Political Connections and Regional Development: Evidence from China

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Abstract

One of the fundamental principles of Chinese-style institutions is that various levels of government control resources, and it is common for firms to form strong bonds with government officials. I examine how this feature affects international openness. The paper first investigates the overall effectiveness of political connections. Using dialect to classify the regions, the model also includes the interaction effect of political connections and regional culture. The results indicate that higher levels of political connections are associated with lower international openness, with the effect varying depending on regional culture. To further understand the characteristics of China's growth, the study constructs a prisoner's dilemma model under the country's unique economic and political structure. Finally, the study employs the propensity score matching method to explore the mechanism behind the negative effect of political connections, specifically on a firm's technological innovation.

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Categorical Code	Dialect	Cities
1	Northeast Mandarin	30
2	Wu	17
3	Ping	15
4	Hui	5
5	Jin	23
6	Xiang	8
7	Cantonese	18
8	Gan	12
9	Min	14
10	Lu	17

Table 1: Dialect Statistics

Variable	Definition
open	The ratio of imports plus exports to GDP
pc	The regional political connections level, measured by the proportion of politically connected listed firms in a city. A politically-connected firm is defined when at least one of its board members or Top Management Team members assumed positions in the Chinese People's Congress (CPC) or the Chinese People's Political Consultative Conference (CPPCC) at the national or provincial level
dis_coastline	Distance between city and coastline (1000km)
s_gdp	The industrial structure of the city, which is measured by the proportion of second industrial GDP
lngdp	Log(real GDP)

Table 2: Data Description 1

Variable	Mean	SD	Min	Mac	Median	N
open	0.142	0.176	0	0.996	0.073	3243
pc	0.478	0.334	0	1	0.5	2782
dis_coastline (1000km)	0.3	0.247	0	1.579	0.253	3232
s_gdp	0.468	0.105	0	0.851	0.468	3239
lngdp	23.696	0.934	20.81	27.033	3.66	3243

Table 3: Summary Statistics 1

VARIABLES	(1) open	(2) open	(3) open
2.dia_main2	0.259***	0.236***	0.236***
	(15.13)	(13.92)	(13.92)
3.dia_main2	0.008	-0.057***	-0.057***
	(0.54)	(-3.43)	(-3.43)
4.dia_main2	-0.008	0.000	0.000
	(-0.39)	(0.02)	(0.02)
5.dia_main2	-0.056***	-0.059***	-0.059***
	(-4.36)	(-4.34)	(-4.34)
6.dia_main2	-0.054***	-0.050**	-0.050**
	(-3.01)	(-2.57)	(-2.57)
7.dia_main2	0.152***	0.134***	0.134***
	(9.32)	(8.05)	(8.05)
8.dia_main2	0.045***	0.053***	0.053***
	(2.92)	(3.30)	(3.30)
9.dia_main2	0.055***	0.041**	0.041**
	(3.21)	(2.41)	(2.41)
10.dia_main2	0.063***	0.046***	0.046***
	(3.80)	(2.77)	(2.77)
lngdp	0.049***	0.061***	0.061***
	(8.87)	(11.00)	(11.00)
dis_coastline	-0.146***	-0.229***	-0.229***
	(-4.48)	(-6.36)	(-6.36)
s_gdp	-0.121***	-0.025	-0.025
	(-3.00)	(-0.59)	(-0.59)
pc		-0.024**	-0.024**
		(-2.08)	(-2.08)
Constant	-0.945***	-1.246***	-1.246***
	(-7.27)	(-9.50)	(-9.50)
Observations	1,791	1,509	1,509
R-squared	0.417	0.488	0.488

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Chapter2 Regression Results

Variable	Definition
rd_con	R&D concentration, a ratio of a firm's R&D investment to its sales value
pc2	Binary variable, where $pc2_{it}$=1 indicates that the firm has state-owned share
exratio	The ratio of export sales value to sales value
industrial	Industrial characteristics, a ratio of fixed assets to total assets
leverage	Leverage ratio of total debt to total asset
tax	Tax burden, (income tax+sales tax)/total income
dur	The age of the firm
holdings	The holdings of the firm at the time of registration. Categorical variable, where holdings=1 indicates state-owned holding; holdings=2 indicates collective holding; holdings=3 indicates private holding; holdings=4 indicates HK, Macau and Taiwan holding; holdings=5 indicates foreign investment; holdings=9 indicates others
scale	The firm's scale, where scale=1 indicates the small firm; scale=2 indicates the medium firm; scale=3 indicates the large firm

Table 5: Data Description 2

Variable	Mean	SD	Min	Max	Median	N
rd_con	0.003	0.026	0	5.157	0	127721
pc2	0.033	0.18	0	1	0	127867
exratio	0.634	0.365	0	1	0.758	127721
industrial	0.301	0.188	0	4.051	0.273	127865
leverage	0.557	0.302	-24.333	17.3	0.564	127865
tax	0.008	0.017	-0.381	1	0.003	127834
dur	8.553	8.171	0	169	7	127861
holdings	5.189	2.542	1	9	4	127867
scale	2.723	0.498	1	3	3	127867

Table 6: Summary Statistics 2

	Mean		t-test	V(T)/
Variable	Treated Control	%bias	t p>t	V(C)
exratio	.35998 .34975	2.9	1.37 0.170	0.96
industrial	.3151 .30866	3.5	1.65 0.099	1.05
leverage	.58818 .58092	2.4	1.18 0.238	1.30*
tax	.01199 .01238	-1.7	-0.73 0.467	1.53*
dur	19.555 18.98	4	1.36 0.175	0.85*
holdings	3.0274 3.0273	0	0.00 0.999	1.49*
scale	2.2637 2.2741	-1.7	-0.68 0.499	1.07*

