Hayek, Local Information, and Commanding Heights:
Decentralizing State-Owned Enterprises in China[1]

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Abstract. Hayek (1945) argues that local information is a key to understanding the efficiency of alternative economic systems and whether production should be centralized or decentralized. The Chinese experience of decentralizing SOEs confirms this insight: when the distance to the government is farther, the SOE is more likely to be decentralized, and this distance-decentralization link is more pronounced with higher communication costs and greater firm-performance heterogeneity. However, when the Chinese central government oversees SOEs in strategic industries, the distance-decentralization link is muted. We also consider alternative agency-cost-based explanations, and do not find much support.

Keywords: Local information, commanding heights, decentralization, Hayek.

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JEL codes: D23, D83, L22, L23, P20, P31

1. Introduction

One of the most dramatic economic events in the last century was the emergence (about a hundred years ago), sustained expansion, and then rapid decline of planned economy and state ownership. Between the end of World War II and the collapse of the Soviet Union, it appeared the socialist system could be as productive as, if not more so than, the capitalist system. In the 1973 edition of *Economics*, Samuelson stated that the Soviet Union's per capita income level would probably match that of the United States by 1990.[2] But there were doubters from the start. The debate over the merits of market socialism in the first half of the last century involved influential economists such as Oscar Lange, Abba Lerner, Ludwig von Mises, and Friedrich Hayek, and has continued in recent decades (Bardhan and Roemer, 1992, 1993; Shleifer and Vishny, 1994; Stiglitz, 1994). The key arguments for why capitalism is more efficient than planned economy are two: stronger incentives under the more secure protection of private property rights; and the efficiency of using specific information dispersed among individuals and plants (Boettke, 2005). This second point originates from Hayek (1945), one of the most influential papers of all time.[3] The critical importance of incentives, ownership, and property rights for explaining performance in socialist and transitional economies is one of the most active areas of research (Megginson and Netter, 2001; Djankov and Murrell, 2002; Estrin et al., 2009). However, the importance of local information for the management of state-

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[2] Even in its 1989 version, within two years of the collapse of the Soviet Union, Samuelson still maintained that "Soviet economy is proof that …. A socialist command economy can function and even thrive" (p. 185-186, Ebenstein, 2015). This belief in the efficiency of the command-economy system was shared by prominent scholars such as Arthur Schlesinger, John Galbraith, Lester Thurow, Paul Kennedy (p. 187, Ebenstein, 2015), and Jan Tinbergen (Yergin and Stanislaw, 1999), among others.

[3] As of January 27, 2017, Hayek (1945) has been cited about 14,000 times in Google Scholar, and it is viewed by a panel of top economists as one of the top 20 articles published in AER in its first 100 years' history (Arrow et al., 2011).

owned enterprises is rarely empirically explored.

We examine the causes of decentralization of state-owned enterprises (SOEs) in China, focusing on the role of local information. We rely on the Annual Survey of Industrial Firms (ASIF) 1998-2007, which covers *all* SOEs. Decentralization is defined as the oversight status of an SOE shifting from a higher- to a lower-level government. The availability of local information is captured by the physical distance between an SOE and the oversight government. A larger distance implies that the government has fewer direct observations on firm-specific information. This interpretation of distance is consistent with the recent literature in which the distance is found to capture information asymmetry in financial markets (Coval and Moskowitz, 1999), to explain a headquarters' investment across its plants in different locations (Giroud, 2013), and to describe the lending relationship between banks and firms (Peterson and Rajan, 1994).

Hayek (1945) implies it is more efficient for an oversight government with a greater distance from the SOE to decentralize the control rights to a lower government closer to the SOE. Moreover, when firms' performance heterogeneity is greater, and hence local information figures more prominently, the same distance results in a stronger tendency to decentralize in order to utilize local information. Furthermore, when the communication costs are lower, the oversight government has less difficulty finding out what is going on in the SOE, and the same distance may lead to a weaker tendency to decentralize (Bloom et al., 2014).

Hayek's insight does not imply that SOEs should always be decentralized. Tilting the balance toward centralization are considerations such as internalizing the externality of SOEs, or putting top-notch experts that specialize in complex problems in charge of sophisticated SOEs (Garicano, 2000). Moreover, the central government may have incentives to control key elements of the economy, that is, what Vladimir Lenin called in 1922 the "commanding heights."

Indeed, most governments of the world have engaged in controlling these

commanding heights since the end of World War II (Yergin and Stanislaw, 1999).[4] Strong state intervention in western economies started with the UK Attlee Labour government in 1945, which promoted government planning and nationalization of industries. The General de Gaulle government in France followed suit, declaring that the state "must hold the levers of command." Similarly, after the independence of India, Prime Minister Nehru often evoked the commanding heights metaphor. Typically, these countries, as well as Germany, Korea, Japan, many Latin American countries, and of course, all socialist countries, had strong state control/ownership over strategic sectors such as defense, iron and steel, railroads, ship-building, utilities, and telecom. In these sectors, the key consideration for decentralization is likely not to utilize local information but to ensure the benefits of "strategic control." Here the force of distance in decentralization should naturally be more muted.

We find support for the above conjectures. Consistent with Hayek (1945), the larger the SOE-to-government distance, the more likely the SOE is decentralized. Moreover, the positive distance-decentralization link is stronger with greater firm-performance heterogeneity and higher communication costs. Consistent with the commanding heights conjecture, for SOEs in strategic industries under the direct oversight of the central government, the distance-decentralization relationship is muted. This strategic segment is non-trivial but not large, about five percent of the total value added of all sample industrial firms.

To ensure correct interpretation for the distance-decentralization link, we conduct several checks. To exclude the possibility that distance to the government serves as a proxy of the distance to an agglomeration center, we construct a placebo distance to the alternative agglomeration city, and do not find this measure to be correlated with decentralization. To address distance's potential endogeneity, we rely on exogenous sources of variation of the distance to identify its effect on

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[4] All historical material on commanding heights across countries in this paper comes from Yergin and Stanislaw (1999).

decentralization. In the 1960s and 1970s, a large number of SOEs were relocated to China's inland areas in anticipation of wars with the U.S. and the U.S.S.R. As a result, their distances to oversight governments were determined historically and had nothing to do with decentralization decisions decades later. The instrumental variable results are qualitatively similar to those in our base specification.

We also consider two alternative hypotheses on decentralization. The first is the oversight agency conjecture, which posits that decentralization originates from considerations of rent seeking by the oversight government. Like the Hayek conjecture, it predicts a positive distance-decentralization link, and a stronger link when communication costs are high. However, only the Hayek conjecture predicts a higher distance-decentralization link in the presence of greater performance heterogeneity. Furthermore, the finding of the lack of relationship between the distance-decentralization link and the rent environment is consistent with the Hayek conjecture, but inconsistent with the oversight agency conjecture. Also supporting the Hayek conjecture is that the government initiated SOE reforms to turn around SOE performance in the mid-1990s.

The second alternative hypothesis is the local capture conjecture, which posits that decentralization is determined by lower governments' lobbying. Perhaps because of its lobbying advantage, the lower government is better able to collude with the SOE for rents (Bardhan and Mookherjee, 2000). This view implies a negative relationship between decentralization and the SOE-to-*lower-government* distance, and this relationship being more pronounced with higher rents. We find support for such a negative relationship (which is also consistent with the information-based Hayek conjecture). However, we do not find the distance-decentralization relationship to be stronger when rents are higher, and this inconsistency with the local capture conjecture makes the Hayek conjecture relatively more appealing. Also supporting the Hayek conjecture is the fact that the decentralization decision could not be refused by lower governments.

