects, respectively.

Table 2 shows the results. For each type of investment, I present two models: the first model excludes control variables, while the second model incorporates all city-level controls. All independent variables are standardized. Therefore, the results should be interpreted as the effect of a one standard deviation change in the independent variables on TFP.

Column (1) illustrates that a one standard deviation increase in real estate investment results in a 0.018 decrease in productivity. This negative impact increases to 0.24 when incorporating all control variables. Conversely, the findings in columns (3) and (4) highlight a contrasting effect of education investment on TFP. Specifically, a one standard deviation increase in education investment, equivalent to an improvement of 103 RMB ($\approx$ \$15)

per capita, leads to increases in TFP by 0.041 and 0.071, respectively. [2] Overall, the results indicate that real estate investment tends to diminish productivity over time, while investment in human capital enhances productivity. In the subsequent sections, I explore the motivations behind local leaders' preference for investing in the real estate sector.

Table 2: Development Policies and Productivity

	TFP			
	(1)	(2)	(3)	(4)
Real estate	-0.018***	-0.024***		
	(0.006)	(0.008)		
Human capital			0.041**	0.071***
			(0.020)	(0.021)
Dep. var. mean	0.97	0.97	0.97	0.97
# of observations	3599	3582	3582	3582
Adjusted R^2	0.01	0.02	0.02	0.03
Year FE	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Note:

[1] Fixed effect models contain prefecture-level control variables: the percentage of primary industrial output in total GDP and total population. In models (1) and (2), they also have total education and science investment while in models (3) and (4), they have total fixed investment as control variables.

[2] Standard errors clustered by cities in parentheses, *p<.10; **p<.05; ***p<.01.

6.2 Information Asymmetry and Resource Allocation

To investigate the hypothesis that local leaders tend to allocate resources towards low-quality investments and less towards high-quality investments as information asymmetry between them and their principals increases, I employ the following model.

$$\text{Development Invest}_{c,t} = \beta_1 \text{Information Asymmetry}_c + \Gamma X_{s,t} + \Theta Z_{c,t} + \lambda_{p,t} + \epsilon_{c,t} \quad (15)$$

[2]Exchange rate: \$1 = 7 RMB.

In equation 15, Development Invest$_{c,t}$ represents the resources allocated to one of the development investments in the prefecture c, at year t. Information Asymmetry$_c$ stands for the information asymmetry for city c. $X_{s,t}$ is a set of personal-level controls for the part secretary, s, and $Z_{c,t}$ is a set of city-level time-variant controls. $\lambda_{p,t}$ is province-by-year fixed effects. The key analytical interest of this chapter is the parameter β_1, which measures the effects of information asymmetry on resource allocation. By incorporating province-by-year fixed effects, I am able to explore the impact of information asymmetry on resource allocation within the same province and year, thereby controlling for provincial-level preferences.

Table 3 presents the findings. Both independent and dependent variables are standardized. The results in column (1) indicate that a one standard deviation increase in information asymmetry corresponds to a 0.036 standard deviation increase in real estate investment. This relationship holds even after incorporating all city-level and individual-level control variables. In columns (3) and (4), the analysis shows that a one standard deviation increase in the information asymmetry index results in a decrease in education investment by 0.04 and 0.05, respectively.

Overall, these results show a pattern in which, as information asymmetry increases, local leaders invest more in low-quality investments that can rapidly increase their promotion chances, while allocating fewer resources to projects that increase the total size of the economy but require a long time to complete, involve complex coordination, and are not easy to demonstrate their abilities. This confirms Hypothesis 1.

Table 3: Information Asymmetry and Development Policies

	Real Estate		Human Capital	
	(1)	(2)	(3)	(4)
Information asymmetry	0.036***	0.037***	-0.044**	-0.050***
	(0.009)	(0.010)	(0.017)	(0.019)
# of observations	3941	3492	3232	2958
Adjusted R^2	0.60	0.54	0.60	0.57
Province and Year FE	Yes	Yes	Yes	Yes
Econ Controls	Yes	Yes	Yes	Yes
Politician Controls	No	Yes	No	Yes

Note:

[1] Fixed effect models contain prefecture-level control variables: GDP per capita, total population, and the percentage of primary industrial output in total GDP. They also include politicians' characteristics: connection with provincial leaders, age, gender, level of education, and tenure at current positions.

[2] Standard errors clustered by provinces in parentheses, *p<.10; **p<.05; ***p<.01.