Table 7: Balance Test

VARIABLES	(1) OLS	(2) PSM_OLS
pc2	-0.009***	-0.001*
	(-3.58)	(-1.80)
exratio	-0.004***	-0.007***
	(-3.89)	(-6.34)
industrial	-0.006***	-0.009***
	(-2.85)	(-4.64)
leverage	-0.001	-0.004
	(-1.44)	(-1.59)
tax	0.007	0.012
	(0.35)	(1.22)
dur	0.000***	0.000
	(3.56)	(0.65)
2.holdings	-0.022***	-0.003***
	(-6.53)	(-2.73)
3.holdings	-0.025***	-0.006***
	(-9.52)	(-6.33)
4.holdings	-0.026***	-0.006***
	(-9.66)	(-5.33)
5.holdings	-0.024***	-0.004***
	(-9.09)	(-4.08)
9.holdings	-0.017***	-0.005***
	(-4.85)	(-4.81)
2.scale	0.002	-0.001
	(0.56)	(-1.32)
3.scale	0.002	-0.003**
	(0.75)	(-2.16)
2006.year	0.009***	0.000
	(2.92)	(0.46)
2007.year	0.008***	0.001
	(2.69)	(0.61)
Constant	0.019***	0.020***
	(4.49)	(7.60)
Observations	171,694	12,667
R-squared	0.001	0.025

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Chapter4 Regression Results

Figures

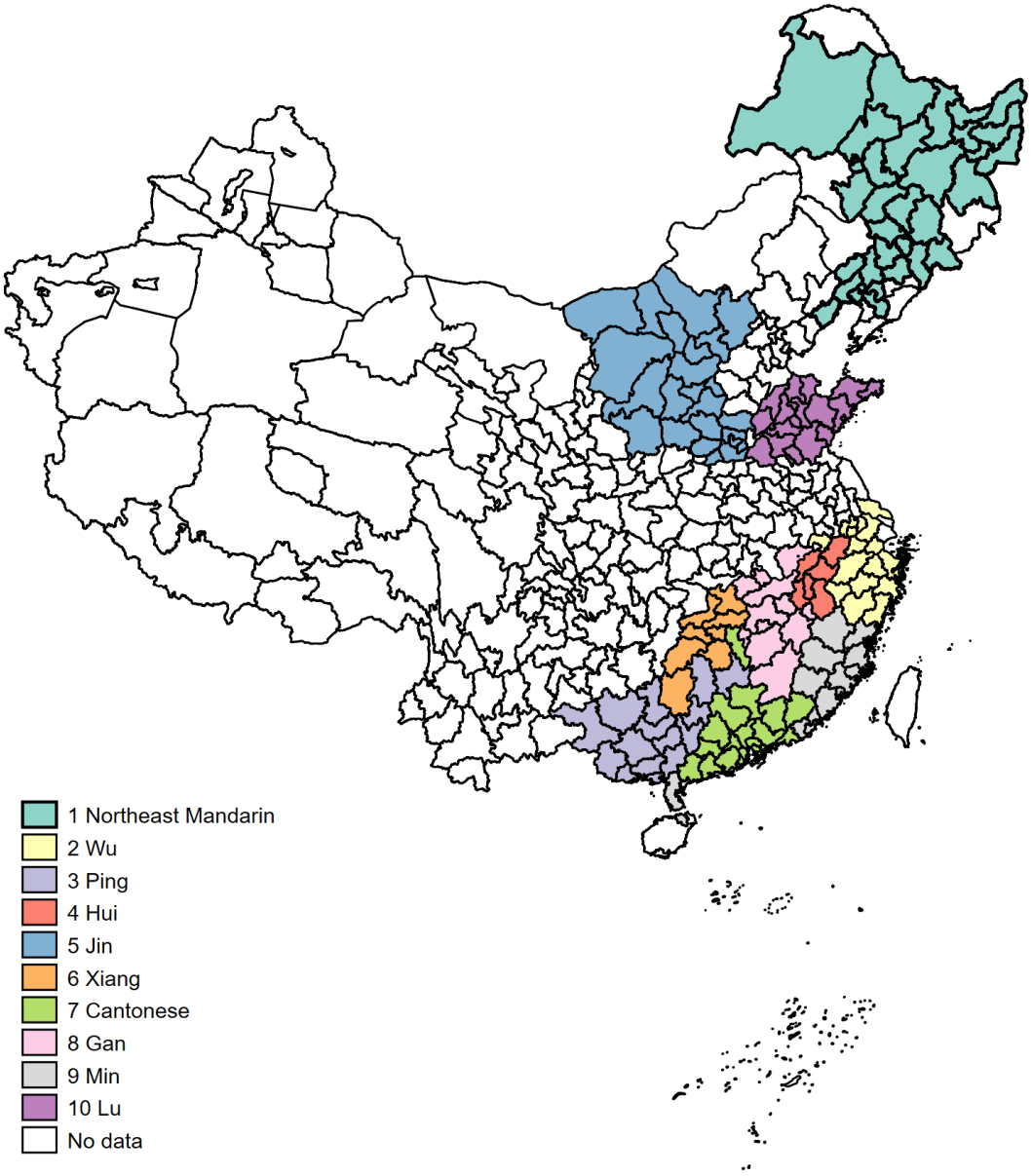
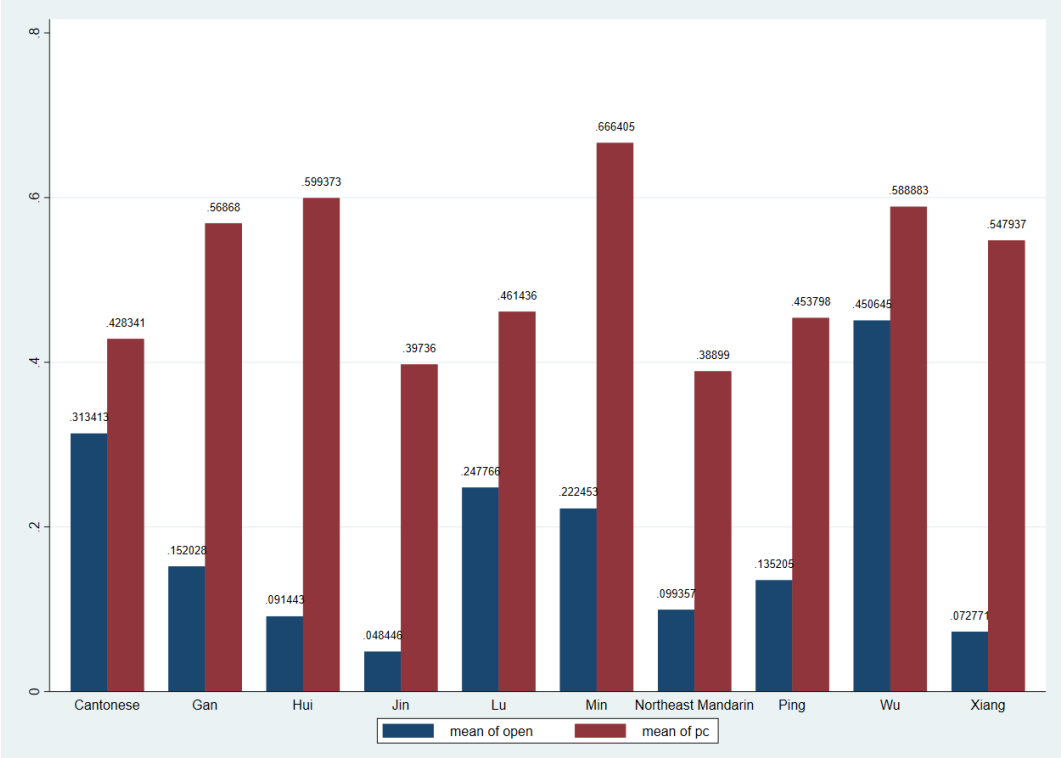
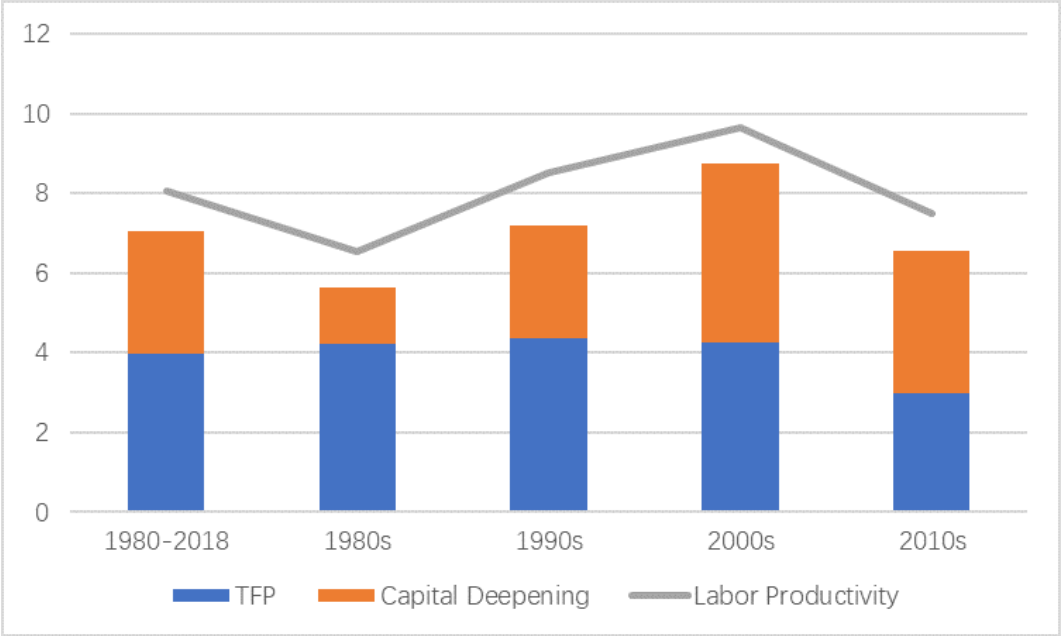


