

Hayek, Local Information, and the Decentralization of State-Owned Enterprises in China

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Abstract

Hayek argues that local knowledge is a key for understanding whether production should be decentralized. This paper tests Hayek's predictions by examining the causes of the Chinese government's decision to decentralize state-owned enterprises. Since the government located closer to a state-owned enterprise has more information over that enterprise, a greater distance between the government and

the enterprise should lead to a higher likelihood of decentralization. Moreover, where communication costs and the government's uncertainty over an enterprise's performance are greater, the government is more likely to decentralize enterprises so that it can better utilize local information. This paper finds empirical support for these implications.

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“If we can agree that the economic problem of society is mainly one of rapid adaptation to changes in the particular circumstances of time and space, it would seem to follow that the ultimate decisions must be left to the people who are familiar with these circumstances, who know directly of the relevant changes and of the sources immediately available to meet them. We cannot expect that this problem will be solved by first communicating all this knowledge to a central board, which, after integrating *all* knowledge, issues its orders. We must solve it by some form of decentralization.”

———— Hayek (1945)

1. Introduction

One of the most important economic dramas in the last century was the emergence and then the decline of planned economy and state ownership. For more than half a century, it seemed that socialism could be as productive, if not more, than capitalist economy. In the 1973 edition of the economics textbook (Samuelson 1973), for instance, Samuelson predicted that the Soviet Union’s income level would probably match that of the United States by 1990 and overtake it by 2010. The debate of the merits of market socialism in the first half of the last century thus involved top economists such as Oscar Lange, Abba Lerner, Ludwig von Mises, and Frederick Hayek. The key arguments for why capitalism would be more efficient than socialism are perhaps two: the stronger individual incentives under the stronger protection of private property rights, and the efficiency of utilizing specific information dispersed among individuals and plants (Boettke, 2004). The second point is of course originated from Hayek (1945), one of the most influential papers of all time.² The key importance of incentives, ownership and property

² As of April 2015, Hayek (1945) has been cited more than 12,000 times in Google Scholar, and it is viewed as one of the top 20 articles published in AER in its first 100 years’ history (Arrow et al. 2011).

rights for explaining performance in socialist and transitional economies is perhaps one of the most active areas for research in the past few decades (Shleifer and Vishny, 1994; Megginson and Netter 2001; Djankov and Murrell 2002; Acemoglu, Johnson and Robinson 2001; Estrin et al., 2009). However, the importance of local information for efficiency in socialist or transitional economies or the state-owned sector is rarely systematically empirically explored.

In this paper we examine the causes of decentralizing state-owned enterprises (SOEs) in China, focusing on the role of local information. The data we use is the Annual Survey of Industrial Firms (ASIF) 1998-2007, which covers non-state firms with sales exceeding 5 million *yuan* and *all* SOEs. Decentralization here is defined as the oversight government of an SOE shifting from a higher to a lower level of government—that is, from the central to provincial, or from provincial to municipality (alternatively called prefecture), or from municipality to county government.³ The availability of local information is captured by the distance between an SOE and its oversight government. A larger distance between the oversight government and the SOE implies that the oversight government can have less direct observations on firm performance, managerial competence, and firm competitiveness. Indeed, there is a large literature providing evidence that distance has huge consequences for firms. For instance, distance (in terms of trust level and physical distance) helps explain decentralization decision between multinational headquarters and oversea subsidiaries (Bloom, Sadun and Van Reenen, 2012); distance helps explain a headquarters' investment allocation across plants in different locations (Giroud 2013); distance has been found to have profound implications for the lending relationship between banks and firms (Peterson and Rajan 1994, 2002; Mian, 2006; Agarwal and Hauswald, 2010); and

³ Chinese local government consists of several (from higher to lower) levels as follows: province, municipality (or prefecture), county, and township. As of 1998, there are 31 provincial-level, 331 municipal-level, and 2863 county-level governments.

distance has been found to be a good proxy of information asymmetry in financial markets (Coval and Moskowitz 1999; Garmaise and Moskowitz, 2004; Grinblatt and Keloharju 2001; Hau, 2001).

Hayek (1945) implies that it would be more efficient for the oversight government with a larger distance to the SOE to delegate (or decentralize) the control rights to a lower level of government, which in general has a shorter distance to the SOE. Moreover, when firms' performance is harder to predict—and therefore local information figures more prominently—the same distance implies a stronger tendency to decentralize so as to better utilize local information. In addition, when communication costs are lower, the oversight government has less difficulty finding out what is going on in the SOE, and the same distance then implies a weaker tendency to decentralize. We should point out here that Hayek's point does not imply that SOEs should always be decentralized so that the distance between the SOE and the oversight government should be minimal. Tilting the balance toward centralizing include other considerations, such as internalizing externality of the SOE, pursuing goals of upper levels of government, and making top-notch experts who can specialize in complex and difficult problems to be in charge of some sophisticated SOEs (Garicano 2000).

We find support for these conjectures implied by Hayek (1945). In particular, the larger the distance between the oversight government and the SOE, the more likely the oversight government is to decentralize the SOE. Moreover, the positive decentralization-distance link is stronger when firm performance exhibits more uncertainty, and when communication costs are higher (as proxied by lower density of road, telecom or internet).

The relationship between decentralization and distance may be subject to other interpretations. To ensure that our interpretation is the right one, we conduct a number of checks. We mitigate omitted variable bias by including industry and year fixed effects, dummies indicating the same original oversight government,

along with province-year-level macro controls (and in an alternative specification, fiscal conditions of the original oversight government and its lower level government). To guard against the possibility that the distance to the oversight governments may be simply a proxy for the distance to agglomeration centers, we construct a placebo distance to an alternative agglomeration city (at the same level as the oversight government), and this placebo distance measure is not significantly related to decentralization. Finally, we rely on exogenous source of variation of distance to identify its effect on decentralization. In particular, in the 1960s and 1970s, a large number of SOEs were relocated to inland provinces to confront the possibility of external wars with the Soviet Union and the U.S. As a result, their distance to their oversight governments was determined historically and likely had nothing to do with the decentralization decisions decades later. The instrumental variable results are qualitatively similar to our base specification.

To the best of our knowledge, this paper is the first paper that tests Hayek's idea of the fundamental importance of local information for understanding the workings of the economic system, in particular, the centralization or decentralization of state-owned enterprises. We test rich implications of Hayek's idea, such as how decentralization depends on the distance to the oversight distance government, and how this link depends on firm heterogeneity and communications costs.

Our paper is most closely related to the empirical literature examining decentralization within firms. In particular, Aghion et al. (2007) provide evidence that the availability of public information to the headquarters reduces the need to delegate controls to the manager. Bloom et al. (2009) provide evidence that information technology and communication technology have different implications for within-firm decentralization, with the former facilitating, while the latter hindering, decentralization. Bloom, Sadun and Van Reenen (2010, 2012) find that competition and trust foster greater decentralization. Giroud (2013), perhaps the

only paper that examines how the within-firm distance between headquarters and their plants affects plant performance, find that proximity of the headquarters to a plant significantly increases the plant's investment and productivity. We differ from these papers in two ways. *First*, we focus on the role of distance between the oversight government and an SOE in the state sector for the decentralization decision of SOEs, and therefore directly address the original concern of Hayek in understanding the role of local information in determining efficiency of centralization versus decentralization. *Second*, the nature of our data set allows us to explore *changes* in organizational structure, thus we study decentralization in a dynamic setting. Our findings thus are complementary to the literature on decentralization within an organization—here we view the whole state economy of China as a gigantic organization with the state as the ultimate owner—that emphasizes the role of information in determining the control rights structure. We offer empirical support for the insight of the critical importance of local information in shaping the organization structure in the largest “organization” (i.e., the state economy of China) in the most populous country.

The paper is also related to a theoretical literature that sheds light on the benefits of decentralization. Bolton and Dewatripont (1994) suggest that decentralization has the benefits of allowing the agent to specialize in some information processing and therefore reducing information acquisition costs, freeing the principal from information-processing time constraint. Aghion and Tirole (1997) suggest that when information advantage of agents is severe, and conflict of interest is not large, it is efficient to formally delegate. Garicano (2000) suggests that in a hierarchy it makes sense to create a hierarchy of knowledge production, with bosses of higher layers of hierarchy focusing on more complex and difficult problems and employees of lower levels specializing in more basic and easier problems. Dessein (2002) suggests that when agents report information to their superiors strategically, it is often desirable for the uninformed principal to

delegate the formal authority to the agent. Alonso, Dessein and Matouschek (2008) suggest that when local information is important and division managers communicate strategically, a higher need for coordination improves horizontal communication but worsens vertical communication, and decentralization can dominate centralization even when coordination is extremely important relative to adaptation. These theoretical papers provide further insights about why sometimes it makes sense to decentralize. These papers greatly enrich the insights of Hayek (1945), highlighting factors that Hayek considered, such as agent information advantage (Aghion and Tirole 1997), or did not consider, such as specialization in information acquisition (Bolton and Dewatripont 1994), hierarchy of knowledge production (Garicano 2000), and strategic reporting by agents (Dessein 2002; Alonso, Dessein and Matouschek 2008). Our evidence is consistent with some of the implications of these models, but our data do not allow us to test the more subtle implications of these new models. The key implications of Hayek (1945), however, are directly testable and receive strong support.

