

Institutions and Organizational Structure: The Case of State-Owned Corporate Pyramids*

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Abstract

Pyramidal organizational structure is wide spread around the world. This paper considers an explanation of pyramids built by the state: separating firms from political interferences. Our empirical results based on hand-collected data of 742 local government owned business groups generally support this political cost hypothesis. The evidence from survey among executives and officials confirm a negative association between the extent of pyramids and that of government intervention of firm decisions. In addition, government owners build more extensive corporate pyramids when firm managers are subject to greater market and legal discipline, indicating that managerial agency problems constrain the extent of pyramids. We also find that managerial professionalism and firm performance measures are higher when firms are associated with more extensive pyramids. These aspects of state-owned pyramids complement recent studies focusing on private ownership.

Keywords: Political Cost; Pyramid; China

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1. Introduction

Pyramid-like organizational structures are commonplace (La Porta, Lopez-de-Silanes, and Shleifer, 1999; Claessens, Djankov, and Lang, 2000; Khanna and Yafeh, 2007). On the apex of a pyramid sits a controlling owner who controls a firm indirectly through layers of intermediate companies. So far the literature focuses on privately controlled pyramids. Much less is known about corporate pyramids formed by the state. Like privately controlled pyramids, state owned corporate pyramids are found in both developing and developed economies. They are often observed in transitional economies such as China, Hungary (Voska, 1993), Russia (Chernykh, 2008), Czech Republic and Slovak Republic (OECD, 2005). In Asia, state owned pyramidal groups are found in India (Phatak, 1968), Malaysia, the Philippines, and Singapore (Claessens, Djankov, and Lang, 2000). In developed Europe, Austria (OECD, 2005) and France (de Jong et al., 2010) are reported to have significant presence of pyramidal state controlled business groups.

In this study, we track the pyramidal structures of a comprehensive sample of 742 new initial public offering (IPO) firms that are majority-owned by various local governments in China. Our empirical results show that local governments form more extensive pyramids on top of their listed companies when they are less burdened with unemployment or fiscal problems, and when their spending in long-term objectives is higher. This suggests that the governments' weaker incentive to impose a policy burden on firms and stronger desire for long-term economic achievements is associated with more enterprise autonomy and more extensive pyramidal structures. The evidence is consistent with a political cost argument that

pyramids separate firms from government interferences (Qian, 1996; Qian and Wu, 2003). We also find that pyramidal structures are more extensive when legal and market disciplines imposed on managers are stronger, indicating that stronger institutions contain agency problem of empowered management. Consistent with our conjecture that pyramids separate firms from government intervention, we find significant positive associations between the number of pyramidal layers and the extent of the firm's managerial professionalism, employment efficiency, total factor productivity, and profitability. Finally, we conduct a survey among senior executives of state owned enterprises (SOEs) and government officials in charge of state asset management and confirm that firm decision rights are more delegated to managers of firms associated with pyramid structures than to managers of firms directly linked to the government.

These results of the state-owned pyramids are interestingly different from those in prior studies based on private ownership, in which negative performance effects are typically found (Claessens et al., 2002; La Porta et al., 2002; Lemmon and Lins, 2003). Moreover, in contrast with the prior findings that pyramids are typically found in weak institutional environments, we find that organizational pyramids are more extensive in the stronger institutional regions in China. These differences, as will be discussed later in details, are critically related to the additional political cost concern prevailed in SOEs.

Our understanding of organizational pyramids is emerging (Khanna and Yafeh, 2007). Earlier papers argue that pyramidal structures can help a controlling owner consume private benefits that include expropriating wealth from minority shareholders (Bebchuk, 1999; Bebchuk, Kraakman, and Triantis, 2000; Bertrand, Mehta, and Mullainathan, 2002; Morck, Wolfenzon, and Yeung, 2004; Wolfenzon, 1999). More recent studies find countervailing

advantages of the structures, including relieving affiliated firms' financial constraints (Almeida and Wolfenzon, 2006; Almeida, Park, Subrahmanyam, and Wolfenzon, forthcoming) and facilitating investments (Masulis, Pham, and Zein, 2009). The existence of pyramidal corporate structures can also be influenced by tax policies (Morck, 2005; Morck and Yeung, 2005). We add to this literature by providing an additional rationale for the pyramidal organizational structures.

Our paper is closely related to the literature concerning the partition and transfer of decision rights within an organization. This literature emphasizes information cost as an important determinant of allocation of authority within an organization (Aghion and Tirole, 1997; Prat, 2005). We argue that the information opacity associated with the pyramid structure can be a device of credible delegation of firm decision rights.

China's state ownership and institutional setting provide several important advantages for testing our hypotheses. First, state assets and their controlling ownership are not freely transferable across firm boundaries. Due to this ownership restriction, state owners almost always possess 100 percent of the equity ownership of the intermediate companies along vertical pyramids, precluding equity financing as the primary reason for a pyramidal structure. Second, the ownership transfer restriction likely induces an alternative device to divide decision rights. A state owner that does not possess rights to sell is unable to use outright sales as a means to transfer decision rights in the firm to a third party, as is typical in a market economy (Burkart, Gromb, and Panunzi, 1997; Baker, Gibbson, and Murphy, 1999). When conditions arise making autonomy desirable, the owner will likely consider another method, such as a pyramid, that achieves division of decision rights short of actual transfer of ownership. Third, China's young market economy allows us to investigate corporate

pyramids close to their inception, during a time when decentralization has been a chief theme of China's enterprise and market reforms (Grove, Hong, McMillan, and Naughton, 1994; Brandt and Zhu, 2000; Maskin, Qian, and Xu, 2000). Fourth, China's diverse markets and geographic regions provide sufficient variation in institutional settings to facilitate the measurement of controlling owners' (local governments') incentives to decentralize decision power to listed firm managers through pyramidal organizational structures.

The remainder of the paper proceeds as follows. Section 2 discusses the literature and develops our hypotheses on the emergence of corporate pyramids in China. The empirical results on the determinants of corporate pyramids are reported in Section 3, and the evidence on the associations between corporate pyramids and firm performance measures are presented in Section 4. Section 5 presents the survey results. Section 6 concludes the paper.

2. Development of Hypotheses

In this section we discuss the literature on decision right allocation within organizations, and the emergence and organization of China's modern enterprises. We then discuss key institutional factors that influence local governments' incentives for organizing their enterprises into pyramids, and the association between pyramids and firm efficiency.