Figure 1: Dialect Distribution



Data Source: CSMAR Database

Figure 2: Openness and political connections



Data Source: World Bank Group

Figure 3: Source of Growth in China, 1980-2018

1 Introduction

Some literature employs the term ”China Model” to explain the economic and social challenges encountered in China. However, unlike a predictable and replicable model, the China Model represents an analysis of the unique features that facilitated China's rapid development over recent years. These include the demographic dividend, government-firm relations, and export substitution, which differ from those of other developing countries in terms of political and economic structures, population size, and geography. This study focuses specifically on the government-firm relations issue, and seeks to answer several questions: What is the overall effect of political connections? Do political connections impact foreign trade differently depending on regional culture? Why is it hard for China to promote production mode based on technology improvement? What is the social cost of political connections? This paper is organized into three parts to address these questions.

In the first part, to conduct a regional study, I classify regions based on dialect distribution to examine the role of regional culture in international openness since that language is significant for identifying cultural and ethnic groups. The fixed effects model shows that Cantonese and Wu-speaking areas have the highest degree of openness. This result is consistent with the fact that these two areas are main economic bodies in China. I then include the key variable, political connection, and the interaction terms of it and each dialect group in the model. The analysis shows that political connections have an overall negative effect and varying impact depending on different regions. Notably, political connections improves the openness in Cantonese-speaking area but dampen the openness in Wu-speaking area. This varying effect reveals the regional differences in both institutions and cultural factors. Historically, the institutional supply tends to be path

dependent: central government prioritizes coastal areas where Cantonese is spoken for exploring the global market and chooses Wu-speaking areas as an experiment field for domestic development.

The second part presents a framework to understand the path-dependent development in China and investigates the government-firm relations through a prisoner's dilemma model. Regarding path dependence, the central government proposed to shift the growth model, which relies on the demographic dividend and export, to the intensive one based on technological improvement and innovation. However, it seems hard for China to shift the way of production since the Total Factor Productivity(TFP) has fallen after the global financial crisis. To investigate the institutional effect, I construct a prisoner's dilemma model under an economically decentralized and politically centralized structure. A firm can take two ways of development: a new path with high cost but a sustainable production mode, and an old path with low cost but low core competitiveness and possibly more accidents. The central government only know the economic outcome, and it delegates authority to local governments to supervise firms' production activities. The model reveals that the penalty and reward system and the specific tax rate can incentive both firms and local governments to choose a sustainable production mode under the information asymmetry.

Moreover, this study also explores one kind of social cost brought by political connections. Chapter 4 discusses the impact of political connections on a firm's technological innovation, which is measured by the research and development fee (R&D). Using the firm-level data, the politically connected firm in this chapter is defined by whether the firm has state-owned capital. I then employ the propensity score matching method and find that politically connected firms are associated with lower investment in R&D.