6.3 Career Incentives and Resource Allocation

To examine Hypothesis 2, I employ a difference-in-discontinuity design, as outlined by He, Wang and Zhang (2020). This approach integrates an interaction between the information asymmetry index and the career incentive dummy variable within a regression discontinuity framework. This specification allows for the identification of "breaks in trends" by comparing changes in discontinuities associated with the career incentives of prefecture leaders (Grembi, Nannicini and Troiano, 2016; Giambona and Ribas, 2022). The model specification is as follows:

$$\begin{aligned}\text{Development Invest}_{s,c,t} = {} & \beta_1 \text{Age Dummy}_{s,c,t} + f(D_{s,c,t}) + f(D_{s,c,t}) * \text{Age Dummy}_{s,c,t} \\ & + \text{Information}_c * f(D_{s,c,t}) + \beta_2 \text{Information}_c * \text{Age Dummy}_{s,c,t} \\ & + \text{Information}_c * f(D_{s,c,t}) * \text{Age Dummy}_{s,c,t} + \theta \Omega_{c,t} + \epsilon_{s,t} \\ & \forall D_{s,c,t} \in (-h, h)\end{aligned} \tag{16}$$

I employ a parametric approach with a uniform kernel across all specifications to estimate the model. The term $\text{Age Dummy}_{s,c,t}$ serves as an indicator for the career incentives of the party secretary s in city c at year t, set to one if the party secretary's age is below 57. The function $f(D_{s,c,t})$ represents a flexible control for the distance in years to the age cutoff. In line with recommendations from Gelman and Imbens (2019), I adopt a local linear approach. Ω denotes the vector of control variables, while h is the age bandwidth, determined by the method proposed in Calonico, Cattaneo and Titiunik (2014). According to their algorithm, the MSE-optimal bandwidth is 5.6. I choose bandwidth 6 in my specifications. β_2 is the analytical interest in this model.

Results are reported in Table 4. Columns (1) and (2) illustrate that among local leaders who face identical information asymmetry, those with higher career incentives invest 0.042 standard deviations more in the real estate sectors compared to their counterparts

with lower career incentives. Conversely, they invest 0.05 standard deviations less in education. The empirical findings remain consistent after incorporating economic control variables, such as GDP per capita, and political control variables, including the political connections of politicians with provincial leaders. Overall, the statistical evidence indicates that within a multi-layered government structure, the promotion incentives of local leaders skew resource allocations away from high-quality investments that are crucial for long-term economic development. This finding confirms Hypothesis 2.

Table 4: Career Incentive Effect

	Real Estate		Human Capital	
	(1)	(2)	(3)	(4)
Information*Career	0.042**	0.042**	-0.050**	-0.049**
	(0.023)	(0.020)	(0.023)	(0.023)
# of observations	2588	2588	2566	2566
Adjusted R^2	0.53	0.53	0.55	0.55
Province and Year FE	Yes	Yes	Yes	Yes
Econ Controls	Yes	Yes	Yes	Yes
Politician Controls	No	Yes	No	Yes
Kernel Type	Uniform	Uniform	Uniform	Uniform

Note:

[1] Prefecture-level economic control variables include GDP per capita and the percentage of primary industrial output in total GDP. They also include politicians' characteristics: connection with provincial leaders, gender, level of education, and tenure at current positions.

[2] Standard errors clustered by provinces in parentheses, *p<.10; **p<.05; ***p<.01.

6.4 Career Incentives of Principal

Finally, I explore the effect of institutional failure, specifically how changes in preferences among principals can further distort resource allocation. The statistical model used is as follows:

$$\begin{aligned}\text{Development Invest}_{c,t} = \beta_1 \textit{Career Incentive}_{ps,t} + \beta_2 Career_{ps,t} * Information_c \\ + \Gamma X_{s,t} + \Theta Z_{c,t} + \lambda_c + \mu_t + \epsilon_{c,t}\end{aligned} \tag{17}$$

Where $\textit{Career Incentive}_{ps,t}$ represents the career incentive of the provincial party secretary ps in year t. It is a dummy variable equal to 1 when the age of a provincial party secretary is below 63. $Information_c$ denotes the information asymmetry index. $X_{s,t}$ represents a battery of personal-level controls for the party secretary s, and $Z_{c,t}$ is a set of city-level time-variant controls. λ_c and μ_t represent city and year fixed effects, respectively.

Table 5: Career Incentive Effects of Provincial Leaders

	Real Estate		Human Capital	
	(1)	(2)	(3)	(4)
Career incentive	0.002	0.011	-0.021	-0.033*
	(0.019)	(0.019)	(0.033)	(0.018)
Information*Incentive	0.043***	0.037***	-0.189***	-0.093***
	(0.012)	(0.012)	(0.028)	(0.014)
# of observations	3928	3863	3865	3831
Adjusted R^2	0.67	0.68	0.25	0.66
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Note:

[1] Prefecture-level economic control variables include GDP per capita and the percentage of primary industrial output in total GDP. They also include politicians' characteristics: connection with provincial leaders, gender, level of education, and tenure at current positions.