We contribute to two threads of literature. First, this is the first empirical paper that links and tests Hayek's idea of the fundamental importance of local information in understanding SOE decentralization. We are not the first to examine how local information affects decentralization of firms in a market economy (e.g., Acemoglu et al., 2007; Bloom et al., 2012, 2014; Giroud, 2013).[5] However, we differ from these previous studies in two aspects. First, we focus on the role of local information in SOE decentralization, and speak directly to Hayek's attempt to understand how local information shapes the choices of centralization versus decentralization for socialist firms. In the literature of the working of socialist firms, there have been numerous studies of incentives and ownership (Megginson and Netter, 2001; Djankov and Murrell, 2002; Estrin et al., 2009), but none documents the key aspect of how the lack of local information affects the governance of socialist firms (Boettke, 2005). In addition, we add to the general literature of local information and firm decentralization by offering evidence that, in the state sector, commanding-heights considerations can overrule the force of local information.

Related to the above, we also add to the empirical literature on the benefits and costs of decentralization in firms (Bardhan, 2016). The theoretical literature on decentralization of firms is large. Aghion and Tirole (1997) show it is efficient to delegate when the information advantage of agents is significant and the conflict of interest is not large. Garicano (2000) suggests that it makes sense to create a hierarchy of knowledge production (see also Bolton and Dewatripont, 1994). Dessein (2002) and Alonso et al. (2008) argue that when agents report information strategically, it is often desirable for an uninformed principal to delegate. These

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[5] Acemoglu et al. (2007) show that the availability of public information to the headquarters reduces the need to delegate controls to the manager. Bloom et al. (2014) provide evidence that the information technology facilitates, while the communication technology hinders, decentralization within a firm. Bloom et al. (2012) find that competition and trust foster greater decentralization. Giroud (2013) examines how the within-firm distance between headquarters and their plants affect plant performance, and finds that the proximity of the headquarters to a plant increases the plant's investment and productivity.

theoretical papers greatly enrich the insights of Hayek (1945) by providing further rationales for decentralization, both highlighting factors that Hayek considered such as agent information advantage (Aghion and Tirole, 1997), and those that Hayek did not consider such as specialization in information acquisition, hierarchy of knowledge production, conflicts of interest between principals and agents (Aghion and Tirole, 1997), and strategic reporting by agents (Dessein, 2002; Alonso et al., 2008). In contrast to the large theoretical literature on decentralization, the empirical literature is limited. Thus, while we cannot directly test the implications of these new models, by testing the simple yet powerful implications of Hayek (1945), we contribute to the emerging empirical literature on decentralization of firms (see Acemoglu et al., 2007; Bloom et al., 2012, 2014; Giroud, 2013; Aghion et al., 2015).

Second, we contribute to an ignored area, that of SOE decentralizations in the literature of SOE reforms. This literature largely focuses on privatization (World Bank, 1995; Yergin and Stanislaw, 1999; Megginson and Netter 2001; Djankov and Murrell 2002; Bai et al., 2009; Estrin et al., 2009), but SOE decentralization has been widespread and important. Indeed, local governments are playing increasingly important roles in SOEs, which remain important in many countries (Bardhan, 2002; 2016). In China, the share of the state sector in the value of industrial output, while dropping precipitously from 78% in 1978, has stabilized at a high level of 22% in 2014.[6]

2. Institutional Background

The hierarchy of Chinese government consists of the central, provincial, municipal, and county governments.[7] Each government of a specific level is in charge of all

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[6] This measure has changed into the share in total industrial sales since 2012, and it does not include the share of collective firms.

[7] There are also township governments, but they are not full-fledged governments and usually do not have oversight duties over SOEs.

the SOEs affiliated with that government.[8]

Decentralization of Chinese SOEs became an important option for SOE reforms as the government confronted SOE losses and tried to improve SOE performance. After China began its economic reform in 1978, market competition quickly intensified coincident with a rise of the private sector (Brandt and Rawski, 2008). As a result, the profits and taxes per unit of net capital stock and working capital in industrial SOEs had fallen from 24 percent in 1978 to 7 percent in 1996 (Qian, 2000), and more than one-third of SOEs had losses in 1996. Realizing the necessity of further reforms, some oversight governments experimented with decentralizing SOEs.[9] One of the major objectives in SOE decentralization was to improve efficiency. For instance, State Economic and Trade Commission et al. (1994) stated that "the adjustment of the oversight status of SOEs should aim for … optimizing the allocation of state assets, and improving operating efficiency of capital."[10] The decentralization process proceeded unevenly. Based on our sample, which includes all SOEs, decentralization happened throughout our sample period: the annual numbers of SOEs being decentralized from 1999 to 2007 are 235, 200, 250, 149, 204, 280, 102, 59, and 37, respectively. We focus on decentralizations after 1998, which is the earliest year with detailed data of all SOEs.

Decentralization was one of many methods for SOE reform beginning in the second half of the 1990s. The slogan of overall SOE reform then was "grab the big and let go of the small" (Xu, Zhu and Lin, 2005; Hsieh and Song, 2015). With limited attention span and information processing ability, the upper government decided to focus its attention on key SOEs. To "grab the big," many large SOEs were merged to form industrial conglomerates, and the control rights over such

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[8] Appendix Figure B-1 shows the distribution of SOE affiliations in terms of the number of firms, employment and output in 1998.

[9] This readiness to experiment with various reform options at the local level is a key advantage of the M-form governance in China (Qian, Roland, and Xu, 2006).

[10] See online appendix C for all government documents cited in the paper.

firms were consolidated to the central government. To "let go of the small," many SOEs were privatized, or went through internal restructuring, bankruptcy, employee shareholding, auctions, leasing, and joint ventures (Garnaut et al., 2005, Chapter 3); others were delegated to lower-level governments, i.e., decentralized. In implementing SOE reforms, the central government offered general guidelines but left significant room for the oversight governments to experiment (Qian, Roland, and Xu, 2006; Brandt and Rawski, 2008). The State Reform Commission (1996), for instance, stated that the reform of small SOEs should respect local conditions of each region, and that the local government was encouraged to experiment with various means. In general, the local government could choose among different restructuring options. Some provinces explicitly listed decentralization as an option.[11]

The decentralization decision, once made by the oversight government, could not be refused by its *lower* governments. Because of its power to appoint government officials, the higher-level government had total control over its lower levels, and the decentralization decision was thus made by the incumbent oversight government. Some provinces explicitly stated that no city had the right to resist the implementation of SOE decentralization (e.g., Chongqing Government, 1997).

Decentralization in general did *not* change the objectives and responsibilities of the oversight government. Delivering growth and/or tax revenues have been the key priority of different levels of governments under China's political system of yardstick competition (Maskin *et al.*, 2000; Li and Zhou, 2005; Shih et al., 2012).

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[11] In Shandong province, the explicit reform methods were franchising, privatization, transfer, decentralization, merger and acquisition, and bankruptcy (Shandong Government, 2003). In Jiangxi province, decentralization was also listed as one of several reform methods (Jiangxi Government, 2007).

There were no strict geography-based rules but some broad guidelines about which level of government should be in charge of an SOE. In general, if an SOE is delegated, it would be under the oversight of the lower government of its location (e.g., Hubei government, 2003; Shaanxi Government, 2005).

Thus, the lower-level government, after taking over decentralized SOEs, would still strive for high growth rates and/or tax revenues, and try to improve its SOEs' performance in order to maintain good promotion prospects. An exception could be made with SOEs of strategic importance to the government. For them, the government might have different objectives that we shall consider later.

China's decentralization featured a full transfer of both cash flow and control rights, which likely reduced the extent of agency costs. Like a decentralized western corporation, the decision-making authority in China's state sector moves down the hierarchy after decentralization. Typically the plant manager in a corporation, after delegation, may take sub-optimal actions at the cost of the firm (Alonso and Matouschek, 2008; Dessein, 2002). China's SOE decentralization, in contrast, partly alleviated this problem: because cash flow rights were also transferred to the local government after decentralization, the local government would partially internalize the costs and benefits of governing the decentralized SOEs.[12] The complete delegation in various rights is documented in State Council (1998): "after decentralization, all rights regarding the SOE's finance, labor, wage, social welfare, and personnel are transferred to the local government; also transferred include state asset, liability, equity….further transferred are the loss and subsidy quotas ….; after decentralization, all income taxes are … turned to local public finance."