In the rest of the paper, Section 2 provides related institutional background and offers a simple conceptual framework to understand the causes of decentralizing SOEs in China. Section 3 provides empirical results on determinants of decentralization. Section 4 concludes.

2. Conceptual Framework

The state sector of the Chinese economy operates like a huge corporation with multiple layers of hierarchy. At the top of the hierarchy are the giant central SOEs, controlled directly by the central government. Below lies a more decentralized local system with each province similar to the self-contained division of a large corporation, with independent accounting and independent performance measures and incentives. Within each province, provincial SOEs account for a large share. At the lower rungs of this complicated ladder are smaller SOEs controlled

by municipal and county governments. The hierarchy of Chinese government consists of, from top to bottom of the ladder, the central, provincial, municipal, and county governments.

The enterprise reforms in the 1980s and 1990s in China aimed to decentralize the oversight of SOEs and to grant SOEs more autonomy in production, investment and financing (Li, 1997). Some industries were decentralized earlier than others, such as machinery, which started decentralization as early as 1985. According to the *China Industrial Census Statistics Book 1985 and 1995*, the share of industrial output accounted for by county SOEs increased from 12.3% in 1985 to 25.8% in 1995.

A large wave of SOE restructuring began from 1997 (Xu, Zhu and Lin 2005). In 1998, the State Council decreed to decentralize all 94 central SOEs (and their subsidiaries) in the coal industry. As a result, 3.2 million workers and 1.3 million retirees were under the oversight of provincial governments (Nie and Jiang 2011). Similarly, the decentralization of provincial SOEs to municipality and county government SOEs was also widespread. Figure 1 shows the 1998 distribution of SOEs with oversight government at different levels, in terms of number of firms, employment, and output, respectively. Differing from earlier waves of decentralization, many SOEs, after being decentralized, were also privatized by lower governments. Indeed, many decrees of provincial governments mentioned that the purposes of decentralizing SOEs include facilitating firm restructuring, and even “first decentralize, then restructure ownership.”⁴

What determines which SOEs become decentralized? To understand this, consider a simplified economy with just two layers of government, upper and lower governments, under which an SOE can be governed. What benefits do the oversight rights entail for the oversight government? Even though all SOEs are state-owned,

⁴ See: <http://gsrb.gansudaily.com.cn/system/2004/06/04/000120947.shtml>, and <http://jxrd.jxnews.com.cn/system/2009/09/30/011217616.shtml>

that is, belonging to the state, the actual control rights are in the hands of either the upper or the lower government. Consistent with the institutional features of China, the oversight government has private benefits of controls as follows. *First*, the oversight government can appoint key positions of the SOE under its oversight. These positions in general are paid well, and the control of these positions entails rents for the oversight government. *Second*, the oversight government has some rights over key strategic decisions of the SOE. For instance, the oversight government can prevent bankruptcy to maintain employment for the benefits of social stability (Demsetz and Lehn, 1985; Shleifer and Vishney 1994), a key criterion in evaluating local government officials. *Third*, and perhaps more importantly, the oversight government enjoys cash flow rights in the form of tax remittance and discretion over the SOE's profit. After the 1994 fiscal reform, SOEs have to pay both local and national taxes, and the local government can retain some local tax revenues. In general, the oversight government obtains a significant share of various taxes that the SOE pays, such as value added tax and corporate income tax (Wong and Bird, 2008).⁵ *Finally*, as direct owners of the SOE, the delegated local government also has more claims to the SOE's asset returns.⁶ Oversight rights also entail *costs*. If the SOE loses money and needs much subsidy, the oversight government shoulders the burden.

What factors would prompt the incumbent oversight government to decentralize? Before we proceed, it is useful to realize that the decision rights were

⁵ For instance, before 2002, except for SOEs that belong to the central government, corporate income tax on all other firms was collected by the Local Tax Bureau and retained by the local government. On January 1st, 2002, the State Council enacted the "Income Tax Sharing Reform Act". Although corporate income tax was still collected by Local Tax Bureau, the central government began to share this revenue with the local government. In 2002, the central and local share was half each. After 2003, the central share was increased to 60%. For the sharing of corporate income taxes between provincial and sub-provincial governments, the rule is not as certain as that between the central and local government—the rule differs by provinces. However, the oversight local government almost always obtains the highest share (Li and Ma, 2015).

⁶ See <http://www.chinaacc.com/new/63/74/117/2006/1/li2366263215171600215588-0.htm> (in Chinese).

top-down, lying largely in the hands of the incumbent oversight government. In general, the incumbent oversight government wants to control important assets in order to maintain some control of the state over the economy. Indeed, around the beginning of our sample period, in the second half of the 1990s, the Chinese government launched a major privatization and decentralization campaign. The slogan for the reform included “grab the big and let go the small” (Xu, Zhu and Lin 2005). With limited attention span, information processing ability (Bolton and Dewatripont, 1994), and comparative advantage in handling complex tasks (Garicano 2000), it makes sense for the upper government to focus its attention to important SOEs.

A second motive for the incumbent oversight government to decentralize SOEs is likely to unload fiscal burdens. Over time, due to incentive problems, many SOEs had experienced declining profitability, which partially motivated the government to decentralize. Since the cost of control is larger for ill-performing SOEs—with less rents to share and more subsidies to shoulder—we expect the incumbent oversight government to decentralize first ill-performing SOEs.

Prediction 1. The incumbent oversight government is more likely to decentralize less important and ill-performing SOEs.

A third likely motive for the government to decentralize is to revitalize SOEs to make them more efficient. Indeed, with many SOEs having difficulties in paying their employees and pension liabilities in the 1990s, some governments such as Shaanxi and Jiangxi provincial governments tried to provide sufficient incentives to local governments by sharing and shouldering some fiscal liabilities associated with SOE decentralization.⁷ It is thus not surprising that the oversight government would decentralize those SOEs who would gain the most in efficiency from decentralization.

⁷ See http://www.cfen.com.cn/web/meyw/2006-03/02/content_224793.htm, and <http://jiangxi.jxnews.com.cn/system/2008/08/23/002826923.shtml>.

Under what circumstances is an SOE more likely to increase its efficiency after decentralization? The literature, starting from Hayek (1945) and including Aghion and Tirole (1994), suggests that a key consideration for efficiency improvement by decentralization is to reduce information asymmetry. SOE managers have important information advantage about the SOE's production technology, profitable opportunities, and cost conditions (Hayek, 1945). The oversight government could obtain some of the information from reporting of SOE managers, or via its own monitoring and observations of performance of similar firms. However, SOE managers and the oversight government have conflicts of interest. SOE managers, for instance, may be more interested in empire building, or a quiet life. The reporting of SOE managers can thus be strategic, biased, and not to be relied upon (Alonso *et al.* 2008).

The extent to which the oversight government can limit the information loss depends on its ability to directly acquire information and monitor the SOE. There are strong reasons that the ability to obtain direct information on the SOE depends on the distance between the oversight government and the SOE.⁸ The oversight government officials are subject to time constraints. When the distance is shorter, the official is more likely to travel to the site to observe first-hand how the SOE is performing and whether the SOE manager is doing a good job. Anticipating better information by the oversight government, the SOE manager is also more likely to report honestly. Indeed, Giroud (2013) find that when the distance between headquarters and the subordinate plant is reduced exogenously (due to the introduction of a direct flight), the plant tends to obtain more investment and perform better. We thus predict that the larger the distance between the oversight government and the SOE, the more likely the oversight government is to decentralize the SOE in order to improve the performance of the SOE.

⁸ Here the distance implies travelling time rather than physical distance.

Prediction 2. The larger the distance between the oversight government and the SOE, the more likely the oversight government is to decentralize the SOE.

But distance is a rather crude measure of information asymmetry. For the same distance between the firm and the government, the amount of information asymmetry depends on how much information is publicly available for the oversight government (Aghion et al. 2007), and the magnitude of communication costs (Bloom et al. 2009). Indeed, centralized control rely more on the information of the principal, and a good indicator for the information of the principal is public available information about similar technologies (Acemoglu *et al.* 2007). When there is more uncertainty over firm performance by the principal, firm-specific local information is likely more important. In this case, oversight rights should be given to governments that are closer to firms (Hayek 1945). We thus conjecture that the positive relationship between decentralization and distance would be stronger for firms with higher performance uncertainty. This is similar to the prediction in Acemoglu *et al.* (2007) that decentralization is more likely for firms located in a more heterogeneous environment, in which case learning from the experiences of others is more difficult.