The remainder of the paper is structured as follows: chapter 2 summarizes the related literature. Chapter 3 discusses the govern-firm relation under different cultural contexts. Chapter 4 provides a framework for understanding path-dependent development in China. Chapter 5 analyzes the impact of political connections on the capital input of R&D, and chapter 6 offers conclusions and

discussions from the research findings.

2 Connection to Existing Literature

Domestic institutions are important determinants of a country's comparative advantage in trade. Since local governments control resources and utilize their power to support businesses connected to them, political connections, defined as the relationship between individuals and organizations with government or political leaders, have been a subject of growing interest in academic research due to their potential negative impact on economic development. Previous literature has highlighted the social cost of political connections. The key findings focus on corporate governance and firm performance as follows.

political connections can negatively impact corporate governance by creating conflicts of interest between the firm and government officials. According to Faccio (2010), politically connected firms are more likely to have weak corporate governance practices, such as lower board independence, weaker shareholder rights, and lower CEO turnover.[1] In addition, political connections can result in higher CEO pay, which may not align with shareholder interests. Faccio (2010) also found that politically connected firms tend to have a higher likelihood of financial misreporting and engaging in fraudulent activities. Furthermore, political connections can lead to an increase in firm leverage and a decrease in firm value.[1] Claessens et al. (2002) showed that politically connected firms in emerging markets tend to have higher leverage ratios than non-connected firms.[2] The authors suggested that this is due to the easier access to government subsidies and other forms of preferential treatment that politically connected firms receive. A study by Nie (2007) discusses political connections in China with collusion instead of corruption.[3] He provided a both theoretical and empirical explanations of high-speed growth and high-frequent pernicious accidents under the framework of government-firm collusion. In his study, collusion is also associated with coalmine

accidents, pollution, and other social problems. For firm performance, studies have shown that politically connected firms tend to have lower profitability and lower productivity. Fisman (2001) showed that politically connected firms are less likely to innovate and adopt new technologies, resulting in lower productivity.[4] Ding et al. (2018) found that political connections also have an adverse effect on firm exports because of managerial inefficiency in China.[5] Nie (2007) discussed that collusion marginally reduces technological innovation and significantly harms TFP.[3]

While most of the research on political connections has focused on the formal institutions and regulations that shape firm-government relations, little literature explores culture's role in shaping political connections and their outcomes. The existing relevant literature mainly uses language as a variable of culture. Lazear (1999) constructed a model of culture to show that trade between individuals is facilitated when all traders share a common culture and language.[6] Melitz (2008) finds that a shared language facilitates international trade through both translation and direct communication(DC), with DC being the more critical factor.[7] Their standard gravity analysis of linguistic ties between regions is measured by dialect data from about 120 years ago. For the role of culture within a country, Xie and Yuan (2020) used dialects to distinguish major business groups in China by dialect. They also measured the regional business culture by indexes of political connections, integrity, innovation, and trust.[8]

This paper makes several contributions to the literature. First, few govern-firms relations studies discuss the role of cultural context. In chapter 3, I classify the regions by dialect distribution and discuss the impact of both historical institutional supply and culture groups. Second, to explain how govern-firms relations affect development, I construct a prisoners' dilemma model to combine the special institutional environment in China.

3 political connections, Path Dependence, and Culture

Using the dialect data and China Custom data, this chapter analyzes the political connections in different regions of China to understand the impact of institutional supply, regional culture, and path dependence. Section 3.1 classifies regions by dialects. Section 3.2 gives a brief overview of regional institutional supply. Historically, the institutional supply of two central economic bodies in China tends to follow the same logic. Section 3.3 discusses the data and econometric approaches to provide empirical evidence.

3.1 Boundary Demarcation of Regions

The existing literature mainly classifies the regions by provincial system or city boundary. However, this study classifies regions based on dialect distribution and uses the prefecture-level city as the smallest spatial unit. The classification method follows two reasons. At first, the current provincial system, the first-level administrative division, sometimes breaks the distribution of regional informal institutions. The city boundaries can also be set up between neighboring provinces under the same institutional supply or similar cultural contexts. For example, one of the most important economic regions, the Yangtze River Delta (YRD), generally comprises the Wu Chinese-speaking areas of Shanghai, northern Zhejiang, southern Jiangsu, and northern Jiangxi, according to Wikipedia. Those areas are all the cultural, economic, and political centers of China. Therefore, it is difficult to fully reflect the homogeneity and heterogeneity of regional culture by dividing the

regional boundaries based on administrative regions. Secondly, linguistic interaction produces and thus constitutes the social order. Talk is not just a reflection of social organization; it is a practice that is one of social organization's central parts.[9] Classifying regions by dialect reflects the role of regional culture and other similarities of business institutions.

Based on the dialect distribution in 1986, this study uses the broadest dialect classification, including ten dialects. Since many cities have more than one dialect, the dialect spoken by most people in the city is chosen. The population data are for 2000. Also, China established the Promote Mandarin Council in 1979, so the represented dialect of 172 cities speak mandarin, which is unbalanced compared to other dialects and not consistent with the actual situation. Therefore, based on both dialect and trade history sub-categories, I adjusted some mandarin places to regions speaking Hui, Xiang, and Min. I also created the Northeast Mandarin region and Lu dialect region, the leading trade area in history. According to the historical trade recording, I exclude some mandarin areas since they contribute little to the current trade volume. For the Ke-speaking area, I moved those cities to the Cantonese area since they are all distributed in Guangdong province, the same as the Cantonese-speaking area. The table1 shows the number of cities where each dialect is spoken after adjustment, and Figure1 shows the geographic distribution of the dialect.