2.1. Division of power within an organization

The importance of organizational design in firm decision right allocation has been extensively discussed in the literature. An owner of a multi-segment firm can create an organizational structure that facilitates the delegation of decision rights within the organization. In this organization, as Williamson (1985) posits, the headquarters specialize in allocating human and financial capital among its various divisions while divisional managers

are given decision rights with respect to local activities. Such delegation can enhance efficiency as it co-locates local knowledge (which cannot be transferred without cost) and decision rights, and provides local managers high-power incentives (Jensen and Meckling, 1992). Stein (2002) shows that when information is costly to transmit from the divisional managers to the headquarters, a decentralized decision structure is more likely to be adopted than is a hierarchical structure.

Given decentralization is desirable, how can it be achieved credibly? It is not sufficient to simply instruct divisional managers to make the decisions, because ex post renegeing/intervention is easy for headquarter managers while costly to divisional managers. A key factor affecting credibility is the cost of transmitting information. The role of information cost in the credible transfer of decision rights is modeled in several papers. Cremer (1995) shows that, in the context of arm's length relationships, lower information cost makes it more difficult to get the principal to commit not to intervene. As a result, the incentive of the agent is weakened, leading to counterproductive activities. Aghion and Tirole (1997) also consider the role of information in the delegation of authority. In their model, delegating formal authority increases the agent's initiative. However, the empowered manager may act for his/her self-interest at the expense of the principal. Whether the principle will delegate the formal authority depends on how informed he is about the agent's proposal and the cost of collecting the information. If the principal is informed, he will retain the authority. If the principal is uninformed, he will delegate the real authority to the agent even though the principal represents the formal authority. Prat (2005) further distinguishes two types of information that a principal can have about his agent, information about the consequences of the agent's action and information about the action itself. He shows that the principal's

knowledge on consequences (such as performance outcomes) is beneficial to credible delegation, while transparency on actions (such as day-to-day decisions) can have detrimental effects. If the principal can observe the agent's activities, the agent will have an incentive to behave in a conformist manner.

These above studies emphasize creating or maintaining information barriers between the headquarters and divisions as devices to enforce decision rules within organizations. Notwithstanding the theoretical development on this subject, few empirical tests exist. Among the few, Baker (1992) and Rajan and Wulf (2006) both find that large U.S. conglomerates over time have adopted more decentralized structures in which divisional managers are given more decision rights than are in the past.

2.2. Division of power within a state-owned organization

Division of power within a state-owned organization poses additional interesting issues. The owner of an SOE, a governmental agency, constrained by its lack of capability and information, typically will allow SOE managers some decision rights. Such empowerment will induce high-power incentive (Williamson, 1985) and improve productivity as will do in a private firm. However, substantial gain from the enterprise autonomy may be expropriated by the empowered managers. This agency problem can be severe in the SOE, because unlike the private firm, the SOE does not have a "true" owner to look after his interest.

As pointed out by Qian (1996), the agency problem is not the only concern. A basic purpose of empowering SOE managers is reducing government interferences and associated political cost. In other words, a state owned firm is burdened by the costs of two types of conflict of interest. The agency cost is associated with the incentive for a firm manager to

expropriate wealth from the firm. The political cost is associated with the incentive for the government to intervene the firm. All else equal, the optimal division of power between the government and the manager should be the point equalizing the marginal agency cost and the marginal political cost.

2.3. Decentralization and state owned pyramids

Suppose decentralization of firm decision rights is desirable by the government, we propose that the pyramidal organizational structure is a device for the government to credibly decentralize firm decisions without transferring firm ownership, i.e., delegating real authority without transferring formal authority (Aghion and Tirole, 1997). Compared with a policy or verbal promise of not to intervene, introducing intermediate companies to separate the government from a publicly traded company can help the government to show commitment of non-intervention.

Of course, the government has the power of intervening firm managers any time, in particular through the Party system and personnel control. The commitment associated with the pyramidal organizational structure can be more credible than the policy order, because the complex organizational structure makes it costly for the government to obtain timely information to intervene the day-to-day operations of the firm (Prat, 2005). The information at the bottom of the pyramid has to travel through the intermediate layer(s) before reaching the top, and the intermediate layer managers, constrained by their own inefficiencies and conflicts of interest, may not deliver timely and undistorted information to the top or monitor the bottom layer firm on behalf of the government on the top. Ironically, an advantage of an extensive vertical pyramid is that it is highly bureaucratic, making information transmission

highly ineffective, an important condition for credible decentralization as emphasized in Cremer (1995), Aghion and Tirole (1997), and Baker, Gibbson and Murphy (1999).

Moreover, Shirley and Walsh (2001) discuss the potential effect of setting up a corporation on government intervention: *“if an enterprise is run as a department of a ministry, with its managers directly appointed by a minister of chief executive, then political interventions will be easy and common. Alternatively, if the government acts as the dominant shareholder of a largely independent firm, acting through a board of directors, political intervention may be possible but is more costly and more transparent.”*

Given the higher information and monitoring costs, the government would not use the pyramidal structure if it worries about losing control of the firm. In other words, the government would use the more informational costly pyramidal structure if it wants to credibly delegate control to firm managers.

2.4. Formation of state-owned pyramidal groups in China

Before 1990, China’s state assets were managed and operated by a system of Soviet style central planning. Since the 1990s this country witnessed a wave of business group formation in which state assets were separate from governmental agencies, spun off from parent SOEs and injected into their newly set up subsidiaries.¹ Keister (2000) provides an excellent description of the business groups in China and their roles in the country’s economic development. The reform and the associated organizational transformation represent the Chinese government’s strive to resolve serious conflicts of interest and low efficiency within

¹ The organizational transformation is typically through several rounds of joint ventures established by SOEs and their subsidiaries with other government and SOE partners (Qian, 1995; Tenev, Zhang, and Brefort, 2002; Garnaut et al., 2005). A subsidiary may further spin off assets into another newly created subsidiary, and so on. The system of state-owned business groups is called “Multi-layer Legal Person System (多级法人制)” (Wu, 2005).

the state enterprise system. A general feature of the reform is transferring down decision rights of SOEs from the central government to local governments. Although the central government still have intervened local government and firm decisions regularly, it has not intervened to the extent of overwhelming the general trend of decentralization.

Since the creation of the stock markets in Shanghai and Shenzhen in the early 1990s, with the newly gained power local governments have spun out productive assets from their SOEs, organized them into corporations, and then partially privatized some of the corporations through IPOs of minority portions of the corporate shares. Over 1,000 companies had gone public in this way by 2001, and most of these firms remain majority-owned by local governments.