3. Conceptual Framework of Determinants of SOE Decentralization

Consider an economy with two layers of government, Upper and Lower. Either can have *de facto* control rights of SOEs, and whichever layer has the control rights benefits as follows. *First*, it obtains a significant share of the taxes that the SOE pays, such as the value added tax and the corporate income tax (Wong and Bird, 2008). It also has discretion over the SOE's profit. *Second*, it has discretion over

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[12] To the extent that local government officials pursue pure private rents and that the delegated cash flow rights are not sufficient to induce efficient behavior, agency costs at the local government level remain.

the SOE's strategic decisions such as preventing bankruptcies to maintain employment and social stability, a key criterion in evaluating local government officials. *Third*, it appoints personnel to key, well-paying positions in the SOE, which engenders rents. Oversight rights also entail *costs* in shouldering subsidies when the SOE takes a loss.

What prompts the oversight government to decentralize? The immediate motive during our sample period was to turn around SOE performance. Over time, many SOEs had experienced declining profitability, which increased the cost of control. With less rent to share and more subsidies to shoulder, poorly-performing SOEs are likely to be decentralized first.

The Hayek conjecture. The literature, starting from Hayek (1945) and including Aghion and Tirole (1997), suggests that one way to improve SOE performance is to take advantage of local information. When the government cares about efficiency improvement, there is a tendency for the government to decentralize those SOEs in which the government has less local information. Hayek (1945) is illustrative:

> "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."

How much the oversight government is privy to local information depends on the distance between the SOE and the government (Giroud, 2013). With a shorter distance, the time-constrained official is more likely to have first-hand knowledge, or through denser social networks to hear, about how the SOE performs and whether

the manager is diligent or competent. Realizing this, the manager is more likely to report honestly, which further improves the quality of knowledge received by the government (Alonso et al., 2008). A shorter distance should then result in a higher likelihood of centralized control. In contrast, the greater the distance between the SOE and the oversight government, the larger the loss of useful (and truthful) local information critical for efficient allocation decisions, and the more likely the SOE is decentralized to preserve efficiency. Interestingly, Chinese governments were aware of this relationship between distance and need for decentralization. For instance, an SOE being "located far away" from the oversight government was explicitly listed as a reason to push forward its decentralization (Shandong government, 2003).

Distance, nevertheless, is a crude measure of information asymmetry. Given the distance, the extent of information asymmetry depends on publicly available information and communication costs (Acemoglu et al., 2007; Bloom et al., 2014). Centralized control relies on information available to the principal, a good indicator of which is publicly available information about similar technologies. When the principal faces higher performance heterogeneity, firm-specific local information becomes more important and the oversight rights should be given to the government closer to the firm. The positive distance-decentralization link should thus be stronger for firms with greater firm-performance heterogeneity. Similarly, when communication costs between the SOE and its oversight government are higher, the principal faces more information asymmetry (Bloom et al., 2012; Garicano, 2000; Giroud, 2013). There is then a greater loss of information in communication between the principal and the agent. When communication costs are higher, the positive distance-decentralization link should thus be stronger. To summarize, our first key conjecture is as follows.

The Hayek Conjecture. When the government cares about efficiency improvement, the greater the physical distance between the SOE and the oversight

government, the more likely the SOE is decentralized. Moreover, the positive distance-decentralization link should be stronger for SOEs with greater firm-performance heterogeneity and facing higher communication costs.

The commanding-heights conjecture. Since many SOEs feature strategic concerns and non-profit objectives (Bai et al., 2000; Bardhan, 2016), other non-economic factors also shape SOE decentralization decisions. In 1922, Lenin proposed that the state should control the "commanding heights", or key segments of the economy. Many governments have since followed this philosophy, strengthening direct control of the economy, most notably during the period from the Great Depression to the collapse of the Soviet Union. Such governments included the Attlee Labour government in the UK, the de Gaulle government in France (both immediately after World War II), as well as India, Germany, Korea, Japan, many Latin American countries, and of course, all socialist countries.[13]

The Chinese central government has always maintained a strong control of its commanding heights. Indeed, "national interests" have often been mentioned in Chinese government's documents about SOEs. In 2006, the State Council's document on the reorganization of SOEs (State Council, 2006) stated, "the state should maintain absolute control over important industries that are related to national security and national economic growth." *A priori*, several features make strategic objectives more salient for the central rather than for local governments. For example, relative to their local counterparts, central government officials have a longer tenure. While the central regime's legitimacy depends on popular support, local government officials owe their appointment entirely to the upper government. Only the central government cares about strategic issues such as ensuring a strong

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[13] Even earlier than the USSR, Japan adopted the heavy-handed SOE-dominated industrialization strategy and directly controlled the commanding heights in the Meiji Restoration period in the 1870s (Morck and Nakamura, 2016), which quickly failed. The government then adopted laissez-faire policies that spurred its first industrialization from 1870s to 1920s.

defense or cultivating "national champions" (Bardhan and Mookherjee, 2000).

The central government has a greater stake in controlling the strategic SOEs for which multiple objectives/tasks feature prominently. Indeed, when conflicts of interest between the principal and the agent become severe, the principal is less likely to delegate (Aghion and Tirole, 1997). It then becomes important to directly control these SOEs in pursuit of the central government's objectives. Otherwise, decentralizing SOEs in these commanding-heights segments may result in the local government ignoring the central government's "strategic considerations" and ultimately hurting the central government. For these strategic SOEs, efficiency and the force of local information thus become less important, and the balance tilts toward centralized control.

The commanding-heights conjecture. The positive distance-decentralization link should be weaker for SOEs with strategic importance to the government，especially for those under central government control.

Agency cost considerations. We have implicitly assumed that the Chinese government intended to improve SOE performance in decentralizing SOEs due to either fiscal reasons or other embedded incentives. Now we consider additional conjectures presuming self-interested government officials.

When the SOE-government distance is shorter, the rents from directly controlling the SOE are likely greater. Proximity magnifies the private benefits associated with being directly in charge, partly due to greater trust between the SOE and its oversight-government officials. As a result, the government wants to keep nearby SOEs, which lowers the chance of their decentralization. Moreover, when communication costs are higher, rent extraction from distant SOEs would be more difficult, and direct control of these distant SOEs becomes less enticing, resulting in a higher chance of decentralization for SOEs at a greater distance. Thus, the positive distance-decentralization link should be stronger for SOEs facing higher communication costs. Similarly, under the assumption of easier rent extraction in

nearby SOEs, when SOE rents are higher, rent extraction from nearby SOEs is relatively more appealing, resulting in a stronger distance-decentralization link in high-rent environments. We call these predictions the *oversight agency conjecture*.

Because decentralization in general could not be refused by lower governments, lobbying for decentralization by lower governments was unlikely to be a key factor behind decentralization. However, we cannot rule it out. Moreover, prevailing literature worries about local capture. If lower-level governments (denoted as *Lower* here) can lobby for decentralization, what are the testable implications?

In recent literature highlighting the specter of local capture (Bardhan, 2002; 2016; Mookherjee, 2015), local governments are often presumed to be better able to collude with the SOEs for personal rents.[14] Presumably the ability to collude depends crucially on the distance. When the distance is short, collusion is more likely and sustainable. Physical proximity enables more interaction, trust, channels of mutual influence, and ultimately, sustained collusion. The key factor in local capture is the SOE-*Lower* distance; where this distance is shorter, it is easier for *Lower* and the SOE manager to collude for rents. *Lower* thus lobbies for decentralization. As a result, decentralization becomes more likely with a shorter SOE-to-*Lower* distance. Moreover, when the SOE has abundant rents to share, *Lower* finds it more enticing to collude with the SOE, and is more motivated to lobby for decentralization. Thus, the negative relationship between decentralization and the distance to *Lower* should be more pronounced when the rents are higher. In sum, the *local capture conjecture* predicts a negative link between decentralization and the distance to *Lower*, and a negative interaction term between the distance to *Lower* and proxies of rents. Interestingly, the Hayek conjecture also predicts a negative link between decentralization and the distance to *Lower*: the efficiency gain is higher when the distance between the SOE and Lower is shorter. The Hayek

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[14] Bardhan and Mookherjee (2000) offer instructive discussions of when local or national capture is more likely.

conjecture, however, does not speak directly to the relationship between the decentralization-distance link and the rent environment.