Similarly, whether or not to decentralize an organization should also depend on the cost of information acquisition (Bloom et al. 2012; Garicano and Rossi-Hansberg 2006; Giroud 2013). When communication costs between the SOE and its oversight government are lower, the principal faces less information asymmetry and can monitor more directly, and there may be less loss of information in the communication process between the principal and the agent. Thus, when communication costs are lower, the positive relationship between decentralization and distance should be smaller.

Prediction 3. The positive relationship between decentralization and distance would be stronger for firms with higher performance uncertainty, and for firms facing greater communication costs.

3. Empirical Results

3.1 Data and Sample

The data we use are from the Annual Survey of Industrial Firms (ASIF) of National Bureau of Statistics of China for 1998 to 2007. ASIF includes *all* SOEs, and all non-state firms with sales exceeding five million *yuan*. Since our research is on the decentralization of SOEs, we only keep the SOE sample (with share of state ownership exceeding 50%).⁹ We do not classify firm ownership based on a firm's registered ownership type because some former SOEs do not change their registered ownership type after ownership restructuring (Dollar and Wei, 2007).¹⁰

The oversight government (for SOEs), from more centralized to more decentralized, can be the central, provincial, municipal (or prefecture), county, and township. We delete from our sample SOEs those observations that have missing or "others" values for the oversight variable (10,133 firms). We further restrict our sample in the following ways. First, we delete those SOEs which lie at the bottom of the hierarchy: those firms whose oversight government is at the county level or below (44,905 firms). These SOEs by definition could not be further decentralized. Second, we drop those enterprises without at least three continuous years of data (22,115 firms). Finally, we delete those enterprises whose oversight relationship had changed more than twice (470 firms).¹¹ Our final sample consists of 14,420

⁹ In other words, we only keep the periods of data for SOEs who were either non-decentralized or just decentralized.

¹⁰ In the data, every firm is given a unique firm code. A small number of firms may change their firm codes within the sample period but remain in the sample. To solve this issue, we follow Bai et al. (2009) and Brandt et al. (2011), and obtain firms' unique codes relying on the firm's name, address, zip code, telephone number, and legal representative so that those firms with changed codes can be allocated unique codes throughout our sample period. The data cleaning includes four steps. First, if the firm code is the same for year t and $t+1$, we keep the original code. Second, for firms that appear in year t but not in $t+1$, we find firms with identical firm names and given the year $t+1$ observation the original firm code of the firm with the same name in year t . Third, repeat step 2, but relying on zip codes and the names of legal representatives to identify unique firm. Fourth, repeat step 2, but now rely instead on zip codes and telephone numbers.

¹¹ Retaining them does not change out key results.

SOEs.

Decentralization, our key variable, is defined as those firm-years that experience a change in oversight government to a lower level. In 1998, the initial year of our sample, firms under the oversight of the central, provincial, and municipal governments account for 15.2%, 27.4%, and 57.3%, respectively. In total, 1,116 firms, or 7.7% of the sample, experience decentralization. Of these decentralized firms, there are 318 (14.5%), 384 (9.7%), and 414 (5.0%) firms whose original oversight government were the central, provincial and municipal governments, respectively. The incidence of decentralization was spread out throughout our sample period: the numbers of SOEs being decentralized for each year from 1999 to 2007 was 168, 161, 162, 97, 151, 222, 82, 40, and 33, respectively.

3.2. Specification and Identification

To examine what determines the likelihood of decentralization, we estimate the following equation:

$$\begin{aligned} Decen^*_{ijkt} &= Distance_{ik} \delta + X_{ijkt-1} \beta + Z_t \alpha + \gamma_t + \rho_k + \theta_j + \varepsilon_{ijkt}, \\ Decen_{ijkt} &= 1 \text{ if } Decen^*_{ijkt} > 0 \end{aligned} \quad (1)$$

Here, $Decen^*_{ijkt}$ is the index function for the tendency to be decentralized, and $Decen_{ijkt}$ is an indicator variable that equals one when the firm is decentralized. The subscripts i , j , k , and t represent firm i in industry j under the initial oversight government with level k at year t . $Distance_{ik}$ measures the logarithm of (one plus) the physical distance (in km) between firm i and the city in which the initial oversight government is located. The constant is added to accommodate the fact that the distance could be zero. We obtain the distance based on GIS data.¹² In some robustness checks, we also discretize the variable into an indicator variable

¹² We do not have the specific location of the firm within a county (or district), and the distance is from the city center of the oversight government to the county/district center in which the firm was located.

of whether the oversight government and the firm are at the same city. The vector X includes once-lagged firm characteristics including firm size as measured by firm assets, performance (i.e., returns to sales, or ROS), the importance of the firm to the oversight government (i.e., the ratio of the firm's value added to the total value added of all the firms in the same 2-digit industry and affiliated with the same oversight government), the dummy variable of full state ownership (i.e., 100 percent state ownership). The vector Z_i measures province-level variables including GDP per capita, unemployment rate, and the share of SOEs in urban employment. Importantly, we control for dummy variables indicating the initial oversight level of the SOE to hold constant oversight-specific tendency to decentralize. In our sample, the oversight government of an SOE could be the central government, or one of the 31 provincial governments, or one of the 331 municipal governments; there are 363 oversight government dummies in total. We also control for industry and year dummies. To allow for correlation of the error term both across time and space, we cluster our standard errors at the level of initial oversight government.

Since the decentralization decision is irreversible—at least in our sample period—we delete those observations after *Decen* has turned one. Our parameter of interest is the marginal effect of Distance. Its estimate is based on the comparison between SOEs with different distances to the original oversight government.

The probit or linear probability models assume that the distance is exogenous. However, the distance could be endogenous for decentralization decisions. For instance, unimportant or less profitable SOEs may be systematically located further. We try several ways to deal with this. First, we control for variables that capture key confounding factors, such as the SOE's importance and lagged firm performance. Second, for central SOEs, the distance to the oversight government means the distance to Beijing, a major metropolitan area and agglomeration center. For SOEs under the oversight of other level of governments, the distance to the oversight government is also the distance to a local agglomeration center. Would

this measure of the distance to political centers then merely capture economy of agglomeration rather than information and monitoring difficulties for the principal? To check this, we replace the distance to the oversight government in the following way: for central SOEs, the distance to the oversight government is replaced by the distance to Shanghai, another metropolitan center as important as Beijing in terms of economic agglomeration; for provincial SOEs, to the largest city within the province other than the provincial capital; for municipal SOEs, to the largest county-level city within the prefecture other than the prefecture seat.¹³ If the distance measure merely captures the agglomeration effect, we expect this placebo distance to be significant and of similar magnitude.

Third, we deal with the possibility that the distance is endogenous. Even after controlling for prominent determinants of decentralization, governments may still put better SOEs at nearby locations. Then the distance may represent something else rather than the quality of information or monitoring intensity. To deal with this concern, we rely on an instrumental variable that likely captures exogenous variations in the distance of an SOE to the oversight government. In particular, during the 1960s and 1970s, worried about potential wars (even nuclear ones) with Soviet Union and United States, China relocated many SOEs to the hinterland, which included relocating central SOEs in inland provinces, and relocating many province- and municipality-governed enterprises to more remote areas within the oversight jurisdiction. This migration of firms is called the Third Front Construction program (for details, see Appendix A). Third Front Construction covered a large area in China—with more than half of the provinces being covered. The relocation sites were chosen to be far away from external threat, and it is implausible that it would affect SOE decentralization 30 to 40 years later when leadership had changed multiple times with the new leaders featuring distinct

¹³ Notice that we have used “prefecture” and “municipality” alternatively within this paper for the administrative level between province and county levels.

objectives. Because the Third Front Construction was a large program that covered 13 provinces, and 6.9% of firms in our sample were affiliated with this program, this instrument is likely a relevant one for the distance variable.

Finally, we try to shed light on the mechanisms of how distance affects decentralization. In particular, we allow the effect of distance on decentralization to differ by communication costs and information available to the oversight government on firms. These results would shed light on potential pathways for distance to affect decentralization.

3.3. Baseline Results

We first, in Table 3, compare how decentralized and non-decentralized SOEs differ in basic characteristics.¹⁴ Relative to non-decentralized SOEs, the decentralized ones are much more likely to be in different cities from the oversight governments (59% vs. 30%), their logarithm of distance to the oversight government is much larger (4.4 vs. 3.0), their average asset size is slightly smaller, their performance is significantly worse in terms of labor productivity and profitability (but not TFP), their relative importance (i.e., the share of their value added in the oversight government's portfolio of SOEs) is lower, and the urban unemployment rates of their location tend to be slightly higher. The picture that emerges is that the oversight government tends to decentralize SOEs that are far away, smaller, less important, and worse-performing. The pattern is roughly consistent with our predictions in the conceptual framework.

In Table 4, we compare the incidence of SOE decentralization for central, provincial and municipal SOEs that are located in the same city as the oversight government with those that are located at different cities. The incidence is much higher when the firm is located in different cities from the oversight government

¹⁴ Tables 1 and 2 contain the definitions of the variables and the summary statistics.

than when it is in the same city: 15.6 vs. 5.5 percent for central SOEs, 15.4 vs. 5.3 percent for provincial SOEs, and 11.4 vs. 4.2 percent for municipal SOEs. This pattern is consistent with our prediction that a larger distance to the oversight government leads to more decentralization.