A local government can choose between two different ways to organize its ownership and control structure of a publicly traded company. One way is to hold the shares of the newly listed company directly through a state asset management *agency*. In this case the ownership structure of the company is simple: the local government directly owns a controlling stake while minority equity investors collectively own the rest (see Figure 1 for an example). Alternatively, the local government can indirectly own the listed company through a pyramid consisting of one to several intermediate companies. If there is only one intermediate company, it is usually a parent SOE or a state asset management *company*, which specializes in managing the assets, while the state asset management agency at the apex of the pyramid continues to serve the government administrative and regulatory functions (see Figure 2). However, if there are multiple intermediate layers, the local government has most likely transferred the control rights of the listed firm to a large state-owned enterprise group with multiple layers of companies. In either case, these intermediate pyramidal layers are non-

publicly traded SOEs solely owned by the local government or jointly owned by the local government and other government agencies. Non-government equity participation of the intermediate SOEs is uncommon, due to state regulations prohibiting free dilution of state ownership. The chain of intermediate companies is typically formed over a period prior to the IPO, through a series of restructuring of SOE assets. To illustrate the reform and the business group formation process, Appendix I summarizes state asset management system reform of Shanghai and associated creation of Shanghai Construction Group.

2.5. Determinants of pyramids

We focus on the possibility that a corporate pyramid serves as a device for a local government to delegate control rights to firm managers. The decision of passing down firm decision rights is made when the local government decides whether to have a state asset management agency directly control the listed firm or to delegate its control to a state asset management company or SOE group. By choosing the latter option, the additional intermediate layers make it more difficult for the government to intervene in the firm's decision making process as discussed before.

If the above argument holds, we are in a position to test the roles of political cost and agency cost in state pyramid formation. To help evaluating political cost, we analyze when and to what extent the government will relinquish the control of the firms. For example, when the government is burdened with poor fiscal conditions or high unemployment, it has a higher incentive to intervene firm decisions and therefore higher political cost. By contrast, when the government is subject to smaller local development pressure and/or higher institutional discipline, its interest would be more aligned with the firms, i.e., smaller political cost. On agency cost, strong market discipline and legal enforcement work to align the interests of the

managers with the owners of the firms. Therefore, under such a context it would be in the government's best interest to delegate its firm decision rights to firm management. By giving decision rights to managers who possess professional skills and local knowledge, decentralization enhances firm decision making efficiency (Jensen and Meckling, 1992), which is important in a highly competitive market environment.

Therefore, we expect that the degree of firm decision right decentralization depends on the local government's incentives to intervene firm decisions and the institutional factors that collectively affect market and legal discipline. The complexity of corporate pyramidal layers linked to a publicly traded company, a proxy for credible decision right delegation, should vary systematically with these government incentives and institutional factors. Accordingly, we have the following two sets of testable hypotheses:

H1: The weaker the local government's incentive to intervene firm decisions, the more extensive is the firm's pyramidal structure.

H2: The stronger the market and legal institutions under which the firm operates, the more extensive is the firm's pyramidal structure.

2.6. Pyramids and efficiency

If pyramidal layers serve as a device to separate firms from political interferences, we should see that firms under more complex pyramidal structures operate with higher managerial professionalism and operating efficiency relative to firms under less complex structures. We therefore have the following hypothesis:

H3: The number of layers in a firm's pyramidal structure is positively associated with post-IPO managerial professionalism and operating efficiency.

However, given the degree to which delegation and the complexity of pyramidal structure are presumably determined by the political and economic institutions of the regions in which the firms operate, it remains an empirical issue whether the number of layers will be associated with performance and operating efficiency after taking into account institutional effects. We will attempt to control for this issue when performing the empirical analysis in the next section.

Note that we avoid claiming causality in this hypothesis. Although pyramids, as we have argued, could insulate firm managers from government interferences and hence improving efficiency and professionalism, it could also be that efficient managers have sufficient bargaining power to compel the state to let them siphon off firm cashflows through the pyramid structures, as part of the rents their talent is due in a competitive setting.

3. Empirical Results – Determinants of Corporate Pyramids

3.1. The sample

Since 2001, publicly traded companies in China have been required to disclose detailed ownership information on their controlling shareholders in annual reports, including the structures of pyramidal chains. However, ideally we would examine the ownership and organizational structures of these companies around their initial public offering, when these structures are initially determined. We therefore trace the ownership and organizational structures of each company traded on the Shanghai or Shenzhen Stock Exchanges back to the IPO year, based on the information disclosed in the 2001 annual report and other supplementary sources, including company prospectus and media reports.² If there is no change in the controlling owner between a company's IPO year and 2001, we consider the

² Survivorship bias is unlikely a concern because no firm is de-listed prior to 2001.

ownership structure to have remained the same since the IPO, unless there is supplementary information indicating a change in ownership structure.³ If there is a change in a controlling shareholder, we identify the controlling shareholder and the ownership structure of the IPO year from the IPO prospectus, media reports, and the websites of the company and its affiliated companies. Most listed SOEs are restructured and spun off from parent SOEs prior to their IPOs. The restructuring processes are disclosed in IPO prospectuses, which also provide us information about the identities of ultimate shareholders.

To facilitate our tests on the effects of regional political and economic institutions on ultimate owners' decisions to form pyramids, and hence on the decentralization of firm decisions, we focus on firms controlled by provincial or county governments. From the complete list of 1,140 IPO firms in China during 1993 through 2001, we exclude firms controlled by the central government (14% of total population), private owners (5%), collectives (4%), other owner types (5%) including the military, public universities, public research institutes, financial intermediaries, and unions, and firms whose ultimate owners cannot be identified (3%). We also exclude firms whose ownership or financial data are unavailable (4%). Our final sample, as described in Table 1, consists of 742 local government-controlled firms, representing 65% of all IPO firms in China during 1993 through 2001. As can be seen in Table 1, the year-by-year coverage of the sample is quite representative, covering the majority of IPOs in almost all of the years.

³ It is possible that, subsequent to IPO, a controlling owner reorganized the company's ownership/organizational structure without changing his/her controlling owner status. Using 2001 data to construct the IPO-year pyramidal structure would introduce measurement bias. As a diagnostic check, we rerun key regressions in this paper using observations solely from 2001 and find similar results.

3.2. Measuring the extent of corporate pyramids

For a given company, we identify all intermediate ownership chains connecting the company and its ultimate controlling owner. We measure the extent of pyramidal structure between the company and its controlling owner as the number of intermediate layers of the longest pyramidal chain in the case of multiple chains.