Distinguishing alternative conjectures. We examine the relevancy of the alternative conjectures by their ability to explain key empirical facts that we shall present later. Each has some unique predictions. First, only the Hayek conjecture predicts that the distance-decentralization link hinges on firm-performance heterogeneity. Second, only the commanding heights conjecture predicts that the distance-decentralization link should be weaker for central SOEs in strategic industries. Third, the oversight agency conjecture uniquely predicts a positive interaction term between rents and distance to the oversight government, while the local capture conjecture predicts a negative interaction term between rents and SOE-to-*Lower* distance. Overall, the conjecture that predicts better and that finds support for its unique prediction(s) should be more relevant. Table 2 lists predicted signs of these conjectures to facilitate comparison.

Aside from these empirical tests, two facts favor the Hayek conjecture over the oversight agency conjecture: Due to the prevalence of SOE losses in mid-1990s, the main motive for decentralization then was to improve SOE performance; and local governments had strong motivation for growth or tax revenues. Similarly, the fact that decentralization decisions were made by the oversight government and could not be refused by lower governments reduces the plausibility of the local capture conjecture.

4. Basic Results

Our dataset is the Annual Survey of Industrial Firms (ASIF) from 1998 to 2007. It includes *all* SOEs and all non-state firms with sales exceeding five million *yuan*. Since we are only concerned with SOE decentralization, in our baseline regressions we only keep the SOE sample (defined as the share of state ownership exceeding

30%); we also drop all post-decentralization observations.[15] The thirty percent threshold is chosen because it indicates relative state control based on available government documents. [16] In alternative specifications when other SOE restructurings (apart from decentralizations) are considered jointly with decentralizations, we keep the sample up to the restructuring year.

For our baseline regressions, we restrict the sample as follows. First, starting with 79,438 SOEs with non-missing oversight information, we drop those at the bottom of the hierarchy, i.e., those under county-or-below oversight governments (43,898 firms), which cannot be decentralized. Second, we drop SOEs without at least three continuous years of data (17,682 firms). This condition is imposed so as to take into account two periods of lagged information in determining decentralization; that is, decentralization was likely determined based on more than one period's information.[17] Finally, we drop SOEs whose oversight status changed and then reversed back within two years (312 firms), which likely represent coding errors.[18] Our final sample consists of 17,546 SOEs. See online Appendix A for details on various stages of the sample choice.

Decentralization is defined to be one once an SOE experiences a change in its oversight status to a lower level; it remains one afterwards. Some may view this zero-one measure as inadequate, that is, its value of one may reflect a different

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[15] We further drop the first year because decentralization needs two years' data to establish.

[16] Several key government documents (State Asset Management Bureau and State Reform Commission, 1994; 1997) state that there are two types of state control, namely, absolute control (i.e., state share exceeding 50%) and relative control (i.e., the state share between 30% and 50%, and being the largest shareholder). We do not classify ownership based on a firm's registered ownership type because some former SOEs do not change their registered ownership type even after ownership restructuring (Dollar and Wei, 2007). We extensively check the sensitivity of our results to alternative definitions of state ownership later.

[17] Assuming that a change in the covariates will have an immediate effect on decentralization decisions, one can also include SOEs with only two years of consecutive observations and use once-lagged explanatory variables. We have conducted a sensitivity check as above, and we get similar results (see Table G-1 in the online Appendix).

[18] Retaining them does not change our key results. See a sensitivity check in Table G-1 in the online Appendix.

extent of decentralization in various rights at each oversight level, and it may thus be more accurate to measure decentralization as a continuous variable. However, it is reasonable to adopt the zero-one measure in our context: decentralization in fact means a complete transfer of all cash flow and control rights for most SOEs, and the proportion of rights decentralized is largely close to one.

In 1998, our initial sample year, the shares of SOEs under the oversight of the central, provincial, and municipal governments in all these SOEs are 15.8%, 28.9%, and 55.3%, respectively. In total, 1,516 SOEs, or 8.6% of the sample, experienced decentralization. Among these decentralized SOEs, there are 455, 543, and 518 SOEs whose original oversight governments were the central, provincial and municipal governments, respectively.

4.1. Specification

We estimate the following probit equation of the determinants of decentralization:

$$P(Decen_{ijkt}=1) = P(Distance_{ik}\,\delta + X_{ijk,lag}\,\beta + Z_{lag}\,\alpha + \theta_j + \rho_k + \gamma_t + \varepsilon_{ijkt} > 0) \quad (1)$$

Here, P means probability. $Decen_{ijkt}$ is a dummy variable that equals one when firm i in industry j under the oversight government k at year t is decentralized. $Distance_{ik}$ measures the logarithm of (one plus) the physical distance (in km) between firm i and the city in which the oversight government is located.[19] The vector X includes lagged firm characteristics including the firm size (i.e. the logarithm of the firm assets), performance (i.e. returns on sales, or ROS), *Firm Importance* (i.e. the share of the firm's value added in the total value added of all manufacturing SOEs within the jurisdiction of the oversight government), and the dummy variable of full (i.e. 100%) state ownership. The vector Z_{lag} measures lagged province-level variables: GDP per capita, unemployment rate, and share of SOEs in total urban employment.

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[19] We obtain the distance based on GIS. We do not have the exact longitude and latitude of the firm within a county (or district/county-level city), and use the county center in which the firm was located as the approximate location.

When computing the lag of a variable, we use the average of its once- and twice-lagged values to take into account multiple periods' information. We also control for the 363 dummy variables indicating the oversight government of the SOE to hold constant oversight-specific tendency to decentralize,[20] and the industry and the year dummies. To allow for correlation of the error term across time and space, we cluster the standard errors at the initial oversight government level.

Since decentralization is mostly irreversible in our sample, we delete those observations after *Decen* has turned one. We consider the possibility of multiple decentralizations per firm later. Our main parameter of interest is the marginal effect of *Distance*. Its estimate is based on comparison between SOEs with different distances to the original oversight government.

4.2. Baseline Results

We first compare the basic characteristics of decentralized and non-decentralized SOEs using the data from the pre-decentralized periods (see Table B-3 in the online Appendix).[21] Relative to the non-decentralized SOEs, the decentralized ones in their pre-decentralized years have a greater logarithm of the distance to the oversight government (4.2 vs. 2.7), their average asset size is smaller, their profitability and TFP are worse, their relative importance (i.e., *Firm Importance*) and the per capita GDP in their location are lower. Thus, the oversight government tends to decentralize SOEs that are far away, smaller, less important, and worse-performing.

Columns (1) to (4) of Panel A of Table 3 present the baseline probit results for all the SOEs: the central, the provincial, and the municipal SOEs, respectively. When examining decentralization by each oversight, we address the concern that the extent of decentralization at each oversight level could differ, in which case it

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[20] That is, the central government, one of the 31 provincial governments, or one of the 331 municipal governments.