3.2 Overview of Regional Institutional Supply

Institutions are a series of formulated rules. It includes law procedures and ethical norms of behavior. Institutions that create the main economic actors—human and physical capitals— are the foremost important factor of long-term growth.[10] At the same time, spatial institutions refer to the institutions which are related to regional resource allocation and development. Justin Yifu Lin divided institutional change into imposed government-instituted change and induced, voluntary change.[11] The former is introduced and implemented by government orders and laws. The latter is

spontaneously advocated and organized by individuals or groups. Nie (2017) categorizes all states into four types based on the share of political and economic powers between the central government and local governments. China is a politically centralized and economically decentralized state.[3] For a centralized political structure, the central government is the dominant factor in determining the direction and form of institutional change. The central government in China is the main organizer of the imposed reform. Meanwhile, the economically decentralized structure requires local governments with independent economic interests to be the intermediary link that communicates the state and micro-subjects. The local governments in China also directly engage in institutional innovation that can lead to the maximization of local interests. In this way, the institutional change in China is led by the central government and implemented by local governments.

This section mainly compares the historical institutional supply of two central economic bodies in China: Cantonese-speaking and Wu-speaking areas. The analysis of institutional supply led by the central government can be traced back to the ancient and modern times since Qing and Han Dynasties. After Qin's wars of unification, the Cantonese-speaking area became the earliest gateway to the outside world in China to expand its territory. The expansion led to the first opening of this area. Since then, in the more than 2000 years of history from the Qin and Han dynasties to the Opium War in the early Qing Dynasty, the opening up policy to the outside world has constituted the mainstream of central institutional changes in Cantonese area.[12] The maritime Silk Road, a long-distance sear route, and a new trading management system were all set up in this period. In this period, the Wu-speaking area did not receive much preferential treatment regarding institutional supply for foreign trade. After the Opium War, the central institutional supply of "Five Ports Open to Trade" changed this pattern. As Liang Qichao says: for central plains of China, the remote Guangdong province is the fringe, but for the relationship between China and the world, Guangdong province is the junction."

It seems that the same institutional supply has also been applied to the design of regional development paths since the founding of the People's Republic of China (PCR). The Table following

demonstrates that when China seeks to expand into the global market, it tends to prioritize the coastal areas where Cantonese is spoken. On the other hand, when the primary objective is to promote domestic development, the Wu-speaking areas are typically chosen.[12]

	Cantonese-speaking Area	Wu-speaking Area
1949-1978	The first Canton Fair was held in 1957	Establish industrial system and stabilize the national supply of industrial products
1978-1990	Three Special Economic Zones[i] (SEZs, formerly known as special export zone) was established under Deng's reforms in 1980	Four Coastal Open Cities[i]were established in 1984
	The State Council approves Guangdong Province as Comprehensive Reform Pilot Zone in 1988	Five Economic and Technological Development Zones (ETDZs)[i]were established during 1984-1986
After 1990s	Implemented transformation and upgrading of processing trade in 2008	Approved the establishment of capital market in 1992
		Established the Shanghai Branch of the People's Bank of China in the Yangtze River Delta

[i] The different types of economic development zones were assigned different goals. In short, China has formed a multi-level pattern consisting of: SEZ, Coastal Open City and ETDZ. From the perspective of opening up policy, the SEZs are the first tier of the institutional supply strategy.

Table 3.1: Historical Institutional Supply

3.3 Econometric Analysis

3.3.1 Model

Under the economically decentralized structure, firms can connect with local governments for their resources and decision-making power. The current research shows that an enterprise will prioritize establishing political connections instead of the capacity building if the government is granted large quantities of economic resources and great discretion on the one hand, and it is challenging

for them to enhance or sustain the advantages of product quality on the other.[13] Therefore, I assume that the politically connected firms will be more reliant on imposed institutions. Since the central government prefers Cantonese-speaking to be the first experiment filed for international trade policy, the political connections will help this area to be more open. On the contrary, the political connections will impede the openness in the Wu-speaking area because of the domestic development plan. In this section, I measured openness by the ratio of imports plus exports to GDP. To provide more empirical evidence of the effect of political connections, I add to the explanatory variables *pc* (political connections), a variable reflecting the regional political connections level. The *dia_main* denotes the main dialect that the city speaks and indicates the region that the city belongs to. Besides, I consider geographical factors. The variable *dis_coastline* is included to reflect the distance between the city and the coastline. Given different levels of economic development in different provinces, I take *lnGDP* (denoting the real GDP) and S_GDP (denoting the proportion of second industrial GDP) as controlled variables.

I start with the following model to test the overall effect of political connections.

$$Openness_{it} = \beta_1 + \sum_{j=2}^{n=10} \beta_j \ j.culture_i + + \beta_{11} lnGDP_{it} + \beta_{12} dis\_coastline_{it} + \beta_{13} S_{GDPII_{it}} + \beta_{14} pc_{it} + v_t + \epsilon_{it}$$

To test the interactive effect between political connections and culture, I add interaction terms in the model. The second regression model is:

$$Openness_{it} = \beta_1 + \sum_{j=2}^{n=10} \beta_j \ j.culture_i + + \beta_{11} lnGDP_{it} + \beta_{12} dis\_coastline_{it} + \beta_{13} S_{GDPII_{it}} + \beta_{14} pc_{it} + \sum_{k=15}^{n=23} \beta_k \ j.culture * pc_{it} + v_t + \epsilon_{it}$$

3.3.2 Data

The paper uses city-level data. I aggregate the firm-level trade data from the China General Administration of Customs to city-level data by their location. For the political connections, I identify the firm whose members in top management organizations are or were a member of public organizations as political-connected firms and calculate the proportion of political-connected firms in city-level for every year. I collect the political connections data from China Stock Market & Accounting Research (CSMAR) database. The GDP data is from the public data of the China City Statistical Year Book and the National Bureau of Statistics. The distance between city and coastline data comes from the National Coastal Port Layout Plan in 2006. Each year's average exchange rate adjusts the data. See Table3 for data description.

The sample includes 159 prefecture-level cities over a span of 12 years between 2008 and 2019. From the figure, we can find that the Wu-speaking area and Cantonese-speaking area have the highest openness over 12 years. However, the Cantonese-speaking area has a lower political connections level than the other seven areas. In some regions, all listed firms have political connections with the government in specific years. See Table3 for summary statistics.

3.3.3 Main Results

Based on the panel data of 159 cities between 2008 and 2019, the testing results are shown in Table4. Since the dialect is a categorical variable, the results compare with the Northeast Mandarin-speaking area.