The examples below illustrate how we identify and measure the extent of pyramidal structures of Chinese listed firms. Changchai Company became publicly traded in 1994. Although publicly listed companies were not required to disclose their detailed organizational/ownership structures until 2001, Changchai Company actually reported its structure in the 1994 annual reports, showing that 66.67% of outstanding shares of Changchai Company was owned by Changzhou Bureau of State Assets Management, a government agency in charge of state-owned assets in the Changzhou region. The same structure (Figure 1) is reported in the 2001 annual report, suggesting that there is no change in organizational structure. In this case, the ultimate owner is a local government and the extent of the pyramidal structure is one layer – the local government directly controls the company. In Figure 2, Guangzhou Pearl River Industrial Development Co. became publicly traded in 1993. Although its organizational structure was not disclosed in the IPO year, we assume that the firm's structure was the same as that in 2001 since we confirm that there has been no change in the controlling shareholder since the IPO. The 2001 annual report shows that the Company is directly owned by Guangzhou Pearl River Industrial Group and Guangzhou Bureau of State Asset Management through 61.51% and 6.83% of outstanding shares, respectively. In turn, Guangzhou Pearl River Industrial Group Co. is wholly owned by Guangzhou Bureau of State Assets Management. Thus, Guangzhou Bureau of State Assets Management, representing the

local government, is the ultimate owner and the number of pyramidal layers is two – the number of layers of the longest pyramidal chain.

Using this method, we systematically measure the extent of corporate pyramids controlling the sample publicly traded firms. Table 1 reports the sample firms' associated pyramidal layers. Note that our sample and the reported statistics include only the publicly traded firms but not the intermediate layer firms. Among the 742 firms, 200 (27%) are associated with only one corporate layer, suggesting that they are directly controlled by their ultimate controlling owners; 452 firms (61%) are linked with their controlling owners through two-layer pyramids; 82 firms (11%) are linked with three-layer pyramids, and 8 firms (1%) are linked with their controlling owners via pyramids of four or more layers. The year-by-year patterns are similar with the overall pattern, showing that most publicly traded local-government-controlled firms in China are associated with pyramidal structures. In particular, two-layer pyramids are most popular.

Despite the extensive use of pyramidal structures, the Chinese listed firms are associated with almost no voting rights and cash flow rights divergence, with a mean ratio of cash flow rights over voting rights of 0.97.⁴ The lack of separation between voting rights and cash flow rights of the Chinese pyramids reflects state regulations prohibiting local governments from freely selling shares of companies that they directly or indirectly control. Equity financing therefore is unlikely the primary cause of these pyramidal structures in China.

⁴ The level of the controlling owner's voting rights is determined as the ownership percentage at the weakest link of the pyramidal chain, while the owner's cash flow rights are estimated by multiplying the ownership percentage of each link across the chain (La Porta et al., 1999; Claessens et al., 2002).

3.3. Measuring the determinants of corporate pyramids

As discussed in Section 2, the extent of corporate pyramids and firm decision right division depend on the intervening incentives of controlling owners (local governments) and the degree of discipline provided by local markets and legal systems. Our local regions include all the Chinese provinces, and the autonomous regions and municipalities that are given provincial-level status. In this subsection, we discuss the regional-level empirical measures that capture local government short- and long-term incentives, and market and legal institutions. We also discuss their predicted relations with the extent of corporate pyramids. Appendix II provides the definitions of these variables and their data sources. Appendix III lists the values of these variables by region.

3.3.1. Local government incentives

We employ several regional-level variables as proxies for local governments' incentives to intervene firm decisions. The first is the unemployment rate of the region under the jurisdiction of the local government. The second is a dummy variable that equals one if the local government's fiscal balance (fiscal revenue minus government expenditure scaled by regional gross domestic product (GDP)) is within the top quartile of the sample, and zero otherwise. The third variable is the total research and development (R&D) expenditures of the local government for the entire region scaled by regional GDP, which proxies for the local government's long-term incentive. We also extract from these three variables a factor score that satisfies the Kaiser criterion using principal component analysis (PCA), and define the factor score as Aggregate Incentive. Table 2, Panel A shows that this factor score is found to be negatively correlated with unemployment and positively correlated with fiscal surplus and R&D expenditures, capturing 54% of the total variance of the principal component analysis.

To be consistent with our hypothesis, a controlling owner's (local government's) incentive for building pyramids should be negatively related to the regional unemployment rate, while positively related to the local government's fiscal conditions, R&D expenditures, and Aggregate Incentive (the factor score).

3.3.2. Market and legal institutions

We use six regional-level variables to proxy for the degree of development of China's regional market and legal environments. We obtain the first three variables from the National Economic Research Institute (NERI) Index of Marketization of China's provinces in Fan and Wang (2001), which was sponsored by NERI and the China Reform Foundation. The first of the three NERI variables is marketization index, which captures the overall level of market development, including the degree of market competition and government intervention. The second variable is a legal environment index that measures the development of market intermediaries and the level of protection of producers' and consumers' interests. The third is an index of property rights protection, which measures the economic significance of all the legal cases in the region relative to the region's GDP and the court's efficiency in resolving these cases. A more detailed description of these variables is presented in Appendix II.

The fourth variable is the deregulation index constructed by Demruger et al. (2002) that captures the extent of preferential policies granted to a region by the central government. A higher value for the deregulation index suggests more deregulation in the region's markets. The last two variables measure the influence of foreign investment and trade on regional market development: the region's annual flow of foreign direct investment scaled by the GDP of the region, FDI, captures the influence of foreign investment, and the total amount of the region's foreign imports and exports scaled by the GDP of the region, Openness, captures the

level of foreign trade. We also extract from these six variables a factor score using principal component analysis. As reported in Table 2 Panel A, this linear PCA factor score, termed Aggregate Institutions, is constructed to be positively correlated with the six institutional variables, capturing 74% of the total variance from the principal component analysis. The extent of a listed company's pyramiding is expected to be positively related to these above variables proxy for the extent of local market and legal discipline.

3.3.3. Control variables

Several control variables are included in the determinant model of corporate pyramids. Firm Size is defined as the natural logarithm of total assets. Growth is the market-to-book ratio, defined as market value of common equity divided by book value of equity, with the market price measured at the end of the first year during which the firm went public. Financial Leverage is total liabilities divided by total sales. These control variables are winsorized at the top 1% level to mitigate any effects of outliers. In addition, we include a regulatory industry dummy variable, which equals one if the firm operates in a heavily regulated sector (i.e., natural resources, electricity, finance, and public utilities), and zero otherwise. Data for constructing these variables are available from the China Stock Market and Accounting Research (CSMAR) database.

We expect that controlling owners of larger firms, higher growth firms, or firms more burdened by debt are more likely to decentralize decision rights to local managers because their firms are more difficult to manage, and thus they are associated with more extensive pyramidal layers than otherwise similar firms. Firms in heavily regulated sectors are less likely to be decentralized from the control of local governments and hence are likely to be associated with fewer pyramidal layers.