Table 5 presents the baseline probit results. The magnitudes reported are the marginal effects on the probability of decentralization. In the first four columns, we present the results for the whole sample, and for the central SOEs, provincial SOEs, and municipal SOEs, respectively, to see if distance matters similarly within each oversight category. In the last four columns, we re-do the analysis using the dummy variable of being in a different city from the oversight government instead of the continuous measure of distance.

Distance (in log) is robustly positively correlated with decentralization, regardless if we use the full or oversight-specific samples. Based on column (1) for the pooled sample, increasing distance by one standard deviation (2.24) would increase the probability of decentralization by 1.41 percentage points (or 10% of the standard deviation of the dependent variable). The positive distance-decentralization link remains true when we estimate the relationship for central, provincial, and municipal SOEs, respectively. The coefficient of distance is especially large for municipal SOEs. For the central, provincial, and municipal SOEs, increasing distance by one standard deviation (1.54, 1.61, and 1.49) would increase the probability of decentralization by 0.75, 0.68, and 0.81 percentage points, or 4%, 5% and 7% of the standard deviation.

Relying on the dummy version of distance, when an SOE is located in a different city from the oversight government, the probability of decentralization increases by 2.72 percentage points for the pooled sample, and 1.87, 1.47, and 4.4 percentage points for central, provincial and municipal SOEs, respectively. These numbers translate into 20%, 10%, 10%, and 4% increase in probability of decentralization in terms of their standard deviations for the pooled, central,

provincial, and municipal SOEs.

Based on the pooled sample, other determinants of decentralization behave similarly as we observed in the decentralization vs. non-decentralization samples comparisons. That is, decentralization is more likely for smaller firms. Consistent with prediction 1, decentralization is more likely for worse-performing firms and for less important firms. However, these auxiliary controls do not behave consistently across oversight status. Thus, the effect of distance between SOEs and their oversight government seems to be more robust than other forces such as control benefits (i.e., firm importance) and fiscal burden (i.e., lagged firm performance).

It is useful to know that our results are robust to whether we include the privatized periods in our sample or not. In our baseline and the rest of paper (except in this paragraph), we delete the periods in which an SOE became privatized—for a firm that experienced privatization in the sample periods, the periods after the first year of privatization are automatically dropped, since, as in the case of decentralization, privatization was largely irreversible in our sample periods. To see whether our key results are sensitive to the inclusion of the observations underlying the period of privatization, we conduct a sensitivity check. Here (and only here) we keep the “just privatized” year for an SOE. Now we have to empirically model a three-way choice: non-decentralized (the base scenario), decentralized, and privatized. We thus estimate the choice problem with multinomial logit model, with non-decentralized as the base category. The set of explanatory variables are the same as in the baseline scenario in Table 5. The result in Table 6 show that the distance between the firm and its original oversight government significantly increase the likelihood of decentralization, continuing to offer support to our conjecture; yet the same distance is not significantly related to the likelihood of privatization. Our key result thus remains intact whether or not we include the sample of “privatization years”.

3.4. Omitted Variables, Agglomeration and Endogeneity

A potential concern is that the decentralization decisions may be affected by particular circumstances faced by both the original oversight government and, in the case of decentralization, the final oversight government at lower level. In such cases, the estimated effect of distance may only reflect the impact of omitted local economic environment. We thus, for all three subsamples of central, provincial, and municipal SOEs, include fiscal revenue per capita, GDP per capita, and fiscal autonomy (i.e., the ratio of fiscal revenue to fiscal expenditure in the firm's county)—for both the original oversight government and the government level immediately below it.¹⁵ The results are shown in Table 7.¹⁶ These additional oversight control variables barely matter in general, and the results on the distance are similar to those in Table 4. Omitted variables related to fiscal circumstances of the governments thus cannot explain the distance-decentralization link.

In China, political and economic centers tend to overlap. Beijing is not only the political center but also a top (economic) agglomeration center. Similarly, provincial capitals tend to be the largest cities in the provinces. Thus, a natural concern is that the distance to oversight government really measures the distance to major economic agglomeration. *A priori* there are no strong reasons why proximity to economic centers would matter for whether an SOE should be governed in a decentralized way. Still, this is a relevant concern that we should take seriously.

If this concern is valid, we should expect the distance of an SOE to other major agglomeration centers in the same oversight region to have positive effect on

¹⁵ For the central SOEs sample, we do not include these additional variables for the original oversight government because there is only one central government, and these additional variables would be perfectly collinear with the year dummies, which we have already controlled for.

¹⁶ Since we don't have fiscal data of prefectural and county governments in 2006 and 2007, regressions in Column 2 and 3 use the sample from 1998 to 2005.

decentralization. To test the validity of this concern, we create a placebo distance measure (Placebo Distance) as follows. For central SOEs, Placebo Distance is the distance to Shanghai, another agglomeration center on par with the capital city of Beijing. For provincial SOEs, Placebo Distance is the distance to the largest city (other than the provincial capital) in the province. For municipal SOEs, Placebo Distance is the distance to the largest county-level city (other than the city seat) within the same prefecture. We re-run our baseline regressions using Placebo Distance to replace the real distance, and the results are in Table 8. For the pooled sample, Placebo Distance is completely insignificant. Thus, our key result on the positive effect of distance on decentralization of SOEs is not due to economic agglomeration.

Another relevant concern is that the distance of an SOE to its oversight government may be endogenous. For instance, far-away SOEs may be systematically less important. To examine this possibility, we now try to find exogenous source of variations for the distance. We exploit a large wave of SOE migration that took place in the 1960s and the 1970s due to the so-called Third Front Construction (TFC) program. TFC was implemented in response to the perceived threat from Soviet Union and U.S for major wars (Figure 2 shows the number of firms established under this program during 1961-1985). This exogenously changed the distance of many SOEs to their oversight government. We thus construct a dummy variable Third Front, which is one if a firm was established during 1964-1966 or 1969-1972 in the TFC Region (Li and Long, 2013).

Table 9 reports the IV regression results using various specifications. In general, our instrument seems to be valid and generates meaningful results. In the first stage regressions, we get significant positive effects of the TFC dummy on distance, suggesting that the politically-motivated TFC relocation did increase the distance between the firm and the oversight government. Distance gets the same positive and significant effect on the likelihood of decentralization in the second-

stage regressions. When we only control for province dummies, the first-stage F-statistics is 18.48 (column 1). When we put more controls and include all the 363 oversight government dummies, which likely takes away a significant portion of the variations in *Distance*, the F-statistics drops to 4.85 (columns 4 and 6). However, even in this case the IV regressions do pass the Anderson-Rubin test, suggesting that the variable *Distance* is significant even in the event of weak IV (see column 6). Nevertheless, we note that the qualitative results of a significant positive effect of *Distance* on decentralization remain intact. Since the results from the IV probit and the two-stage least square (2SLS) models are similar, we shall focus on the 2SLS results. As expected, being a Third-Front-Construction SOE would increase log distance by 0.19, and it is statistically significant at the 5% level. Once corrected for endogeneity, the distance remains exerting a positive influence on decentralization, and the coefficient increases to 0.03 (from 0.006). The results thus confirm the key importance of the distance between enterprises and their oversight government.

3.5 The Mechanisms of Distance on Decentralization

In the conceptual framework, we predict that the decentralization-distance link would be stronger for firms with higher communication costs or with higher performance uncertainty. To test this, we need measurements.

We proxy communication costs by three measures. The first is provincial road mileage (road mileage per capita): more convenient transportation significantly reduces the difficulty of on-site inspection, and thus makes information more accurate. The second is provincial telecom density, i.e., the share of people having either mobile or fixed phones. The third is the share of people using internet.

We proxy high uncertainty over a firm by several variables: the average share of intangible assets in total assets within the firm's industry, and several

measures of the dispersion of firm performance within the firm's industry. A higher share of intangible assets for a firm in general implies higher uncertainty about the firm's technology and performance. Since we rely on three different ways to compute TFP—the OLS production function method, the Olley-Pakes method, and the index function method—we present three sets of results for the distance-TFP-dispersion specification (see the data appendix for the details of the construction of TFP). In addition, we also present the dispersion in return-to-sales (ROS, that is, before-tax profit over sales), which is more transparent.

The results in Table 10 strongly support our conjecture. Indeed, lower communication costs are associated with a reduced importance of distance in determining decentralization. The interaction with provincial road mileage, our proxy of communication costs, is statistically significant (see column 1). Increasing provincial road density at the mean by one standard deviation is associated with a reduction in $\frac{\partial Decen}{\partial Distance}$ by 38 percent. The results are qualitatively similar when we use provincial telecom density, or internet density. Furthermore, uncertainty about the firm is associated with an increase the importance of distance in determining decentralization. The interactions of distance with our proxies of uncertainty about the firm are all positive and statistically significant. Increasing dispersion of industry TFP (calculated by Olley-Pakes method) at the mean by one standard deviation would increase $\frac{\partial Decen}{\partial Distance}$ by almost 120 percent.¹⁷ Increasing average intangibility ratio of the industry at the mean by one standard deviation is associated with an increase in $\frac{\partial Decen}{\partial Distance}$ by 10 percent. These findings put in perspective the relative magnitudes of the two mechanisms. It seems that both mechanisms are qualitatively important, and uncertainty about firm performance is perhaps somewhat more important.