[21] Table 1 contains the definitions of the variables. Table B-2 in the online Appendix presents the means and the standard deviations for the key control variables.

is unclear if the decentralization dummy captures similar extent of delegation for SOEs under different oversight levels. We find that distance is robustly and positively correlated with decentralization whether using the full or the oversight-specific samples. Using the pooled sample estimates, increasing the distance by one standard deviation (SD, here 2.40) would increase the probability of decentralization by 1.3 percentage points, or 9.2% of the SD of the dependent variable. For the central, the provincial, and the municipal SOEs, increasing the distance by one SD (1.66, 1.74, and 1.57) would increase the probability of decentralization by 0.78, 0.64, and 0.71 percentage points, or 4.0%, 4.1% and 6.2% of the SD of the dependent variable. In addition, decentralization is more likely for smaller, poorly-performing, and less important firms (see column (1)).[22]

Restructuring options. In our baseline estimation, we focus on decentralization. But an SOE could face other restructuring options (including privatizations).[23] For those SOEs that were eventually restructured, some observations are left out of our previous estimation: in the case of SOEs being restructured but never decentralized, all the restructuring years; in the case of SOEs being restructured after decentralization, all the post-decentralization years. This could be problematic if ignoring simultaneous choices of decentralization and restructuring might bias the estimate of the distance effect. We thus examine how our results hold when considering both decentralization and restructuring.

We need to bear in mind that measuring privatizations with our data is difficult. An SOE's privatization is manifested in several ways: staying in the sample with

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[22] Another issue is whether the probit model is the right specification. Alternatively we could use the duration model since the structure of the outcome is $\{0, 0, \dots, 0\}$ or $\{0, 0, \dots, 0, 1\}$. The literature has shown that the estimates from a discrete-time binary-choice model converge to those obtained from a continuous-time duration model (Allison, 1982). Thus not surprisingly, we reach qualitatively similar results in column (5) using the Cox proportional hazard model (see online Appendix D for further results using the hazard model).

[23] In the rest of this paper, restructuring means all restructuring options including privatization but excluding decentralizations.

the state share dropping sufficiently; becoming privatized but exiting the sample due to its sales being below five million yuan; going bankrupt and exiting the sample; and being merged with private firms and exiting the sample. The number of SOEs disappearing from the sample ("exit") in the middle of the survey (7,183) far exceeds that experiencing explicit privatization (4,060). Because we cannot capture most privatizations, in this check we lump explicit privatizations with "exit" and call such SOEs *Restructured*. Because our objective is to understand decentralization and to ensure the robustness of the distance-decentralization link, modeling all restructuring options as thoroughly as possible is beyond the scope of this paper.

In a given year an SOE faces three options: unchanged (base), decentralized, and *Restructured*. We use the multinomial logit framework. The incumbent government maximizes among the utility levels associated with all the options, and chooses the optimal one. For this exercise we keep the post-decentralization observations and expand the sample up to the restructuring years for the SOEs that were eventually restructured during the sample years.[24]

The results are in columns (6) and (7) of Panel A of Table 3.[25] The coefficient of log distance remains positive and statistically significant, with a marginal effect on the probability of decentralization of 0.0053, similar to our baseline estimate. Our result on the distance-decentralization link thus remains robust. In contrast, the distance coefficient for *Restructured* is small and statistically insignificant.[26]

A related check is to delete those SOEs that were eventually restructured. Now

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[24] An exception is municipal SOEs, which drop out of the sample after decentralization. This is because after decentralization, the municipal SOEs become county SOEs, and no longer face the same three options as other SOEs (i.e., they cannot be further decentralized).

[25] Again, we report marginal effects on the probability of each option.

[26] The distance-decentralization result remains robust when we split the *Restructured* option into *Explicit Privatization* (i.e., when the state share falls below 30%), and *Exit* (i.e., when the firm exits the sample).We again find a positive and statistically significant effect of distance on decentralization, and no effect on either *Explicit Privatization* or *Exit* (see Table E-1 in online Appendix E).

the choices are "no change" and "decentralization". We re-estimate the base specification using this smaller sample, and the coefficient of log distance remains positive and statistically significant (see Table E-2 in online Appendix E).

Omitted variables. In columns (1) to (3) of Panel B of Table 3, we deal with the concern that the estimates may be affected by the omitted circumstances faced by both the original and the lower governments. To address this, we examine decentralization by each oversight and include additional controls that may affect decentralizations: fiscal revenue per capita, GDP per capita, and fiscal autonomy (i.e., the ratio of fiscal revenues to fiscal expenditures). For the provincial and municipal SOEs, we add these controls for both the original oversight government and the lower government. For the central government, we only add these controls at the lower government level.[27] The results on distance remain similar.

Full versus partial SOEs. Columns (4) and (5) of Panel B of Table 3 distinguish the case of full (i.e., 100%) and of partial (i.e., 30-99%) state ownership. In the case of partial state ownership, there are other corporate governance mechanisms to obtain information, and the direct information available to the government that is captured by distance is thus less important. We therefore expect a weaker distance-decentralization link under partial state ownership. That is confirmed: the coefficient is larger in full than in partial SOEs.

Additional checks. First, we consider various ways to define an SOE: using the 50% threshold of state ownership (i.e., absolute state control), or using the definition of Brandt et al. (2012), or that of Hsieh and Song (2015) (see online Appendix F). Second, we add back the 312 SOEs whose oversight status changed and then immediately reverted back within two years. Third, we keep post-decentralization observations, which allow us to add 26 SOEs with a second

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[27] 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.

decentralization. Fourth, we loosen the requirement of having at least three consecutive years of data for an SOE, and require only two years of consecutive observations and use once-lagged covariates (see Table G-1 of the online Appendix G). In all the checks, our key results remain robust.

Centralization. Some SOEs also experienced *centralization* (i.e., the oversight status changing to a higher level). Does the distance matter symmetrically in determining centralization as in determining decentralization? To see this, we define centralization to be one (and stay so) after the oversight status changing into a higher-level government, and zero otherwise. We then modify the sample by dropping central SOEs, which cannot be centralized further, and adding the 20,273 county SOEs, [28] which can be centralized. A much smaller share of SOEs experienced centralization than decentralization: among the provincial and municipal SOEs, two percent experienced centralization; among the county SOEs, 3.5 percent did. For centralization, the key distance measure is that to the *upper* government, which captures informational gains from centralization.

In Appendix H, we estimate the centralization equation with the baseline covariates. The results are symmetric to the case of decentralization: SOEs located closer to the upper government are more likely to be centralized. The magnitude of this distance measure (in absolute value) is significantly smaller than in column (1) of Table 3 with respect to decentralizations.

4.3. Agglomeration and endogeneity

Agglomeration. In China, political and economic centers overlap. Beijing is also a key agglomeration center, and a provincial capital is usually the largest city in the province. The distance to the oversight government could then reflect the distance to an economic center. *A priori* the proximity to economic centers matters for SOE decentralization because such SOEs are more viable thanks to this geographical

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[28] Again we impose the restriction of three years of consecutive observations. See Table A-2 for the evolution of sample with various restrictions by oversight level.

advantage, and retaining control of them might be beneficial to the oversight government. If this concern is valid, the distance between an SOE and the other agglomeration center in the oversight region should also have a positive association with decentralization.

To verify, we create a placebo distance measure (*Placebo Distance*). For central SOEs, *Placebo Distance* is the distance to Shanghai, the other agglomeration center on par with Beijing. For non-central SOEs, *Placebo Distance* is to the largest non-capital city within the jurisdiction. We then re-run our baseline regressions using *Placebo Distance* to replace the distance variable. If its coefficient is positive and statistically significant, we might worry that our distance variable may simply capture economic agglomeration. Reassuringly, the results in column (1) of Table 4 show that the coefficient of *Placebo Distance* is statistically insignificant and only about 1/11th the size of the coefficients in Table 3. We also consider the possibility that the "other largest city" could be far smaller than the capital city. We repeat the exercise using the subsample that excludes the regions whose capital city's GDP is more than 50% larger than that of the second largest city. The results in column (2) of Table 4 remain similar. Thus, our result on the positive distance-decentralization link does not reflect the agglomeration effect.

Endogeneity. Although we have controlled for many variables that capture key confounding factors, such as the SOE's importance and lagged firm performance, the distance may still capture something other than the quality of information. The distance could then be endogenous: unimportant or less profitable SOEs may be located further away.