3.4. Regression results

We regress the number of pyramidal layers on the regional institutional variables and the control variables. Since the values of the dependent variable are discrete and bounded between 1 and 5, we employ the ordered probit model in the regression analysis. Because several of the regional variables are highly correlated, we include these variables one at a time in separate regressions. We lag FDI, Openness, Unemployment, and Fiscal Surplus by one year to mitigate potential endogeneity concerns. However, we have only one period's worth of data for the other institutional and incentive variables, restricting the values of these variables to be fixed across time. To control for any effects of regional wealth and growth, we include provincial GDP and GDP growth as additional independent variables. While the results of the institutional and incentive variables remain unchanged, we fail to find the effects of the two GDP variables to be significant. We therefore exclude them from the regression analysis. In addition to the regional variables and the control variables, we include a set of year dummy variables (not reported). There are a total of eight year dummy variables representing each year from 1994 to 2001. Each year dummy variable is set to one if the firm has gone public during that year, and zero otherwise.

Table 2, Panel B reports the regression results of the institutional variables. The six institutional variables and Aggregate Institutions are included separately in the regressions. The results show that the extent of a firm's pyramidal structure is significantly positively related to the degree of marketization, legal environment development, property rights protection, market deregulation, the amount of FDI and foreign trade, and Aggregate Institutions. In Panel C, we again test the government incentive variables and Aggregate Incentive separately in the regressions. As shown in columns (1) to (4), corporate pyramiding

is significantly negatively related to the unemployment rate, while positively related to the local government's fiscal health, R&D expenditures, and Aggregate Incentive. Column (5) reports the results of the regression including the two PCA factors, Aggregate Institutions and Aggregate Incentive. Both of these factor scores are positive and statistically significant, suggesting that the degree of firm decision right decentralization is significantly related to controlling owners' (local governments') incentives and the quality of local market and legal institutions.

Across the columns, the effects of the firm-level variables are as expected. Corporate pyramiding is positively related to Firm Size, Growth, and Financial Leverage, but is statistically significant only for Firm Size. Whether the firm belongs to a heavily regulatory sector does not matter to its pyramidal structure.

3.5. Endogeneity issues

We next perform several robustness checks. As discussed in the previous section, it could be that efficient managers have bargaining power with the government, leading to the pyramid structures of their firms. To investigate to what extent managerial professional traits might affect our other results, we include a managerial professionalism variable in the pyramid determinant regressions as an additional explanatory variable. The variable is defined as a dummy variable equal to one if the CEO or chairman of a company has CPA, lawyer certification, or above college education; and otherwise zero. The estimated coefficient of managerial professionalism is indeed significantly positive. After controlling for the effect of managerial professionalism, the effects of the institutional factors on pyramids remain significant.

Another concern is that the relation between pyramid and institution may be spurious.

For example, the total number of SOEs in a region with strong institution could be more than that in a weaker institutional region. If so, even a random allocation of firms across pyramids and direct ownership structures should produce the result that good institutions are associated with more pyramids. We find that the correlation coefficient between the institutions variable and the number of SOEs are indeed significantly positive (55%). However, the correlation coefficient between pyramid layer and the number of SOEs is negative (-5%). We include the number of SOEs as an additional independent variable in the regressions, finding either insignificant or significantly negative coefficients across the various regression specifications and the other results remain unchanged. We do not tabulate these robustness check results to save space.

The relations between corporate pyramiding and the regional factors studied are still subject to several other interpretations. Firms gaining autonomy might pressure governments to improve market and legal infrastructures. By contrast, local governments that are still tightly controlling their firms might obstruct legal and market development in the region to protect their interests (Shleifer and Vishny, 1994; Morck, Strangeland, and Yeung, 2000). To mitigate these reverse causality issues and other potential spurious correlations, we employ a two-staged regression analysis. In the first stage, Aggregate Institutions, the PCA factor of the six institutional variables, is regressed on three instrumental variables: Seaports, Commercial Ports, Leased Territories.

Seaports is the number of seaports in the region during our sample period. This variable measures each region's access to the sea, which should influence its institutional development. However, a region's sea accessibility, which is primarily determined by its geography, is not affected by the setting up of corporate pyramids in the region. The next two

variables, Commercial Ports and Leased Territories, capture the effects of foreign institutional development in a region. Commercial Ports is a dummy variable that equals one if the region had sea or inland river ports forced open to foreigners as treaty ports after the first Opium War in 1842 during the Qing Dynasty⁵, and zero otherwise. Similarly, Leased Territories is a dummy variable that equals one if the region leased territories to foreigners during the Qing Dynasty. Since these treaty ports and leased territories were opened to foreigners by exogenous forces over 100 years ago, corporate pyramids cannot have had any direct impact on their creation. However, like colonization, the establishment of ports and territories that were influenced or governed by foreigners was likely to have had a long-term impact on the development of local market and legal institutions (Acemoglu, Johnson, and Robinson, 2000). In addition, since the direct influence of the number of seaports, and the presence of leased ports and territories in a region, on firms' pyramiding decisions works through institutional development, these instrumental variables control not only for potential reverse causality but also for spurious correlation between the institutional factors and the pyramid variable.

In addition to the instrumental variables, we include firm control variables: size, leverage, growth, and the regulatory industry dummy variable. Because the first-stage regressions are run at the regional level, the firm control variables are calculated as regional averages.

⁵ After the first Opium War in 1842, China was forced to sign several treaties with foreigners to open treaty ports or set up leased territories. The period between 1842-1943 (or alternatively 1842-1949) was labeled by Fairbank and Goldman (1992) as the Treaty Century, which was characterized by increasing openness of China to foreign contact. These treaty ports are located in (1) Fujian, Guangdong, Shanghai, and Zhejiang (Treaty of Nanjing, 1842), (2) Fujian, Hainan, Hubei, Guangdong, Jiangsu, Liaoning, and Shandong (Treaty of Tianjin, 1858), (3) Tianjin and Xinjiang (Treaty of Beijing, 1860), (4) Anhui, Hubei, Guangxi, and Zhejiang (Treaty of Yantai, 1876), and (5) Chongqing, Hubei, and Zhejiang (Treaty of Maguan, 1895). The locations of the leased territories include Tianjin (1860), Shanghai (1845), Jiangsu (1863), Zhjiang (1896), Anhui (1877), Jiangxi (1861), Fujian (1861), Shandong (1889), Guangdong (1857), Chongqing (1901), and Hubei (1861).

Compared with Institutions, we are less concerned about endogeneity between the government incentive variables and firms' pyramiding decisions. For example, firms associated with less extensive pyramids (hence tighter control by local governments) should help to alleviate fiscal deficit and unemployment problems, which is not consistent with the findings in Table 2.