¹⁷ The corresponding increase when using dispersion of TFP based on the index function method is almost 130 percent.

Overall, results in this section suggest that an SOE is more likely to be decentralized if it lies far away from the oversight government. The effect of distance is larger when there is more uncertainty about the firm and when communication costs are higher.

4. Conclusions

China's decentralization of SOEs represents a unique chance to test the implications of Hayek's insight on the importance of local information for designing an economic system. As the opening quote of Hayek suggests, when a society is experiencing rapid changes, the ultimate decisions should be left to those familiar with the particular circumstances, and "some form of decentralization" is needed. Indeed, we find that a larger information asymmetry between the original oversight government and the SOE, as proxied by their physical distance, is associated with a greater likelihood of decentralization. Moreover, the positive effect of distance on decentralization is larger where SOE performance is more uncertain and communication costs are higher. Our findings suggest that Hayek's insight on local information is a key for understanding the efficiency of firms in general and economic systems in particular.

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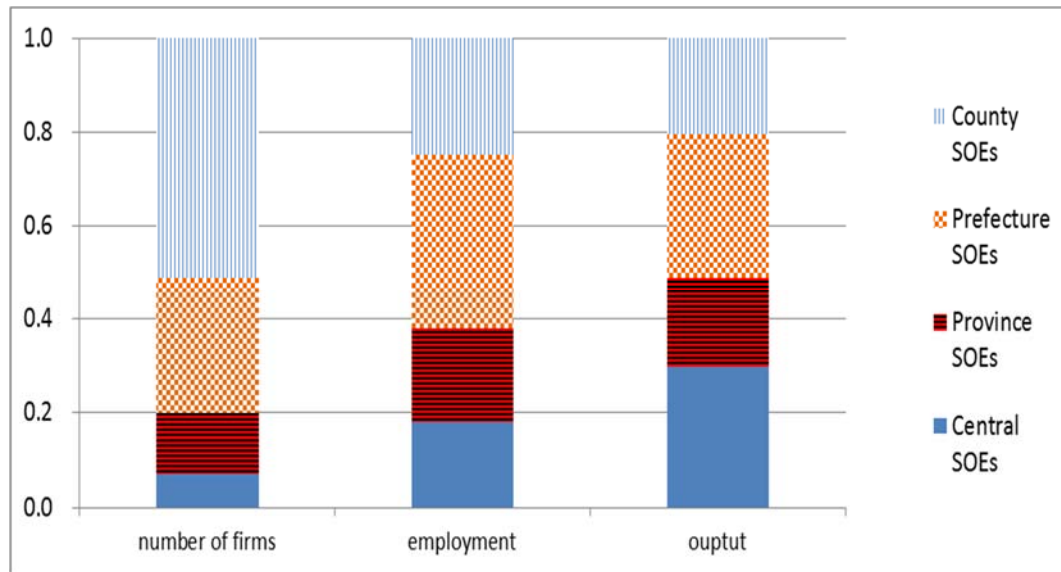
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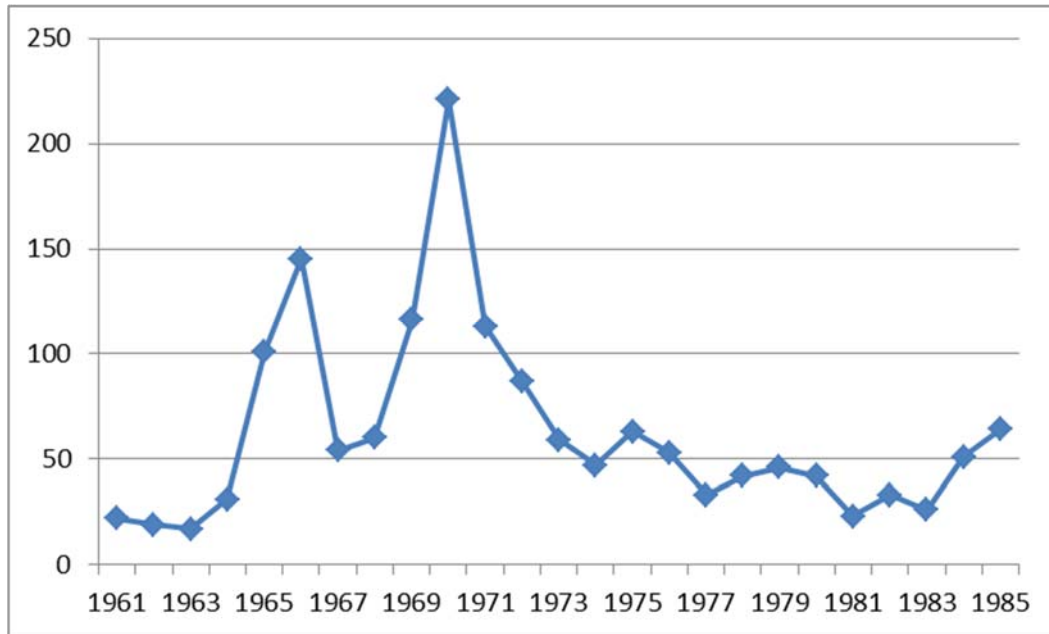
Figure 1. Hierarchy of China's SOEs Affiliation



Note: This figure shows the distribution of SOE affiliations in terms of number of firms, employment and output.

Source: Author's calculation from China Industrial Firm Database, 1998.

Figure 2. Number of New Firms in “Third Front Construction” Area during 1961-1985



Source: The data is from Annual Survey of Industrial Firms (ASIF).

Table 1. Variable Description

| Firm-level variables | |
|-----------------------------|---|
| Decentralized | Dummy variable equals to one if a firm's affiliation-level is changed from a higher level government to a lower level government. Source: Annual Survey of Industrial Firms (ASIF). The default source for all variables is ASIF. |
| Different city | Dummy variable equals to one if located in a different city with the seat of the government with which it is affiliated, and zero otherwise. |
| Distance | The physical distance (log kilometers) between the firm and the seat of the government with which it is affiliated. Source: ASIF, and Geographic Information System. |
| Placebo distance | Distance from Shanghai for central SOEs, distance from the largest city within the province (except for the provincial capital) for province SOEs, distance from the largest county-level city within the same prefecture (except for the prefecture seat) for municipal SOEs. Source: ASIF, and Geographic Information System. |
| Privatized | Dummy variable equals to one if state share falls below 50% or exit from the database |
| Firm asset | Log of firm asset |
| ROS | Ratio of before-tax profit to sales |
| <i>TFP</i> | Total factor productivity, calculated as the residual from the regression of log value added on log fixed capital and log employment. Three methods are used, including OLS, Olley-Pakes and index number. Please see the Appendix E. |
| Firm importance | Ratio of the firm's valued added to the total value added of firms in the same 2-digit industry and affiliated with the same government |
| Fully state-owned | Dummy variable equals to one if state share in firm's equity equals 100% |
| Third front firm | Dummy variable equals to one if firm was established during 1964-1966 or 1969-1971 in the <i>Third Frond Construction Area</i> . |

Table 1. (Cont'd)

| Fiscal and Economic Variables in Province, Prefecture and City levels | |
|--|--|
| Province GDP per capita | Annual per capita GDP in the firm's province, constant price in the year 2000. Source: China Statistical yearbooks. |
| Province state sector share | Percentage of employment in SOEs in total urban employment in the firm's province. Source: China Statistical yearbooks. |
| Province unemployment rate | Annual urban employment rate in the firm's province. Source: China Statistical yearbooks. |
| Province fiscal revenue p.c. | Annual per capita fiscal revenue in the firm's province. Source: China Statistical Yearbooks. |
| Province fiscal autonomy | Ratio of fiscal revenue to fiscal expenditure in the firm's province. Source: China Statistical Yearbooks. |
| Prefecture GDP per capita | Annual per capita GDP in the firm's prefecture. Source: Public Finance Statistical Materials of Prefectures, Cities, and Counties (1998-2005). |
| Prefecture fiscal revenue per capita | Annual per capita GDP fiscal revenue in the firm's prefecture. Source: Public Finance Statistical Materials of Prefectures, Cities, and Counties (1998-2005). |
| Prefecture fiscal autonomy | Ratio of fiscal revenue to fiscal expenditure in the firm's prefecture. Source: Public Finance Statistical Materials of Prefectures, Cities, and Counties (1998-2005). |
| County GDP p.c. | Annual per capita GDP in the firm's county. Source: Public Finance Statistical Materials of Prefectures, Cities, and Counties (1998-2005). |
| County fiscal revenue per capita | Annual per capita GDP fiscal revenue in the firm's county. Source: Public Finance Statistical Materials of Prefectures, Cities, and Counties (1998-2005). |
| County fiscal autonomy | Ratio of fiscal revenue to fiscal expenditure in the firm's county. Source: Public Finance Statistical Materials of Prefectures, Cities, and Counties (1998-2005). |
| TFP dispersion | Standard deviation of firm TFP in the same 3-digit industry |
| ROS dispersion | Standard deviation of firm ROS in the same 3-digit industry |
| Intangibility | Average ratio of intangible assets to firm total assets in the same 3-digit industry |
| Province telecom infrastructure | Per capita number of mobile phone and fixed telephone users |
| Province internet infrastructure | Per capita number of internet users |
| Province road mileage | Per capita road mileage. Different levels of roads and railway are translated into the equivalent of second-level road according to transport capacity. |