Column 1 in Table4 shows that the Cantonese-speaking and Wu-speaking areas have the highest degree of openness. The Jin-speaking and Xiang-speaking areas, located in the central plains, have the lowest degree of openness. Since language and dialect have played an essential role in shaping

regional identities and cultures in China, this result shows that there correlate with regional culture and openness. Column 2 in Table4 shows that the overall effect of political connections is negative and statistically significant at a 5% significance level, meaning that political connections has a generally negative effect on regional openness. This suggests that political connections have a dampening effect on regional openness. According to relevant literature, it created barriers to trade or limited exposure to new ideas and cultures.

The estimated coefficient of interaction terms in column 3 shows that political connections has a stronger beneficial effect on the Cantonese-speaking area but a stronger negative effect on the Wu-speaking area. The coefficients of these two interaction terms are statistically significant at 1%, but other interaction terms are not significant.

This key finding provides insights into the impact of political connections, path dependence, and regional culture. The varying effect of political connections reveals the regional differences in institutions or cultural factors that affect how political connections are perceived and used. As the analysis in the previous section shows, regional development in China is influenced by path dependence. The historical prioritization of coastal areas where Cantonese is spoken for global market expansion has continued influencing political and economic decision-making. Conversely, Wu-speaking areas are typically chosen for domestic development purposes. Furthermore, the positive effect of political connections in Cantonese-speaking areas is likely due to the fact that these areas have been prioritized for trading and investment, while the negative effect in Wu-speaking areas may be related to historical and cultural factors such as a stronger emphasis on local governance and relative less reliance on external trade. It is not that I deny the gains from political connections. In previous years, the Wu-speaking area has been constructing and improving the industrial system. Meanwhile, local government also shifted their focus toward the global market after the 1990s. The Wu-speaking area is one of the most advanced regions in China. However, this speedy growth owes their success to historical factors such as demographic dividends and extensive production modes.

In addition, this finding provides empirical evidence of the important effect of regional culture and history on shaping economic and political outcomes in China. Specifically, there is a long history of regional differences in political and social structures between northern and southern China, dating back to imperial times. The southern emphasis on local autonomy and community ties can be traced to the influence of Confucianism and its emphasis on the importance of personal relationships and moral values.[14] In the 20th century, these regional differences were further reinforced by political and economic changes. During the Chinese Civil War and the early years of the People's Republic of China, the Communist Party focused its efforts on building up grassroots organizations. In many southern regions, this involved working closely with local elites and relying on preexisting social networks to establish Party committees and mobilize support. This contrasts with many northern regions where military leaders or cadres often led the local governments from other regions.[15] Joseph Esherick examines the social and economic changes in late Qing China that led to the Boxer Uprising of 1900. He argues that the Boxer movement was primarily a response to the rapid social and economic changes occurring in northern China at the time, including the influx of foreign traders and the growth of capitalist agriculture. In contrast, Esherick notes that southern China at the time had a more developed local governance system, with officials who were often drawn from local elites and had deep ties to their communities.[16] He suggests that these factors may have contributed to the relative lack of Boxer activity in southern China compared to the north. In this way, the local officials in the southern region can more effectively mobilize local resources and promote economic development in their regions. This can also help to explain that political connections have beneficial effects to international trade on the Cantonese-speaking area.

4 The Prisoners' Dilemma and political connections

This chapter provides an analysis framework of political connections to explain why it is hard for China to promote growth mode. Section 4.1 introduces the background of China's growth model, which is more extensive than intensive. Section 4.2 constructs a prisoner's dilemma model based on the information asymmetry under China's specific economic and political structure.

4.1 Background

Growth is a fundamental question for every government. In the past years, China achieved undeniable economic growth. Superficially, China's growth model appears to be doing well. The growth model is classified as extensive growth and intensive growth. Extensive growth refers to a growth strategy based on labor, capital, and territory increases. Krugman (1994) discussed that it was simply not possible for Soviet economies in the second half of the 20th century to sustain the rates of growth in labor force participation, average education levels, and above all, the physical capital stock that had prevailed in previous years.[17] In short, Soviet economies failed to develop intensive growth derived from technical change. As the largest economy in Asia after the dissolution of the Soviet Union, China relies on the demographic dividend, and signifies the comparative advantage of labor prices in the international market for many years. As a matter of fact, China proposed to shift the way of growth early in the Thirteenth Party Congress in 1987. Nevertheless, the total factor productivity of China does not increase as the total output did. The contribution of TFP to China's economic growth has fallen markedly since the global financial crisis. Figure3 shows that

TFP growth fell from 4 percent in the four decades up to 2010 to 3 percent in the decade. This reality implied that China's economic growth could not sustain growth through input expansion.

4.2 The Prisoners' Dilemma: An Analysis Framework

This section will discuss why China, even if the central government proposed to shift the growth model in the 1980s, relies heavily on the old path. The institution is the foremost important factor of long-term growth.[10] China's institutions can be concluded as politically centralized and economically decentralized. Political centralization refers to the central government having a higher level of both executive and legislative power. The central government can decide to dismiss local officials and delegate some responsibilities to local governments. At the same time, centralized economic pass the supervision power of production activities to local government. Under this specific situation, information asymmetry exists. Local government and firms can choose the production mode with more benefit, even if it conflicts with the central's interest.

The main interests of the central government are growth and sustainable development. To expedite growth, the central set economic target for regions and measure their performance by instant results, such as yearly GDP and export data. The local government with great performance is rewarded by higher fiscal revenue, political revenue, and other forms of central's favor. These gains are a limited resource, so they are associated with the regional competition. For local government, the efficient way to achieve the target is to stick to the extensive production mode, the old development path. However, the old path and short-term benefits come with problems: economic bubbles, environmental pollution, workplace accidents, and brain drain. The central is aware of long-term development very early. China's Party Congress report proposed to shift the production from extensive to intensive early in 1987. Intensive production denotes high investment in research and development and adopting high-tech and high-value-added strategy. The high initial cost does not

encourage instant economic performance.