In the second stage, we employ the predicted values of Aggregate Institutions, called Predicted Institutional Factor, estimated from the first-stage regressions to replace Aggregate Institutions in the pyramid determination regressions in model (5) of Table 2, Panel C.

The results of the first- and second-stage regressions are reported in Table 3. The coefficients of Number of Sea Ports and Leased Territories in the first-stage regression are significantly positive, while the coefficient on Commercial Port is negative but statistically insignificant. The adjusted R-squares of the first-stage regressions is quite high (83 percent). In the second stage, the coefficient on Predicted Institutional Factor is positive and statistically significant. The coefficient on Aggregate Incentive remains positive and statistically significant.

4. Pyramids and Firm Performance

Next we analyze the role of pyramidal structures in managerial professionalism and firm performance as measured by Tobin's Q, employment efficiency, total factor productivity, and accounting profitability.

4.1. Managerial professionalism

If the pyramid system is built for separating an SOE from political interference, we should observe a high degree of managerial professionalism in the decentralized firm.

Moreover, the decentralized firm's managers may have a lower degree of affiliation with government than others in the not decentralized firm, assuming that they are less intervened by government and/or pursue arm's-length competition rather than depending on government resources. We initially focus on top managers, and define Professionalism as a dummy variable equal to one if the CEO or chairman of a company has CPA, lawyer certification, or above college education; and otherwise zero. We define Political Connection as a dummy variable equal to one if the CEO or chairman has been a bureaucrat, and otherwise zero (Fan, Wong, Zhang, 2007). We regress Professionalism and Political Connection on Pyramid and the usual control variables.

Panel A of Table 4 reports logit regression results. Pyramid is strongly positively related to Professionalism. The relation is robust to controlling for Aggregate Institutions and Aggregate Incentives. The relation between Pyramid and Political Connection is insignificant.

We next examine professionalism and political connection of all members of board of directors. Professionalism is alternatively defined as the percentage of directors having CPA, lawyer certification or above college education. Political Connection is alternatively defined as the percentage of directors who have been government bureaucrats.

Panel B of Table 4 reports ordinary least square regression results. Again, the results show that Pyramid has a significant positive relation with Professionalism, but an insignificant relation with Political Connection.

The above results lend support to the hypothesis that pyramidal organizational structure is associated with professionalization of firm management. However, the relation between pyramid and political connection is insignificant.

4.2. *Tobin's Q*

Tobin's Q is estimated as the market value of common stock plus the book value of total liability divided by the book value of total assets, as of the last day of the IPO fiscal year. The stock based measure is useful for examining whether minority shareholders are concerned about the potential costs and benefits of the pyramid structure.⁶ Tobin's Q is regressed on Pyramid, Firm Size, Sales Growth, Financial Leverage, the industry dummy variable, and the year dummy variables. Sales Growth is defined as the two-year average annual growth in sales prior to the firm's IPO. Because of missing pre-IPO sales data of some companies, this regression is performed on 562 firms. Table 5 reports the regression results. The coefficient on Pyramid is positive and statistically significant at the 10-percent level (column (1)), suggesting that more pyramidal layers are associated with higher firm value. However, the relation becomes statistically insignificant when we further control for Aggregate Institutions and Aggregate Incentive (Column (2)).

4.3. *Employment efficiency*

State-owned firms typically have an objective of maintaining employment, sometimes even at the expense of firm efficiency. However, decentralized firms are expected to be less burdened by the employment requirement than other firms tightly controlled by the state. It can therefore be expected that the labor efficiency of a firm is positively related to the extent of the pyramidal structure. In Column (1) of Table 6, we find such a relation when we regress the number of employees over firm sales, an inverse measure of labor efficiency, on Pyramid, controlling for industry, year, and the other firm effects. This regression is run using 617 firm observations in the IPO year. The relation between pyramidal structure and labor is robust to

⁶ Minority interests in Chinese SOEs are significant. The average tradable shares of the companies in the sample account for almost 28% of total outstanding shares. Among the sample firms, almost 40% has at least one none-group affiliated block holders with more than 5% ownership.

the inclusion of Aggregate Institutions and Aggregate Incentive as additional control variables, suggesting that the relation is not spuriously induced by the institutional or incentive effects.

4.4. Total factor productivity

We next analyze the relation between a firm's pyramidal layers and its total factor productivity based on a log-linear Cobb-Douglas production function. Output is constructed as the logarithm of total sales in each of the three years after the IPO year. Two input factors are Labor and Capital, measured as the logarithm of the total number of employees in the IPO year⁷ and the logarithm of total fixed assets in each of the three years after the IPO. In addition, we include Pyramid in the production model to capture any productivity difference due to pyramidal structure. The regulatory industry dummy variable and year dummy variables (not reported) are included in the regression.

Table 7 reports the regression results. Consistent with prior research, the coefficients of Labor and Capital are positively and highly statistically significant. The coefficient of Pyramid is positive and statistically significant at the 10-percent level. This positive relation is robust to controlling for Aggregate Institutions and Aggregate Incentive.

4.5. Profitability

We next investigate the relation between the pyramid structure and firm accounting profitability measured by return on sales (ROS) and return on assets (ROA). After controlling the firm fundamentals, we find that the pyramid variable is statistically positively related to ROS, but not to ROA, as reported in columns (1) and (3) in Table 8. After further controlling for the institutional variables, the pyramid variable is significantly related to both ROS and

⁷ Because post-IPO employee numbers are unavailable, we assume these numbers are similar to those in the IPO year.

ROA (columns (2) and (4)). The overall result in Table 8 suggests a positive association between the pyramid structure and accounting profitability.

In summary, the various analyses in this section provide consistent evidence that firms with more extensive pyramidal structures tend to have higher degrees of managerial professionalism, greater employment efficiency, higher total factor productivity, and higher profitability and share value. These results lend additional support to our conjecture that the pyramidal structures are associated with lower political interference and more empowered firm management relative to the direct ownership structures. However, we are unable to claim that the pyramid structures cause efficiency, as either the government can delegate decision rights to capable firm managers or capable firm managers can bargain with the government for the decision rights. In addition, although we have analyzed the relation between pyramid and performance controlling for the institutional variables potentially affecting both pyramid and performance, we are unable to claim that we have properly accounted for the selection effects of pyramid.

5. Evidence from the field

Although we have provided evidence consistent with the argument that pyramids are associated with delegation of firm decision rights, we have not shown any direct evidence that managers of pyramid affiliated firms actually possess more firm decision rights than managers of firms directly linked to the government. To address this concern we perform survey on senior SOE managers and government officials in charge of state asset management.