[2] Standard errors clustered by provinces in parentheses, *p<.10; **p<.05; ***p<.01.

The results in columns (1) and (2) of Table 5 indicate that career incentives for provincial leaders lead to a 0.043 standard deviation increase in real estate investment among localities subject to the same information asymmetry. Conversely, the results from columns (3) and (4) demonstrate that these same career incentives result in a decrease in education investment by 0.189 standard deviations.

Figure 2: Dynamic Effects of Career Incentives on Real Estate Investment

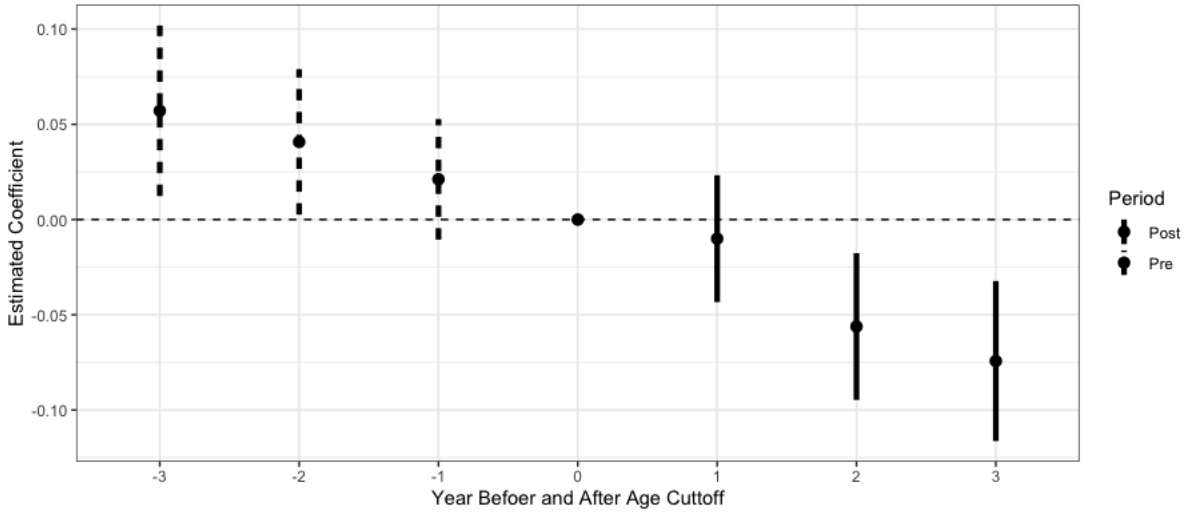


Figure 2 illustrates the dynamic impact of career incentives on real estate sector investment three years before and after the age cutoff for promotion eligibility. It clearly shows that before the age cutoff of 63, provincial leaders demonstrate a preference for more real estate investments, motivated by their pursuit of career advancement. This preference then extends to prefecture-level politicians, leading to an increase in real estate investments. However, immediately following the loss of career incentives, there is a noticeable decline in such investments.

6.5 Robustness Checks

I perform several robustness checks and placebo tests to validate the main findings. First, I use the change in technical efficiency from the Malmquist Productivity Index to measure productivity. The results are shown in Table B.1 in section B.1. Second, I modify the measure of information asymmetry to the road distance between prefectures and provincial capitals. The results are presented in Table B.2 in the Appendix. Additionally, I conduct a placebo test using the distance between prefectures and the capitals of their nearest

provinces, discussed in section B.2. Third, I assess the robustness of the RD design by applying a different kernel and bandwidth. Details can be found in section B.3. Finally, I conduct two placebo tests concerning the impact of provincial leaders' career incentives. Overall, across all robustness checks, the findings consistently align with those reported, and the placebo tests yield null results.

7 Conclusion

This chapter provides both theoretical arguments and empirical evidence on how information asymmetry in a multi-layered government influences political leaders' allocation of resources across different development investments. I calculate the optimal resource allocations for the economy, the principal, and subnational leaders. Based on this, I identify two efficiency losses in the political promotion system. The first is due to "institutional failure," whereby the principal fails to design policies that achieve optimal economic allocation. The second is "agency failure," where local leaders' optimal political allocations of resources are misaligned with those of the principal. The most significant prediction based on the model is an "amplifying effect," where institutional failure exacerbates agency failure.

My empirical findings reveal that within a political promotion system, information asymmetry encourages subnational leaders to skew resource allocation towards low-quality investments that can boost short-term economic growth, at the expense of investing in education that could foster innovation and sustain long-term economic development. Moreover, this inclination is particularly strong among leaders with significant career incentives. Additionally, the career incentives of political principals further exacerbate the shift in resource allocation towards these low-quality investments. Consequently, regions affected by substantial resource misallocation show lower productivity levels.

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