The model is based on the information asymmetry under the institutional environment above. Theoretically, the challenge of transformation of development is a collective action. Generally, each region is aware of the harm of keeping extensive production. Nevertheless, under the regional competition and the benefit of being favored by the central, unless all regions agree or are forced to share the cost of shifting, they will rationally seek to maximize their interests. No local government will take action to enhance the realization of a common goal, and their behavior will affect the decisions of the firm. This section constructs a prisoner's dilemma model based on the theoretical framework in Nie (2017).[3] His analytical framework provides a provision of collusion between local governments and firms. This model discusses the competitive game faced by firms under the action of local governments and central governments. It mainly reflects the negativity of regional competition and the significance of joint transformation.

Assume that firms a and b are in two regions, A and B. Both have two options for development: the old path and the new path. The old path uses the familiar production strategy and low demand for new technology. The old path's development cost is lower, expressed by $\underline{c}$. Comparatively, the new path requires higher investment and shifting cost, and the cost is expressed by $\overline{c}$. Given $0 < \underline{c} < \overline{c} < 1$, $\Delta c = \overline{c} - \underline{c}$, Δc represents quasi-rent, i.e., the cost saved by the firm if it chooses to stick on the old path. Since the "permit" of local government gives this advantage to the firm, the firm pays a transfer payment $b = k\Delta c$, $k \in (0, 1)$ represents the share of quasi-rent for local government. The firm will get a reward of R if and only if it has more efficient output than another firm, i.e., the firm produced with less cost can get the reward. If their contract is disclosed, they will both be penalized. The possibility of disclosure is p and the penalty are F_a,F_b, F_A and F_B respectively. Usually, the form of penalty on local government is a political measure, like dismissing the officials. The penalty can be more severe for the firm, sometimes even shutting down the whole industry. The expected penalty for the firm is pF_a,pF_b. The decision tree is as follows.

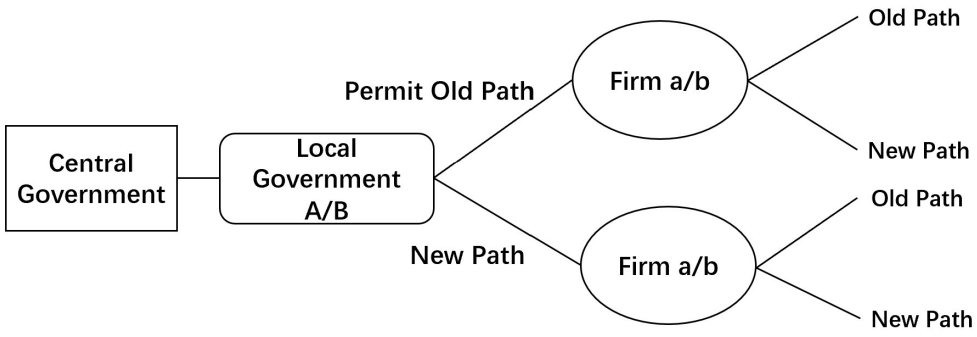


Figure 4.1: Decision Tree

Suppose firm a and firm b have the same output, x. Since this is a two-stage dynamic game of complete information, I use backward induction to solve the game. The game of firms' behavior is shown in Table4.1.

		Firm b			
		old		new	
Firm a	old	$x-\underline{c}-k\Delta c-pF_a$	$x-\underline{c}-k\Delta c-pF_b$	$x-\underline{c}-k\Delta c-pF_a+R$	$x-\overline{c}$
	new	$x-\overline{c}$	$x-\underline{c}-k\Delta c-pF_b+R$	$x-\overline{c}$	$x-\overline{c}$

Table 4.1: The Game Result

From this table, we can conclude the following results: a) When $(1-k)\Delta c < pF_{(a,b)} - R$, both firms choose the new path. Intuitively, when the difference between penalty and reward in two regions is higher than the share of saving cost for firms, both firms will choose a new path. The equilibrium is (new, new). b) When two regions face different punitive forces, $(1-k)\Delta c < pF_a - R$,$(1-k)\Delta c > pF_b - R$ or $(1-k)\Delta c > pF_a - R$,$(1-k)\Delta c < pF_b - R$, there have two equilibrium: (new, old) and (old, new). c) When two regions have a relatively low penalty and high rewards, $(1-k)\Delta c > pF_a - R$,$(1-k)\Delta c > pF_b - R$, the equilibrium is (old, old).

For the local government, their optimal strategy is to maximize the tax revenue. To make the

(new, new) also be the optimal strategy for local government, the new tax revenue needs to be higher than the old. Given the tax rate is t,$t \in (0,1)$,$T^{old}_{A,B} = (x - \underline{c} - pF_{a,b} + R) * t + k\Delta c - pF_{A,B} < T^{new}_{A,B} = (x - \overline{c}) * t$, i.e., $pF_{A,B} > \Delta c * t + k\Delta c - (pF_{a,b} - R) * t$. Intuitively, the penalty for local government should be higher than the tax revenue from the saving cost, direct sharing cost, and reward, excluding possible penalties for firm. When $pF_{(A,B)} > \Delta c * t + k\Delta c - (pF_{(a,b)} - R) * t$, the (new, new) is also the equilibrium of the local government.

The condition for local government is compatible with the optimal solution (new, new). Combing the condition for firms into this new one, we can find that when $pF_{(A,B)} > (1+t)k\Delta c$, the local government with the sole goal of tax maximization still has incentives to explore the new path because the benefits of permitting the old path cannot make up the loss caused by disclosure. Therefore, from the perspective of the characteristics of the optimal solution (new, new) can bring the most considerable profits for both local governments and firms. This is the optimal equilibrium point in this two-stage game model. However, this optimal equilibrium is unstable and weak, making it only possible to achieve with regulations targeting local governments and firms. It must rely on the regional competition level and the penalties of firms and local officials.

5 political connections and Technology Innovation

This chapter discusses the mechanism of how political connections affect the firm's development. Since the results in Chapter 3 reveals that the overall effect of political connections is negative, this chapter further discusses the social cost of political connections. It does not deny the possible benefits of political connections, but it is necessary to understand the form of negative costs of political connections. This chapter mainly focuses on the impact of political connections on corporate behaviors. By using the Chinese Industrial Enterprise Database, I examine how political connections affect technological innovation. The political connections in this chapter is measured by whether the firm has state-owned capital, and the technology innovation is measured by the ratio of R&D to sales value. Section 5.1 introduces the background and relative literature. Sections 5.2-5.4 employed propensity score to examine the impact of political connections on R&D.