Table 2. Summary Statistics

| | Obs | Mean | S.D. | Min | Max |
|---------------------------------|-------|--------|-------|---------|--------|
| Firm-level Variables | | | | | |
| Decentralized | 60274 | 0.019 | 0.135 | 0.000 | 1.000 |
| Different city | 58076 | 0.304 | 0.460 | 0.000 | 1.000 |
| Distance | 58076 | 2.984 | 2.238 | 0.000 | 8.129 |
| Firm asset | 60274 | 10.719 | 1.897 | 0.662 | 19.892 |
| Firm age | 60143 | 3.151 | 0.839 | 0.000 | 7.602 |
| ROS | 59150 | -0.171 | 0.501 | -5.259 | 0.416 |
| Labor Productivity | 56993 | 2.946 | 1.261 | -7.496 | 6.368 |
| TFP OLS | 56144 | 0.426 | 1.354 | -10.698 | 12.276 |
| TFP Olley-Pakes | 48778 | 1.328 | 1.474 | -9.930 | 9.483 |
| TFP Index Number | 56144 | 1.182 | 1.411 | -9.766 | 12.085 |
| Firm importance | 59988 | 0.310 | 0.381 | 0.000 | 1.000 |
| Fully state-owned | 60274 | 0.818 | 0.385 | 0.000 | 1.000 |
| Third front firm | 60274 | 0.056 | 0.230 | 0.000 | 1.000 |
| Province-level Variables | | | | | |
| GDP per capita | 60264 | 8.531 | 0.532 | 7.234 | 10.160 |
| State sector employment share | 60264 | 0.511 | 0.109 | 0.173 | 0.794 |
| Unemployment rate | 60264 | 3.386 | 0.878 | 0.620 | 6.800 |
| Road mileage | 60264 | 13.711 | 8.017 | 3.936 | 63.554 |
| Telecom infrastructure | 60264 | 7.712 | 0.813 | 5.597 | 9.659 |
| Internet users | 60264 | 4.490 | 2.139 | -1.446 | 7.993 |
| Industry-level Variables | | | | | |
| Intangibility | 60274 | 0.015 | 0.009 | 0.000 | 0.068 |
| ROS dispersion | 60274 | 0.132 | 0.036 | 0.057 | 0.269 |
| TFP OLS dispersion | 60274 | 1.215 | 0.184 | 0.736 | 2.193 |
| TFP Olley-Pakes dispersion | 52496 | 1.165 | 0.165 | 0.749 | 2.094 |
| TFP Index Number dispersion | 60274 | 1.147 | 0.174 | 0.660 | 2.068 |

Table 3. Summary Statistics: decentralized vs. non-decentralized enterprises

| | SOEs decentralized during 1999-2007 | SOEs NOT decentralized during 1999- 2007 | t-statistic of mean difference test |
|--|---|---|---|
| | (1) | (2) | (3) |
| Different city _(t-1) | 0.593 | 0.299 | 0.294*** |
| Distance _(t-1) | 4.415 | 2.957 | 1.457*** |
| Firm asset _(t-1) | 10.398 | 10.725 | -0.327*** |
| ROS _(t-1) | -0.108 | -0.082 | -0.026*** |
| TFP OLS _(t-1) | 0.420 | 0.426 | -0.006 |
| TFP Olley-Pakes _(t-1) | 1.315 | 1.329 | -0.014 |
| TFP Index Number _(t-1) | 1.209 | 1.182 | 0.027 |
| Firm importance _(t-1) | 0.181 | 0.298 | -0.117*** |
| Fully state-owned _(t-1) | 0.800 | 0.812 | -0.012 |
| Provincial GDP per capita _(t-1) | 8.535 | 8.526 | 0.010 |
| Provincial state sector share _(t-1) | 0.512 | 0.512 | 0.000 |
| Provincial unemployment rate _(t-1) | 3.607 | 3.361 | 0.247*** |
| Number of firms | 1,116 | 13,304 | |
| Number of observations | 3,493 | 56,781 | |

This table lists summary statistics of SOEs that were decentralized and those that were NOT decentralized during 1999-2007. Column (3) shows the t-statistics of mean difference tests. An SOE is defined as *decentralized* if its affiliation level is changed from a higher-level government to a lower-level government.

*, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Table 4. Decentralization Ratio by Location and Affiliation

| | Ratio of Decentralization | |
|----------------|---|--|
| | SOEs located in the SAME city with the seat of the government | SOEs located in a DIFFERENT city with the seat of the government |
| Central SOEs | 5.53% (253) | 15.63% (1945) |
| Province SOEs | 5.33% (2231) | 15.35% (1726) |
| Municipal SOEs | 4.17% (7298) | 11.38% (967) |

This table compares ratio of decentralization of SOEs located in the *same* city with the seat of the government with which it is affiliated and SOEs that are located in a *different* city. Number of firms in each subsample is listed in brackets. A firm is *decentralized* if its affiliation level is lowered.

Table 5. Determination of Decentralization - Baseline Results

| | (1) Whole Sample | (2) Central SOE | (3) Province SOE | (4) Municipal SOE | (5) Whole Sample | (6) Central SOE | (7) Province SOE | (8) Municipal SOE |
|-------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Distance _(t-1) | 0.0063*** (0.0008) | 0.0049** (0.0022) | 0.0042*** (0.0007) | 0.0055*** (0.0009) | | | | |
| Different City _(t-1) | | | | | 0.0272*** (0.0030) | 0.0187*** (0.0047) | 0.0147*** (0.0030) | 0.0444*** (0.0092) |
| Firm asset _(t-1) | -0.0024*** (0.0007) | -0.0036*** (0.0010) | -0.0020*** (0.0005) | -0.0020*** (0.0006) | -0.0025*** (0.0007) | -0.0037*** (0.0009) | -0.0021*** (0.0005) | -0.0018*** (0.0007) |
| ROS _(t-1) | -0.0030*** (0.0012) | -0.0020 (0.0037) | -0.0032*** (0.0010) | -0.0016 (0.0010) | -0.0033*** (0.0012) | -0.0023 (0.0037) | -0.0034*** (0.0010) | -0.0022** (0.0011) |
| Firm importance _(t-1) | -0.0040* (0.0023) | 0.0333 (0.0321) | -0.0046 (0.0032) | -0.0039* (0.0024) | -0.0045* (0.0023) | 0.0330 (0.0325) | -0.0048 (0.0033) | -0.0044* (0.0024) |
| Fully state-owned _(t-1) | -0.0055*** (0.0018) | -0.0001 (0.0052) | -0.0138*** (0.0035) | -0.0015 (0.0017) | -0.0061*** (0.0018) | -0.0003 (0.0054) | -0.0142*** (0.0035) | -0.0017 (0.0017) |
| GDP per capita _(t-1) | 0.0084 (0.0056) | -0.0050 (0.0064) | -0.0661** (0.0300) | 0.0931** (0.0383) | 0.0058 (0.0050) | -0.0057 (0.0059) | -0.0679** (0.0295) | 0.0977** (0.0416) |
| State sector share _(t-1) | 0.0181 (0.0344) | -0.0794** (0.0326) | 0.1210*** (0.0360) | 0.0612 (0.0397) | 0.0155 (0.0300) | -0.0811*** (0.0281) | 0.1256*** (0.0363) | 0.0631 (0.0406) |
| Unemployment rate _(t-1) | -0.0004 (0.0017) | 0.0030 (0.0028) | 0.0001 (0.0034) | -0.0017 (0.0019) | -0.0002 (0.0020) | 0.0020 (0.0037) | -0.0000 (0.0033) | -0.0022 (0.0020) |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Oversight government dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Observations | 41,681 | 8,724 | 15,681 | 16,727 | 41,681 | 8,724 | 15,681 | 16,727 |
| Pseudo R-squared | 0.120 | 0.0858 | 0.157 | 0.188 | 0.118 | 0.0854 | 0.156 | 0.186 |

This table reports probit regression results on the determination of SOE decentralization. **Marginal effects** on the probability of decentralization that are evaluated at the mean and their standard errors are listed. All these firm-specific and province-specific variables are lagged by one year. Standard errors are clustered at the level of the same oversight government.

*, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Table 6. Determinants of the Decentralization – Multinomial logit model

| | (1) | (2) |
|-------------------------------------|--|------------------------------------|
| | Baseline option: <i>neither privatized nor decentralized</i> | |
| | Second option: <i>Privatized</i> | Third option: <i>Decentralized</i> |
| Distance _(t-1) | -0.0088 (0.0014) | 0.0054*** (0.0009) |
| Firm asset _(t-1) | -0.0173*** (0.0011) | -0.0015** (0.0006) |
| ROS _(t-1) | -0.0502*** (0.0037) | -0.0022*** (0.0007) |
| Firm importance _(t-1) | -0.0215*** (0.0062) | -0.0060** (0.0028) |
| Fully state-owned _(t-1) | -0.0313*** (0.0046) | -0.0074*** (0.0018) |
| GDP per capita _(t-1) | 0.0170 (0.0109) | -0.0002 (0.0028) |
| State sector share _(t-1) | 0.1848** (0.0178) | -0.0166 (0.00207) |
| Unemployment rate _(t-1) | -0.0007 (0.0034) | -0.0012 (0.0017) |
| Oversight government dummies | YES | YES |
| Year dummies | YES | YES |
| Observations | 55,674 | 55,674 |

This table reports the regression results of the multinomial logit model. Marginal effects evaluated at the mean and standard errors are listed. The baseline option is *neither privatized nor decentralized*. The second column reports the probability of being *Privatized* which takes on the value of 1 if a firm is privatized in year t, and 0 otherwise. The last column reports the probability of being *Decentralized* which takes on the value of 1 if a firm is decentralized in year t, and 0 otherwise. All these firm-specific and province-specific variables are lagged by one year. Standard errors are clustered at the level of the same oversight government.

*, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Table 7. Determinants of Decentralization - Additional Controls

| | (1) Central SOE | (2) Province SOE | M |
|--|------------------------|------------------------|---|
| Distance _(t-1) | 0.0047*** (0.0018) | 0.0028* (0.0015) | |
| Firm asset _(t-1) | -0.0037*** (0.0009) | -0.0021** (0.0011) | |
| ROS _(t-1) | -0.0022 (0.0037) | -0.0031** (0.0013) | |
| Firm importance _(t-1) | 0.0332 (0.0336) | -0.0035 (0.0042) | |
| Fully state-owned _(t-1) | -0.0004 (0.0051) | -0.0159*** (0.0050) | |
| State sector share _(t-1) | -0.0674** (0.0305) | 0.2213*** (0.0754) | |
| Unemployment rate _(t-1) | 0.0024 (0.0022) | 0.0031 (0.0043) | |
| Original oversight government fiscal revenue per capita _(t-1) | | 0.0289 (0.0401) | |
| Original oversight government GDP per capita _(t-1) | | -0.0997* (0.0546) | |
| Original oversight government fiscal autonomy _(t-1) | | 0.0484 (0.0782) | |
| Lower-level government fiscal revenue per capita _(t-1) | -0.0091 (0.0060) | -0.0002 (0.0064) | |
| Lower-level government GDP per capita _(t-1) | 0.0053 (0.0103) | -0.0019 (0.0061) | |
| Lower-level government fiscal autonomy _(t-1) | 0.0102 (0.0267) | -0.0210 (0.0185) | |
| Observations | 8,724 | 10,328 | |
| Oversight government dummies | YES | YES | |
| Year dummies | YES | YES | |
| Pseudo R-squared | 0.0867 | 0.153 | |

This table additionally controls for per capita GDP, fiscal revenue, and fiscal autonomy of the government with which the firm is associated (see Table 1 for definitions). Column 1-3 are the results for the regression on the subsample of central SOEs, province SOEs and municipalities. We report marginal probabilities evaluated at the mean of the variables. Standard errors are clustered at the level of the same over time. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Table8. Determinants of the Decentralization - Placebo Test

| | (1) Whole Sample |
|-------------------------------------|------------------------|
| Placebo distance _(t-1) | -0.0006 (0.0012) |
| Firm asset _(t-1) | -0.0026*** (0.0008) |
| ROS _(t-1) | -0.0031** (0.0012) |
| Firm importance _(t-1) | -0.0053** (0.0024) |
| Fully state-owned _(t-1) | -0.0059*** (0.0019) |
| GDP per capita _(t-1) | 0.0009 (0.0056) |
| State sector share _(t-1) | 0.0083 (0.0327) |
| Unemployment rate _(t-1) | 0.0023 (0.0026) |
| Oversight government dummies | YES |
| Year dummies | YES |
| Observations | 41,699 |
| Pseudo R2 | 0.101 |

This table replicates the full sample result of Table 5 by replacing the distance variable with a new variable *Placebo distance* which is defined as “distance from Shanghai for central SOEs, distance from the largest city within the province (except for the provincial capital) for province SOEs, distance from the largest county-level city within the same prefecture (except for the prefecture seat) for municipal SOEs”. Marginal effects evaluated at the mean and standard errors are listed. The dependent variable, *Decentralized*, takes on the value of 1 if a firm is decentralized in year *t*, and 0 otherwise. All these firm-specific and province-specific variables are lagged by one year. Standard errors are clustered at the level of the same oversight government.

*, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Table 9. Determinants of Decentralization - Third Front Construction as IV

| | IV Probit model | | IV Probit model | | 2SLS model | |
|-------------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| | (1) 2 nd stage | (2) 1 st stage | (3) 2 nd stage | (4) 1 st stage | (5) 2 nd stage | (6) 1 st stage |
| | <i>Decentralized</i> | <i>Distance</i> | <i>Decentralized</i> | <i>Distance</i> | <i>Decentralized</i> | <i>Distance</i> |
| Distance _(t-1) | 0.0143** (0.0059) | | 0.0431** (0.0189) | | 0.0318* (0.0175) | |
| Firm asset _(t-1) | -0.0045** (0.0017) | 0.1864*** (0.0216) | -0.0044*** (0.0016) | 0.0028 (0.0135) | -0.0031*** (0.0010) | 0.0028 (0.0135) |
| ROS _(t-1) | -0.0060** (0.0024) | 0.3160*** (0.0377) | -0.0059** (0.0024) | 0.0504*** (0.0144) | -0.0050** (0.0021) | 0.0504*** (0.0144) |
| Firm importance _(t-1) | 0.0204* (0.0122) | -2.6195*** (0.1458) | -0.0013 (0.0047) | -0.1162*** (0.0404) | 0.0019 (0.0030) | -0.1162*** (0.0404) |
| Fully state-owned _(t-1) | -0.0079*** (0.0030) | 0.2003*** (0.0719) | -0.0087* (0.0045) | -0.0057 (0.0238) | -0.0050*** (0.0018) | -0.0057 (0.0238) |
| GDP per capita _(t-1) | 0.0090 (0.0400) | 0.5752 (0.5234) | 0.0553** (0.0276) | -1.2842** (0.5223) | 0.0432 (0.0289) | -1.2842** (0.5223) |
| State sector share _(t-1) | 0.0848 (0.05748) | -0.7283 (0.9390) | 0.0850 (0.0696) | -1.6849 (1.4856) | 0.0579 (0.0645) | -1.6849 (1.4856) |
| Unemployment rate _(t-1) | -0.0023 (0.0036) | 0.0310 (0.0734) | -0.0166* (0.0094) | 0.4420* (0.2284) | -0.0094 (0.0100) | 0.4420* (0.2284) |
| Third front firm | | 0.4684*** (0.1089) | | 0.1913** (0.0869) | | 0.1913** (0.0869) |
| Oversight government dummies | | | YES | YES | YES | YES |
| Year dummies | YES | YES | YES | YES | YES | YES |
| Province dummies | YES | YES | | | | |
| Observations | 56,700 | 56,700 | 41,684 | 41,684 | 56,705 | 56,705 |
| First-stage F statistic | | 18.48 | | 4.85 | | 4.85 |
| Anderson-Rubin test | | | | | | 0.0937 |
| P-value | | | | | | |

In this table, we present the results of distance on decentralization using *Third Front Construction (TFC) Dummy* as the instrument. *TFC* equals to one if firm was established during 1964-1966 or 1969-1971 in the “Third Front Construction Area.” Marginal effects evaluated at the mean and standard errors are listed. The dependent variable *Decentralized* in the 2nd stage takes on the value of 1 if a firm is decentralized in year *t*, and 0 otherwise. Columns 1-4 present the 2nd and 1st stage results from IV Probit model, which is estimated using conditional MLE (i.e., the first stage result is estimated jointly with the parameters of the Probit equation when implementing conditional MLE). Columns 1-2 control for province dummies. Columns 3-4 control for a full set of oversight government dummies. Columns 5-6 present results from a standard 2SLS model. Standard errors are clustered at the level of the same oversight government.

*, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Table 10. Determinants of Decentralization – Role of Information

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|-----------------------------------|--|------------------------------------|-----------------------|---------------------------|-------------------------------|---------------------------------------|--|
| | <i>Province road mileages</i> | <i>Province telecom infrastructure</i> | <i>Province internet users</i> | <i>Intangibility</i> | <i>ROS dispersion</i> | <i>TFP OLS dispersion</i> | <i>TFP Olley-Pakes dispersion</i> | <i>TFP Index Number dispersion</i> |
| Distance _(t-1) | 0.0104*** (0.0010) | 0.0193*** (0.0036) | 0.0088*** (0.0013) | 0.0052*** (0.0009) | 0.0039*** (0.0011) | (0.0009) -0.0005 | -0.0006 (0.0026) | -0.0004 (0.0023) |
| Distance _(t-1) * Information Intensity | -0.0003*** (0.0000) | -0.0017*** (0.0004) | -0.0005*** (0.0002) | 0.0730** (0.0327) | 0.0192** (0.0079) | 0.0055*** (0.0016) | 0.0062*** (0.0020) | 0.0058*** (0.0017) |
| Information Intensity | 0.0014*** (0.0004) | -0.0010 (0.0072) | 0.0022 (0.0030) | -0.3068** (0.1488) | -0.1140** (0.0479) | -0.0286** (0.0117) | -0.0312** (0.0140) | -0.0289** (0.0122) |
| Other control variables | YES | YES | YES | YES | YES | YES | YES | YES |
| Oversight government dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Observations | 41,684 | 41,684 | 41,684 | 41,681 | 41,684 | 41,684 | 35,660 | 41,684 |
| Pseudo R2 | 0.123 | 0.123 | 0.123 | 0.121 | 0.121 | 0.121 | 0.119 | 0.122 |

This table reports *probit* regression results on the determinants of firms' decentralization. Marginal effects evaluated at the mean and standard errors are listed. The dependent variable takes on the value of 1 if a firm is decentralized in year *t*, and 0 otherwise. Standard errors are clustered at the level of the same oversight government.

*, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

On-Line Appendix: Not for Publication

Appendix A. China's third-front industries

China experienced massive relocation of industries from coastal provinces to her inland provinces during 1960s and 1970s, known as Third Front Construction. The move was a response to perceived military threat from USSR and USA. In August 1964, North Vietnam and U.S. navy had a series of confrontations in the waters of Tonkin Gulf. The U.S. Congress passed the Gulf of Tonkin Resolution, which gave President Lyndon B. Johnson the authorization to deploy forces and commence warfare against North Vietnam. Feeling that the war might escalate and China might eventually confront the U.S. military forces, Mao Zedong, China's top leader then, decided to move China's heavy industry and other strategically important resources to China's inland provinces, so that they would survive in a likely air assault. The move was temporarily stopped in 1966 due to the outbreak of Cultural Revolution, and was resumed after March 1969, when China was engaged in military conflict with USSR over Zhenbao (also known as Damansky) Island. With Richard Nixon's visit to China in 1972, China managed to improve her relations with the west. This led to relief of security pressure and the Third Front Construction came to a halt afterwards. During these two periods, 1964-1966 and 1969-1972, China relocated more than 1100 factories and about 4 million workers to mountainous areas in West China. The result was sudden increase in the number of SOEs in these areas during the two periods (see Figure 2).

Appendix B. Estimation of TFP

Here we describe in detail the approaches to estimate firm-level TFP.

We use a standard log-linear Cobb-Douglas production function to estimate firm-level TFP. Specifically, TFP of firm i in year t is the estimated residual from the regression:

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + u_{it} \quad (A1)$$

where y_{it} is the logarithm of value-added, and k_{it} and l_{it} are the logarithms of capital and labor, respectively. To allow for different factor intensities across industries, we estimate equation (A1) separately for each two-digit industry.¹⁸ Accordingly, TFP can be interpreted as the relative productivity of a plant within its industry.

Real value added is constructed by subtracting deflated input from real output. We use the two-digit ex-factory price index from *China Urban Living and Price Statistics* to deflate output. The input deflator is calculated based on available output deflators at 2-digit industry level and information from the National Input-Output (IO) tables in 1997, 2002, and 2007. From the IO table, we know how much inputs are needed to produce one unit of output. Then the average input price index will be the weighted average of the price index of those inputs. Thus, to obtain the input deflator for each industry, we calculate a weighted average of the input deflators, using as weights the coefficients in the IO table.¹⁹

In the ASIF dataset, firms report total annual employment, but they do not report the real capital stock. Instead, firms report the value of their fixed capital stock at original purchase prices. As these book values are the sum of nominal values for different years, they are not equal to the real capital stock and are not comparable across time and across firms.

Ideally, we need information on all past investments of a firm to construct the real capital stock. This, however, we do not have. Roughly following Brandt et al. (2011), we make several assumptions and convert the value of their capital stock at original purchase prices into real values by the following procedures.

First, we estimate the nominal value of capital stock for each year between firm's established year and the first year in which the firm appears in our data set. For simplicity of presentation here, we assume that it is 1998, the first year of our panel. We assume that the growth rate of nominal capital stock of each firm equals to the growth rate of nominal capital stock in the corresponding

¹⁸ China's Industrial Classification (CIC) system has 30 two-digit manufacturing industries.

¹⁹ The 1997 IO table is used to construct the input deflators of 1998-2000, and the 2002 IO table is used to construct the input deflators of 2001-2005, and the 2007 IO table is used to construct the input deflators in 2006-2007.

two-digit industry, which is reported by *China Statistics Yearbook*.²⁰ Then, we can calculate the nominal capital stock in 1998 from the following equation:

$$NK_{1998} = NK_s \prod_{t=s}^{1998} (1 + r_t) \quad (A2)$$

Where NK_{1998} is the nominal capital stock in 1998 reported in the ASIF data, s indicate the firm's established year, while NK_s is the nominal capital stock in the firm's. And r_t is the growth rate of nominal capital stock in the two-digit industry in year t , which is reported by *China Statistics Yearbook*. From equation (A2), we can calculate the nominal stock in each year between firm's established year and 1998.

Second, annual nominal investment NI_t is the change in nominal capital stock between years, that is, $NI_t = NK_t - NK_{t-1}$.

Third, we derive the real capital stock for each year between firm's established year and 1998. We deflate annual nominal investment in each year NI_t into real values RI_t with the investment deflator. *China Statistics Yearbook* reports the investment deflator from 1990. For years 1986-1989, we use the investment deflator constructed by Perkins and Rawski (2008).

Fourth, we obtain the real capital stock in 1998 from the perpetual inventory method. Specifically,

$$RK_t = (1 - \delta)RK_{t-1} + RI_t$$

Where RK_t is the real capital stock in year t , and δ is the depreciation rate, which is estimated by $\frac{\text{accumulated depreciation reported in 1998}}{1998-s} / NK_{1998}$, where s is the year of establishment for the firm.

Finally, we obtain annual real investment and real capital stock after 1998. For years after 1998, we use the observed change in the firm's nominal capital stock at original purchase prices as our estimate of nominal annual investment, that is, the nominal annual investment NI_t is still obtained from $NK_t - NK_{t-1}$. Real fixed investment RI_t is obtained by deflating NI_t with the investment deflator reported by *China Statistics Yearbook*. The Real capital stock is constructed using the perpetual inventory method, that is,

$$RK_t = RK_{t-1} - Depreciation_t + RI_t$$

$Depreciation_t$ is annual depreciation directly reported in ASIF database and is deflated by investment deflator reported by *China Statistics Yearbook*.

In our baseline analysis, we estimate equation (A1) by ordinary least squares (OLS). We call

²⁰ Since China Statistics Yearbook report the growth rate of nominal capital stock in the two-digit industry from 1986, we assume firms established before 1986 are established in 1986.

this TFP-OLS. While this approach is common in the literature, past research has argued that OLS estimates suffer from two endogeneity issues: simultaneity of input choice and selection biases. These two issues will generate biased estimates of β_k and β_l , and therefore biased estimation of residual in equation (A1). A variety of techniques have been suggested to address the simultaneity and selection problems. We use the method proposed by Olley and Pakes (1996). We call this TFP-OP.

As a robustness check, we also use a straightforward index number approach, which does not require the estimation of any parameters. In particular, the industry-specific average wage share in output is used to measure β_l , and one minus this share is used to measure β_k . The intuition is that a cost-minimizing firm will make sure the relative factor price ratio equals the local elasticity of substitution between inputs of the production technology. Since we do not have good comparable data to compute factor shares based on our survey data, we rely on the estimates of factor shares in two-digit industry level from Bentalila and Saint-Paul (2003). Bloom, Sadun and Van Reenen (2012) use a similar treatment. We call this TFP-IN.

Overall, these three approaches yield similar qualitative results. The correlations of these productivity measures are quite high: that between TFP-OLS and TFP-IN is 0.92; between TFP-OLS and TFP-OP, 0.96. Thus, it is not surprising that our results in general do not hinge on how we measure productivity.