To deal with endogeneity, we rely on an instrumental variable (IV) that captures exogenous variations in the SOE-government distance. We take advantage of the fact that, being worried about potential wars with the U.S. and the U.S.S.R. during the 1960s and 1970s, China relocated many SOEs to her hinterland. This migration of firms is called the Third Front Construction program (TFC, see online Appendix

I), which covered a large area in China. The relocation sites were chosen to be far away from external threats. It is implausible that, other than through the channel of the distance to the government, the TFC affiliation would affect SOE decentralization three to four decades later—after all, China's central leadership had changed several times, and the new leaders had distinct objectives. Because TFC covered 13 provinces and 5.9% of firms in our sample, this instrument is likely a relevant one. We thus construct a dummy variable TFC, which is one if a firm was established during the TFC period (i.e. 1964-1966, and 1969-1971) and in the TFC regions.

A key concern for a valid IV is that it is correlated with the unobserved factors behind the outcome. One way to shed light on (but not prove) the excludability is to examine if the IV is related to other known determinants of the outcome in sensible ways (Altonji *et al*., 2005). To see this, we regress TFC on other covariates in the decentralization decision (see Table J-1 of the online Appendix J). The coefficients of the firm size, full state ownership, and income are statistically significant, not surprisingly since we know that TFC moved larger SOEs to inland (and thus lower-income) regions. In contrast, the coefficients of the key current determinants of decentralization, profitability and *Firm Importance*, are statistically insignificant. These results along with the historical origin of TFC suggest that TFC is indeed likely excludable.

Columns (3) to (4) of Table 4 report the IV regression results based on the 2SLS specification.[29] Our IV seems to be relevant. In the first stage (column (3)), TFC has a positive and statistically significant effect on the distance: a TFC affiliation increases the SOE-oversight-government distance by 24 log points. Moreover, based on the Anderson-Rubin test under the 2SLS model with the clustered standard errors (column (4)), which provide valid inference on the coefficient of the

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[29] The results based on the IV-Probit specification are qualitatively similar to the 2SLS results.

endogenous variable even in the presence of a weak instrument (Finlay and Magnusson, 2009), the test statistic is significantly different from zero with a p-value of 0.0504. The 90% confidence interval is [0.005, 0.054], suggesting that the coefficient of distance is positive and statistically significant even if the IV is weak.

In the second-stage, the coefficient of distance remains positive and statistically significant. Once corrected for endogeneity, the distance's coefficient increases from 0.0054 to 0.024. The larger magnitude of the IV estimate relative to the OLS/probit estimate likely reflects the endogeneity bias associated with the latter. In the online Appendix J, we examine whether the difference in the magnitudes could reflect special characteristics of the complier group since the IV estimate reflects the local average treatment effect of that group (Angrist and Pischke, 2009). We show that the compliers group (i.e., the SOEs that change their distance statuses due to the switch on TFC) is a small share of the population, but the distributions of the characteristics of the complier group and the population are similar (Table J-2). These two findings offer cautious optimism about extending the IV estimate to the population.

5. Distinguishing between Alternative Hypotheses

Now we try to distinguish between the alternative hypotheses about decentralization by allowing the distance-decentralization link to depend on communication costs, firm-performance heterogeneity, and rents.

Measurements. We proxy communication costs by the provincial road mileage per capita. We proxy firm-performance heterogeneity by measures of the dispersion of firm performance within the firm's industry-year cell. Since we use three methods to compute TFP (i.e., the OLS production function, the Olley-Pakes, and the index function methods; see Appendix K), we present three sets of results when we interact the distance with the TFP dispersion. In addition, we also present the dispersion in return on sales (ROS, that is, before-tax profit over sales), a more transparent and intuitive measure.

Communication costs. Based on columns (1) and (2) in Panel A of Table 5, the effect of distance on decentralization is statistically significantly higher when the road density is lower.[30] Increasing the road density at the mean by one SD is associated with a reduction in $\frac{\partial Decen}{\partial Distance}$ by 28 percent. This supports both the Hayek and the oversight agency conjectures (see Table 2).

Firm-performance heterogeneity. Relative to the other conjectures, the Hayek conjecture increases its appeal once considering the interaction of the distance with firm-performance heterogeneity. The results in columns (3) to (6) show robustly that the distance-decentralization link is significantly stronger when firm-performance heterogeneity is greater. Based on the estimates, increasing the dispersion of industry TFP (by the Olley-Pakes method) by one SD at the mean would increase $\frac{\partial Decen}{\partial Distance}$ by 23 percent, a large effect. This confirms a unique prediction of the Hayek conjecture (see Table 2).

The commanding heights conjecture. To capture strategic concerns for certain types of SOEs, we first construct a subsample of strategic industries (denoted as Strategic-Industries-I (or II), see online Appendix L for details). We then interact the distance measure with the Strategic-Industries-I (or II) dummy, and re-estimate the baseline model with the pooled sample and by oversight.

Consistent with the commanding heights conjecture, the coefficient of the interaction term between Strategic-Industries-I and distance is negative and statistically significant for central SOEs (Panel B of Table 5). In contrast, it is statistically insignificant for the non-central SOEs.[31] The result is robust with Strategic-Industries-II. Also consistent with the commanding heights conjecture, the share of SOEs that were decentralized is higher for the non-strategic than for

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[30] Columns (1) and (2) use the lagged road density and the road density in 1998 to see if the result is sensitive to the lagging structure of the road density.

[31] Result on provincial and municipal SOEs separately are similar and available upon request.

the strategic SOEs among those under the central government oversight: 16.7% (17.35) vs. 11.0% (12.1%) under Strategic-Industries-I (II).

When relying on the Strategic-Industry-I definition, the group of central strategic SOEs, 490 in 1998 and 407 in 2007, represents a non-trivial share of the Chinese industrial economy. Their relative importance in the sample industrial firms had dropped from 1998 to 2007 (see Table L-1): in terms of the share in the total number of firms, from 0.3% to 0.1%;[32] in terms of the share in the total number of employees, from 2.5% to 1.3%; in terms of the total value added, from 6.2% to 4.4%.[33]

Rents. To further shed light on the various conjectures, we interact the distance with the two proxies of rents: the local corruption level and the firm-level rents. To accommodate all the conjectures, we use two distance measures: that between the SOE and the oversight government, which is needed for the oversight agency conjecture; or that between the SOE and the *lower* government, which is needed for the local capture conjecture. We choose two proxies for corruption: the number of graft cases filed per thousand people (similar to Aghion et al., 2016); and the provincial share of entertainment and travelling costs over sales, which has been shown to be a good proxy for corruption at the local level (Cai, Fang and Xu, 2011).[34] We proxy the firm-level rents with the firm's profitability, its average wage level, and its market power (as measured by the Herfindahl index at its three-

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[32] This is based on calculation from our sample, that is, it excludes non-SOE firms with sales below 5 million Yuan. So the share can be roughly viewed as in large and medium industrial firms. See Table L-1 for these statistics.

[33] The relative importance of the central strategic SOEs in the sample SOEs, however, had increased significantly from 1998 to 2007: in terms of the share in the total number of SOEs, from 0.9% to 3.0%; in terms of the share in the total number of employees, from 4.7% to 8.9%; in terms of the total value added, from 14.1% to 23.5%.

[34] See Table 1 for definition. Some may question whether the provincial proxy of corruption would work for the central SOEs. We do not think this is an issue because the central SOEs are physically located in their specific provinces, and their rent-seeking tendency would be influenced by the local norms of corruption (Fisman and Miguel, 2007). We have tried dropping the central SOEs to ensure our proxy of local corruption is accurate, and the key results remain similar.

digit industry). The results are in Panel C of Table 5.