5.1. Survey on SOE managers

Similar to World Bank's (1992) Enterprise Surveys, our survey incorporates long-term strategic decisions including appointing and firing executives, setting executive compensation plans, raising capital, paying dividends, investment, and mergers and acquisitions, as well as short-term operating decisions including purchasing raw materials and electricity, setting product prices, choosing suppliers and customers, hiring and firing workers, and setting workers' compensation plans. Each of the decisions is associated with four different levels of government restrictions from which a survey respondent can choose: 1-No restriction; 2-Some restrictions, 3-Many restrictions, 4-Complete restriction. The survey questionnaire is provided in Appendix IV.

We survey senior managers on three different occasions. The first two groups are EMBA students of Shanghai National Accounting Institute and Nankai University in Tianjin. We distribute 45 questionnaires in the classroom and receive 41 valid responses, of which 15 are from SOE managers. Of the 15 SOE executives, 6 are senior executives at or above the chief finance officer level. In addition, we send survey questionnaires directly to 30 companies with the assistance of Tianjin Bureau of State Asset Management and the Corporate Governance Center of Nankai University. We receive 22 valid responses, of which 18 from SOEs. After further imposing the seniority requirement of respondents, we obtain another 6 valid responses from senior managers. Altogether from the three sets of survey we obtain 12 valid responses by senior managers, 3 from firms directly linked with the government, 4 from firms associated with 2-layer pyramids, and 5 from firms affiliated with pyramids of more than 2 layers.

We create a government intervention score of long-term and short-term managerial decision making by summing the restriction scores of the individual decisions within the

respective category. As reported in Table 9, we find that the average level of government intervention over firm managers' long-term strategic decisions and short operating decisions both decrease as the number of pyramid layers increases. The mean intervention score over long-term strategic decisions decreases from 2.81 to 2.31 and further to 2.18 as the number of pyramid layers increase from one to two, and to more than two layers. The mean intervention score over short-term operating decisions decreases from 1.85 to 1.63 and further to 1.42 as the number of pyramid layers increases from one to two and to more than two. Across the two types of decisions, we find that government intervention is more pronounced in long-term strategic decisions than in short-term operating decisions. Because of the small sample size, we do not provide statistical tests for the differences we have reported.

5.2. Survey on bureaucrats

In addition, we conduct a survey on local bureaucrats in charge of state asset management. The survey sketches a firm (Firm A) directly linked to the government and another firm (Firm B) affiliated with a pyramid. All other aspects of the two firms are the same. We ask each respondent that "as a major shareholder, do you intervene managers' decisions differently between Firm A and Firm B?" We code the response as 1 if a bureaucrat responds that he/she intervenes Firm A more than Firm B, as 0 if the bureaucrat replies no difference in intervention between the two firms, and as -1 if the bureaucrat responds that he/she intervenes Firm B more than Firm A. The survey questionnaire is provided in Appendix V. The results of the survey on bureaucrats are perhaps more indicative than the survey results of firm managers, because the bureaucrat respondents are able to compare their intervention levels of the two otherwise identical firms except for the difference in their

organizational structures. In the survey on firm managers, we are unable to control for differences in various firm characteristics.

We send 20 questionnaires to bureaucrats of various local state management offices in Tianjin City and Shangdong Province, with the assistance from the Corporate Governance Center of Nankai University. We receive 15 valid responses. As reported in Table 10, among the valid responses, the average scores of intervention are mostly significantly positive for both the long-term and the short-term decisions, indicating more severe government intervention in firms directly linked to government than in firms linked with pyramids.

Overall, the results of the survey on SOE managers and on state asset management bureaucrats both show that more firm decision rights are passed down to managers of firms associated with pyramidal organizations than are to managers of firms directly linked to government.

6. Conclusion

Pyramidal organizational structures have been associated with agency problems (La Porta et al., 1999), financial constraints (Almeida and Wolfenzon, 2006), and taxation (Morck, 2005). These explanations target private ownership. Based on Chinese data, we provide an explanation of state-owned corporate pyramids – a system of reducing political cost while empowering managers.

Interestingly different from some prior researchers finding negative aspects of the pyramid structure, we report positive roles of pyramids. However, this aspect of pyramids is not unique to China or state owned organizations. Political cost arising from government intervention is not only a concern of state owned enterprises but also private firms in heavily

regulated industries. In the United States, privately controlled public utility companies historically have been subject to heavy government regulations in the name of public interest. In the early twentieth century, emerging electric companies initially avoided regulations by restructuring their firms as holding companies. A holding company is a corporate entity that partly or completely controls interest in another operating company. Throughout the 1920s, public utility holding companies and their subsidiaries bought smaller utilities, and thus the emergence of public utility organizational pyramids. An important advantage of the public utility pyramids was that operating companies at lower levels were subject to state regulation, while holding companies on the top level were not. Holding companies could issue new stock and bonds without state oversight. However, the Public Utility Holding Company Act and other legislations in the aftermath of the stock market crash of 1929 dismantled organizational pyramids in public utility and other sectors in the United States (Morck and Yeung, 2005).⁸

Another aspect of pyramidal organizations comes from the history of British trading business groups in the late 19th and the early 20th century. Among numerous insightful observations, Jones (2000) points out that given the widespread contractual relationships between controlling owners and affiliated firms, it is surprising how few legal cases occurred. “It would seem that the trading companies seldom sought to pursue their interests to such an extent that outside shareholders were blatantly dis-advantaged (Page 185).” More recently, Khanna and Thomas (2009) find information sharing among firms affiliated by interlocking directors as an important advantage of the networked firms. Several other studies have also discovered other aspects of the pyramid organizational structure (Almeida et al., forthcoming;

⁸ The Public Utility Holding Company Act outlawed interstate utility holding companies and made it illegal for a holding company to be more than twice removed from its operating subsidiary. The legislation had a swift and dramatic effect on the public utility pyramids. Between 1938 and 1958 the number of holding companies fell from 216 to eighteen. This forced divestiture continued until deregulation of the 1980s and 1990s. See Lai (2001) and Warkentin (1998).

Masulis et al., 2009). These studies and our own research suggest that our understanding of the pyramidal organizations is far from complete.