5.1 Background

The relationship between political connections and firm innovation has long been a topic of interest in the literature on corporate governance and technological innovation. Because of China's specific political and economic structure, political connections plays a key role in the firm's strategic decisions. A study by Wu, Liu, and Ma (2020) found that political connections significantly negatively affect firms' R&D investments in China.[18] Similarly, Huang, Jiang, and Liu (2015) found that politically connected firms in China tend to invest less in R&D and have lower innovation performance than non-connected firms.[19] Theoretically, Yang (2011) utilized a quality/vertical dif-

ferentiation model to examine businesses' decision-making challenges when allocating resources towards political connections and product R&D.[13] The study asserts that if the government has access to substantial economic resources and significant discretion, enterprises find upgrading and maintaining product quality advantages challenging. Businesses may prioritize political connections over the capacity building. Yang further observes that domestic enterprises are more likely to focus on low-end services and products and prioritize political connections if the income distribution system leads to a larger low-end consumer group and a wider gap between the poor and the rich.

Furthermore, several high-profile cases have highlighted the potential negative impact of political connections on R&D. One notable case is the scandal involving the Chinese vaccine manufacturer Changsheng Biotechnology. Changsheng Biotechnology is a Chinese pharmaceutical company that was found to have produced and sold substandard vaccines in 2018. According to BBC News, the vaccines, including ones for rabies and diphtheria, were found to be ineffective and caused public outrage.[20] It was later revealed that the company had falsified data during production and used expired materials. The company had close ties to local government officials and had received substantial financial support from them. In 2013, Changsheng entered a joint venture with a state-owned company, receiving a $17 million investment from a state-owned Assets Supervision and Administration Commission subsidiary. Using political connections, the company obtained approval for its drugs without conducting adequate clinical trials, and it also enjoyed preferential policies such as subsidies and tax breaks. This suggests that the company may have prioritized political connections over investing in R&D and conducting proper product testing. Another pharmaceutical company Qilu Pharmaceutical announced that it would invest 3.2 billion yuan (approximately USD 500 million) to build a new R&D center. But it was later found to have paid bribes to government officials to obtain approvals for its drugs. The company's chairman and several executives were subsequently arrested, and the company's stock price plummeted. Similar scandals also took place in the technology industry. These scandals led to public scrutiny of the

relationship between pharmaceutical companies and government officials in China.

Based on the existing literature and cases, we can make the following hypothesis: assuming all other factors remain constant when a firm constructs connection with the government, it is likely to be less incentivized to invest in research and development.

5.2 Empirical Model

This section constructs a model to investigate the effect of political connections on R&D, which is the dependent variable in the model. The key variable is $pc2_{it}$, a dummy variable of political connections. The model also includes other factors that can influence a firm's innovation: the ratio of export sales value, industrial characteristics, leverage, tax burden, duration, holdings, and scale.

$$RD_{it} = \beta_1 + \beta_2 pc2_{it} + \beta_3 industrial_{it} + \beta_4 leverage_{it} + \beta_5 tax_{it} + \beta_6 duration_{it} + \beta_7 holdings_{it} + \beta_8 scale_{it} + v_t + \epsilon_{it}$$

To reduce the potential endogeneity issue, I employ the propensity score matching method in this part. To match connected and non-connected firms, I estimate the following logit model using a data set at the firm level,

$$P_{it} = Pr[pc2_{it} = 1|X_{it}] = e(X'_{it})/[1 + e(X'_{it})]$$

where $pc2_{it}$ is a connected-firm dummy variable and X_{it} is a vector of covariates. Also, year-fixed effects are included. I then predict each firm's propensity score and employ the three nearest neighbors' technique to pair up the firms.

5.3 Data

To test the hypothesis, I use the data from the Chinese Industrial Enterprise Database. The database mainly contains basic information and financial data of more than 300 thousand firms. This sample includes the data of export firms between 2005 and 2007. I measure R&D by the ratio of a firm's R&D investment to its sales value. $pc2_{it}$, the key dummy variable, is 1 when the firm has state-owned shares. The existing literature usually adopts two ways to identify enterprise ownership: registered type or paid-in capital. The former indicates the type of the enterprise when it was registered with the Industrial and Commercial Bureau, and the latter can indicate the actual holding type of the enterprise at that time. I use the latter one to measure the political connections since it can reflect the enterprise ownership in a timely manner. The registered type is included in the model as the control variable. See the definitions of all financial data and basic information in Table5. Table6 reports the summary statistics.

I calculate each firm's predicted propensity score using the logit model and then match firms. To ensure that the matched firms are comparable, I perform the balance tests of covariates. See Table7 for the Covariates balance test. The standardized deviation (%bias) of all variables is less than 5%, and all t-test results accept the null hypothesis "there is no systematic difference between the treatment group and the control group" at a 5% significance level, so the parallel hypothesis is satisfied.

5.4 Regression Results

Column (2) of Table8 reports the regression results using the propensity score matching method. The key finding after matching is that the coefficient on political connections is significantly neg-

ative at a 10% significance level. This suggests that political connections hurt firms' motivation to conduct research and development and innovate technologically. This finding testifies to the hypothesis. Additionally, the coefficient for firm scale is significantly negative, indicating that more robust monopolistic capabilities are associated with less investment in R&D. This finding suggests that larger firms with greater market power may have less incentive to innovate, which could have important policy implications for competition regulation.

6 Conclusion

This paper discusses the govern-firm relations measured by political connections. As a result, in chapter 3, the overall effect of political connections on international openness is negative, but it can improve openness in the Cantonese-speaking area. Hence, though there are several types of social costs of political connections, it still has possible and significant benefits in a specific environment. It is crucial to adjust and improve the institutional environment of govern-firms relations, especially in China, where the government strongly influences access to resources and regulatory and market access. For future work, I want to investigate how to improve the institutional environment and how developing countries can transition from extensive dependence to intensive and sustainable development.

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