The results are against both the oversight agency and the local capture conjectures. In column (1), the coefficient of the distance to the oversight government is positive and statistically significant, consistent with both the Hayek and the oversight agency cost conjectures. The coefficient of the distance to the lower-level government is negative and statistically significant, consistent with both the Hayek and the local capture conjectures. However, in nine out of the ten columns, the coefficients of the interaction terms between the proxies of rents and the two distance measures are statistically insignificant, inconsistent with both the oversight agency and the local capture conjectures.[35]

Overall plausibility. Table 2 shows the match of the empirical results and the predictions from the conjectures. Among all the facts to be explained, the Hayek conjecture appears to explain the most about decentralization for the vast majority of the SOEs. The commanding heights conjecture contributes to understanding about central SOEs in strategic industries. Some key predictions of the oversight agency and the local capture conjectures are not confirmed empirically.

6. Conclusions

China's decentralization of SOEs provides a unique opportunity to test the implications of Hayek's insight on the importance of local information for designing economic systems. As the quote from Hayek suggests, when a society experiences 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 SOE and the original oversight government, as proxied by their physical distance, is associated with a greater likelihood of decentralization. Moreover, the positive effect of

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[35] The negative and statistically significant coefficient of the interaction term between the distance to the oversight government and lagged firm ROS is in fact opposite to what the oversight agency conjecture predicts.

distance on decentralization is larger where SOE performance is more heterogeneous and the communication costs are higher. Our findings suggest that Hayek's insight on local information is indeed a key for understanding the organization of firms in general and economic systems in particular. Our findings also suggest that when the central government decides to control the commanding heights, the Hayek conjecture loses much of its explanatory power. This group of commanding-heights SOEs represented about five percent of industrial output in China. The Chinese experience of managing its SOEs thus demonstrates the dual goals of the government: efficiency and controlling commanding heights. We also consider but do not find strong support for the agency-costs-based explanations.

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Table 1. Variable Descriptions

Firm-level and industry-level variables	
Decentralized	Dummy variable which equals to one if a firm's affiliation-level is changed to a lower level of the government, zero otherwise. Source: Annual Survey of Industrial Firms (ASIF).
Different city	Dummy variable which equals to one if being located in a different city from the seat of the government with which it is affiliated, and zero otherwise.
Distance	The logarithm of the physical distance (in kilometers) between the firm and the seat of the oversight government. 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 provincial SOEs, and distance from the largest county-level city within the same municipality (except for the municipal seat) for municipal SOEs. Source: ASIF, and GIS.
Restructured	Dummy variable equals to one if the state share falls below 30% or exit from the database.
Firm asset	Log of firm asset.
ROS	Ratio of before-tax profit on sales, winsorized at tail 0.5 percent.
TFP	Total factor productivity (see online Appendix K for details). Three methods are used, including OLS, Olley-Pakes and the index number.
Firm importance	Ratio of the SOE's valued added to the total value added of the SOEs under the same oversight government.
Fully state-owned	Dummy variable which equals to one if the state share in the firm's equity equals 100%.
Average wage	Log of the average wage (in thousand yuan) within the firm.
Industry-level HHI	Herfindahl index at the 3-digit industry level.
TFP dispersion	Standard deviation of the firm's TFP in the 3-digit-industry-year level.
ROS dispersion	Standard deviation of the firm's ROS in the 3-digit-industry-year level.
TFC	Dummy variable equals to one if the firm was established during 1964-1966 or 1969-1971 in the *Third Frond Construction Area* (see online Appendix I).

Fiscal, Economic and Institutional Variables at Province, Municipal and County levels	
Provincial (municipal, county) GDP per capita	Log of annual per capita GDP in the firm's province (municipality, or county), in constant price of year 2000. Source: China Statistical Yearbooks (CSYs) (1998-2007).
Provincial state sector share	Share of SOE employment in total urban employment in the firm's province. Source: CSYs.
Provincial unemp. rate	The annual urban unemployment rate in the firm's province. Source: CSYs.
Provincial (municipal, county) fiscal revenue per capita	Log of the annual per capita fiscal revenue in the firm's province (municipality, and county), in constant price of year 2000. Source: CSYs and Financial and Statistical Materials of Municipalities, Cities, and Counties (FSMPCCs) (1998-2007).
Provincial (municipal, county) fiscal autonomy	The ratio of fiscal revenue to fiscal expenditure in the firm's province (municipality, and county). Source: CSYs and FSMPCCs.
Road mileage	Road distance (in kilometers) per thousand people at the province level. Different levels of roads and railway mileage are translated into the equivalent of second-level road mileage according to transport capacity. Source: CSYs and FSMPCCs.
Entertainment and travel cost	The average ratio of the firm's entertainment and travel cost to sales in a province. A higher value means more corruption. Source: World Bank Enterprises Survey for China, 2005.
Corruption cases	Graft cases filed per thousand people. Source: Procuratorial Yearbooks of China.

Table 2. Summary of Predictions from Key Hypotheses

Predictions from the hypotheses	Hayek Information	Commanding heights	Oversight agency	Local capture
Distance to the oversight gov't ($Dis_{OS\text{-}gov}$)	Positive [YES]		Positive [YES]	
$Dis_{OS\text{-}gov}$ × firm heterogeneity	Positive [YES]			
$Dis_{OS\text{-}gov}$ × communication costs	Positive [YES]		Positive [YES]	
$Dis_{OS\text{-}gov}$ × strategic industries × central gov't		Negative [YES]		
$Dis_{OS\text{-}gov}$ × rents			Positive [NO]	
Distance to lower government (Dis_{Lower})	Negative [YES]			Negative [YES]
Dis_{Lower} × rents				Negative [NO]

Note.

[YES]: Results consistent with predictions.

[NO]: Results inconsistent with predictions.

Empty cell: no prediction.

Table 3. Determination of Decentralization

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Baseline Results		Probit			Hazard	Multinomial Logit	
	Whole Sample	Central SOEs	Provincial SOEs	Municipal SOEs	Whole Sample	Whole Sample	
		Dependent variable: $Decentralized_{(t)}$				$Decentralized_{(t)}$	$Restructured_{(t)}$
Distance $_{lag}$	0.0054	0.0047	0.0037	0.0044	0.3059	0.0053	0.0011
	(0.0007)	(0.0017)	(0.0008)	(0.0005)	(0.0434)	(0.0008)	(0.0010)
Log(firm asset $_{lag}$)	-0.0029	-0.0049	-0.0030	-0.0017	-0.1454	-0.0025	-0.0109
	(0.0005)	(0.0009)	(0.0010)	(0.0009)	(0.0320)	(0.0006)	(0.0011)
ROS $_{lag}$	-0.0102	-0.0171	-0.0129	-0.0044	-0.5428	-0.0074	-0.0683
	(0.0015)	(0.0065)	(0.0029)	(0.0017)	(0.0801)	(0.0015)	(0.0065)
Firm importance $_{lag}$	-0.0466	-0.2243	-0.1461	-0.0248	-2.5841	-0.0399	-0.0716
	(0.0203)	(0.5033)	(0.1049)	(0.0152)	(1.1532)	(0.0187)	(0.0200)
Fully state-owned $_{lag}$	-0.0069	-0.0129	-0.0147	0.0001	-0.3387	-0.0059	-0.0264
	(0.0013)	(0.0051)	(0.0023)	(0.0013)	(0.0723)	(0.0013)	(0.0045)
GDP per capita $_{lag}$	0.0061	-0.0026	-0.0094	0.0620	0.3009	0.0045	0.0007
	(0.0044)	(0.0050)	(0.0331)	(0.0224)	(0.2421)	(0.0043)	(0.0154)
State sector share $_{lag}$	-0.0062	-0.0958	0.0765	0.0620	-0.2776	-0.0140	0.2086
	(0.0309)	(0.0239)	(0.0625)	(0.0470)	(1.6584)	(0.0270)	(0.1069)
Unemployment rate $_{lag}$	-0.1128	0.2042	-0.1744	-0.1104	-7.2925	-0.0558	-0.8459
	(0.1100)	(0.2195)	(0.4464)	(0.2980)	(7.1847)	(0.1222)	(0.4227)
gov't, year & industry dummy	YES	YES	YES	YES	YES	YES	YES
Observations	69,785	11,171	20,356	38,258	69,785	83,700	83,700
Pseudo R-squared	0.115	0.085	0.111	0.189	0.077		
Panel B. Robustness checks - Probit	Central SOEs	Provincial SOEs	Municipal SOEs	Full state ownership	Partial state ownership		
Distance $_{lag}$	0.0045	0.0025	0.0047	0.0062	0.0046		
	(0.0017)	(0.0010)	(0.0006)	(0.0008)	(0.0014)		
Controls	YES	YES	YES	YES	YES		
Additional controls	YES	YES	YES				
Observations	11,171	19,562	32,974	54,161	15,624		
Pseudo R-squared	0.086	0.116	0.194	0.113	0.143		

Note: Standard errors clustered at the oversight-government level are reported in the parentheses.

Columns (1)-(4) of **Panel A** report the marginal effect from the probit regressions. Column (5) reports the results from a Cox proportional hazard model. Columns (6)-(7) report results from a Multinomial Logit (MLogit) model: for each firm in year *t*, there are three possible outcomes, with "*neither restructured nor decentralized"* being the base. The two columns report the marginal effect of each explanatory variable on the probability of being *Decentralized* and being *Restructured*, respectively. When computing the lag of a variable, we use the average of its once- and twice-lagged values to take into account multiple periods' information. The samples used in the Probit and Mlogit specifications differ in two ways. First, for those eventually-restructured SOEs, the MLogit model contains observations in their first year after restructuring, while the Probit model does not. Second, the Mlogit model also includes the post-decentralization years for the central and provincial SOEs, because once decentralized, they still face the choice of being further decentralized (and being restructured).

Panel B performs robustness checks using the probit model. Columns (1)-(3) are the results for the subsamples of the central, the provincial, and the municipal SOEs, respectively, with *additional controls* for per capita GDP, fiscal revenue, and fiscal autonomy of both the incumbent oversight government and the lower-level government. Columns (4)-(5) use the subsamples of fully state-owned and of partially-privatized SOEs, respectively.

Table 4. Determinants of Decentralization: Placebo Test and Third Front Construction as IV

	Placebo test		2SLS	
	(1)	(2)	(3) 1st stage	(4) 2nd stage
	whole Sample	excluding small placebo city	*Distance*	*Decentralized*$_{(t)}$
Placebo Distance $_{lag}$	0.0005	0.0002		
	(0.0009)	(0.0012)		
Distance $_{lag}$				0.0240
				(0.0124)
TFC			0.2416	
			(0.1018)	
Controls	YES	YES	YES	YES
Observations	69,785	56,742	69,785	69,785
Kleibergen-Paap F statistic			5.627	
Anderson-Rubin F statistic				3.83
(P value)				(0.0504)
90% confidence interval				[0.0050, 0.0537]

Note: Standard errors clustered at the oversight-government level are reported in the parentheses.

Columns (1)-(2) report results on Placebo distance using the probit model. Placebo distance is defined as the distance from Shanghai for the central SOEs, the distance from the largest city within the province (except for the provincial capital) for provincial SOEs, and the distance from the largest county-level city within the municipality (except for the municipal seat) for municipal SOEs. Column (2) excludes the provincial and municipal SOEs located in the same jurisdiction with the jurisdictional capital as the sole agglomeration city. Columns (3)-(4) report results using TFC as the instrument. Column (3) reports the 1st stage results. Column (4) reports the linear probability IV estimates (i.e. 2SLS) and the associated test statistics. The control variables are the same as in Table 3.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A	Key indicators of communication costs or firm performance heterogeneity					
	Province road mileages $_{lag}$	*Province road mileages* $_{1998}$	*ROS dispersion* $_{lag}$	*TFP OLS dispersion* $_{lag}$	*TFP Olley-Pakes dispersion* $_{lag}$	*TFP Index Number dispersion* $_{lag}$
Distance $_{lag}$	0.0086	0.0077	0.0032	0.0016	-0.0021	0.0009
	(0.0010)	(0.0011)	(0.0009)	(0.0019)	(0.0020)	(0.0018)
Distance $_{lag}$ × Key indicators	-0.0021	-0.0017	0.0117	0.0026	0.0048	0.0032
	(0.0004)	(0.0006)	(0.0045)	(0.0011)	(0.0012)	(0.0011)
Key indicators	0.0132	0.0113	-0.0654	-0.0116	-0.0152	-0.0141
	(0.0033)	(0.0040)	(0.0277)	(0.0059)	(0.0066)	(0.0061)
Controls	YES	YES	YES	YES	YES	YES
Observations	69,785	69,785	69,785	69,784	61,660	69,784
Pseudo R-squared	0.118	0.116	0.116	0.116	0.114	0.116
Panel B	Interactions of distance with Strategic Industries					
	Whole sample	Central SOE	Provincial & Municipal SOE	Whole sample	Central SOE	Provincial & Municipal SOE
Distance $_{lag}$	0.0055	0.0048	0.0046	0.0056	0.0056	0.0046
	(0.0007)	(0.0017)	(0.0005)	(0.0006)	(0.0017)	(0.0005)
Strategic industries I ×Distance $_{lag}$	-0.0011	-0.0047	0.0008			
	(0.0007)	(0.0016)	(0.0011)			
Strategic industries II ×Distance $_{lag}$				-0.0011	-0.0052	0.0002
				(0.0006)	(0.0018)	(0.0007)
Controls	YES	YES	YES	YES	YES	YES
Observations	69,785	11,171	58,614	69,785	11,171	58,614
Pseudo R-squared	0.116	0.088	0.135	0.115	0.087	0.134
Panel C	Key indicators of corruption being:			Key Indicators of firm rents being:		
	Entertainment and travel cost	*Corruption cases* $_{lag}$	*Firm ROS* $_{lag}$	*Firm average wage* $_{lag}$	*Industry-level HHI* $_{lag}$	
Distance to oversight gov $_{lag}$	0.0055	0.0082	0.0048	0.0054	0.0060	0.0056
	(0.0007)	(0.0022)	(0.0016)	(0.0006)	(0.0011)	(0.0006)
Distance to oversight gov $_{lag}$×Key indicators		-0.2031	0.0140	-0.0074	-0.0002	-0.0082
		(0.1520)	(0.0465)	(0.0033)	(0.0005)	(0.0229)
Distance to Lower gov $_{lag}$	-0.0010	0.0006	0.0009	-0.0010	-0.0011	-0.0011
	(0.0004)	(0.0012)	(0.0022)	(0.0003)	(0.0010)	(0.0006)
Distance to Lower gov $_{lag}$×Key indicators		-0.1177	-0.0608	-0.0008	-0.0001	0.0024
		(0.0753)	(0.0620)	(0.0009)	(0.0004)	(0.0305)
Key indicators		2.1216	-0.0647	0.0002	-0.0032	0.0586
		(0.9606)	(0.3534)	(0.0011)	(0.0021)	(0.0591)
Controls	YES	YES	YES	YES	YES	YES
Observations	69,785	69,785	66,173	69,785	69,157	69,785
Pseudo R-squared	0.116	0.116	0.117	0.116	0.117	0.116

Note: Standard errors clustered at the oversight-government level are reported in the parentheses.

This table reports the marginal effect from Probit regressions. The control variables are the same as in Table 3.

In Panel B, Strategic industries **I** includes: (1) Oil and gas, petroleum; (2) Nuclear fuel, aviation and aerospace, arms and ammunition; (3) Electricity, heat, gas, and water supply. Strategic industries **II** includes: Strategic industries **I**, plus (4) Automobile, locomotive, and ship. See Appendix L for details about the construction of strategic industries.