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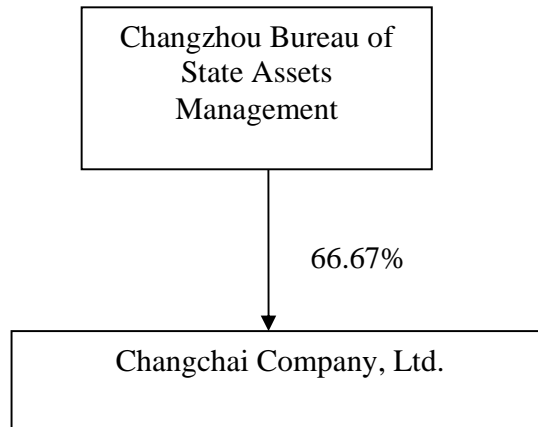
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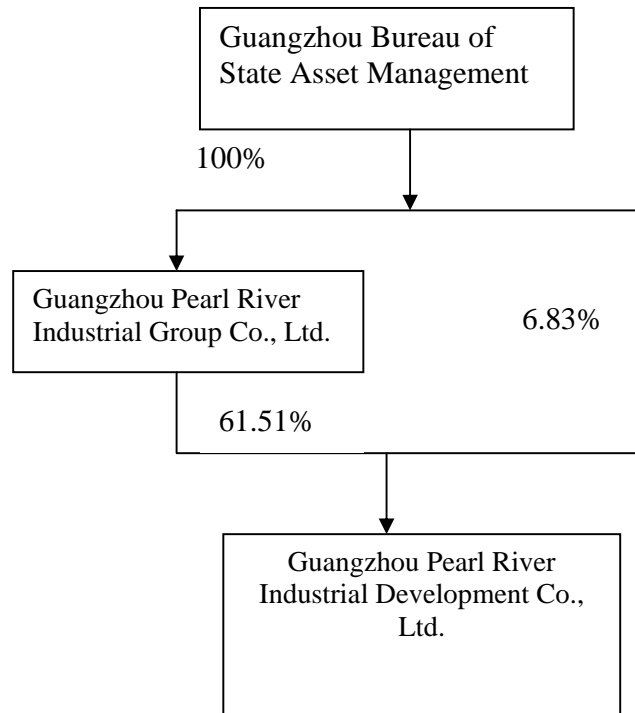
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Figure 1
A Listed Company Directly Controlled by a Local Government



Source: The 2001 annual report of Changchai Company, Ltd.

Figure 2
A Listed Company Controlled by a Local Government through a Two-layer Pyramid



Source: The 2001 annual report of Guangzhou Pearl River Industrial Development Co., Ltd.

Table 1 Sample

The table reports the distribution of pyramidal layers of the sample firms by IPO year. The sample is composed of 742 newly listed local-government-controlled firms, representing around 65% of all IPO firms in China between 1993 and 2001. The number of pyramidal layers is defined to be one when a government agency directly controls the listed firm, two when there is one intermediate company between the government agency and the listed firm, and so on. The number of pyramidal layers is counted from the longest controlling chain in case of multiple chains.

Listing Year	Number of Pyramidal Layers				Total	As a Percentage of Total IPO Firms
	1	2	3	≥ 4		
Before 1993	16	13	6	1	36	67.92%
1993	54	34	5	0	93	75.00%
1994	42	32	5	0	79	71.17%
1995	7	8	2	0	17	70.83%
1996	33	82	18	0	133	65.84%
1997	24	94	14	2	134	65.05%
1998	8	59	7	0	74	69.81%
1999	6	43	10	2	61	62.24%
2000	7	50	6	2	65	47.45%
2001	3	37	9	1	50	63.29%
Total	200	452	82	8	742	65.09%

Table 2 Regression Results of the Determinants of Corporate Pyramids**Panel A: Principal component analysis for institutional and incentive variables**

This table provides the results of principal component analysis (PCA) of six institutional variables (Marketization, Legal Environment, Protection of Property Rights, Market Deregulation, FDI, and Openness) and three incentive variables (Unemployment, Fiscal Surplus, and R&D) as defined in Appendix II. Aggregate Institutions, which captures 74% of the total variance, is the only factor with an eigenvalue greater than one from the PCA of institutional variables. Aggregate Incentive, which captures 54% of the total variance, is the only factor with an eigenvalue greater than one from the PCA of incentive variables.

Factor	Component loading	Proportion of variance
Aggregate Institutions		74%
Marketization	0.385	
Legal Environment	0.424	
Protection for Property Rights	0.367	
Market Deregulation	0.437	
FDI	0.422	
Openness	0.411	
Aggregate Incentive		54%
Unemployment	-0.647	
Fiscal Surplus	0.564	
R&D	0.512	

Table 2 Regression Results of the Determinants of Corporate Pyramids**Panel B: Institutional determinants**

This table reports the regression results of the institutional determinants of pyramidal organizational structure. The dependent variable is the number of pyramidal layers between the controlling owner and the listed firm. Independent variables include the following variables. The six institutional variables (Marketization, Legal Environment, Property Rights, Deregulation, FDI, and Openness) and the principal component analysis factor score, Aggregate Institutions, are included in the regression in columns (1) to (7), respectively. Control variables include Firm Size, which is the logarithm of total assets at the end of the IPO year; Financial Leverage, which is the ratio of total liabilities to sales at the end of the IPO year; Growth, which is the ratio of market-to-book equity at the end of the IPO year; and Regulated Industry, which equals one if the firm is in a highly regulated industry and zero otherwise. All regressions include year dummy variables but they are not reported. The firm-level independent variables with continuous values are winsorized at the top 1% level. An ordered Probit model is used in the regressions with clustering error by provinces. Absolute Z-values are in parentheses. Asterisks denote the level of statistical significance: *** 1%, ** 5%, and * 10%. Variable definitions are provided in Appendix I.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Marketization	Legal Environment	Protection for Property Rights	Market Deregulation	FDI	Openness	Aggregate Institutions
Institutional Determinant	0.094 (2.71)***	0.201 (3.62)***	0.127 (2.83)***	0.252 (2.17)**	4.362 (3.36)***	0.566 (10.43)***	0.132 (3.98)***
Firm Size	0.187 (3.25)***	0.142 (1.61)	0.177 (2.03)**	0.173 (1.87)*	0.164 (1.84)*	0.138 (1.53)	0.146 (1.60)
Financial Leverage	0.018 (0.41)	0.015 (0.42)	0.010 (0.28)	0.009 (0.27)	0.008 (0.23)	0.010 (0.29)	0.009 (0.25)
Growth	0.043 (1.57)	0.037 (1.62)	0.040 (1.76)*	0.038 (1.65)*	0.037 (1.72)*	0.039 (2.02)**	0.034 (1.55)
Regulated Industry	0.110 (0.76)	0.073 (0.79)	0.099 (1.00)	0.094 (1.10)	0.064 (0.68)	0.053 (0.60)	0.068 (0.75)
N	742	742	742	739	742	742	739
Pseudo R-square	0.084	0.096	0.090	0.0930	0.100	0.115	0.102

Table 2 Regression Results of the Determinants of Corporate Pyramids**Panel C: Incentive determinants**

This table reports the regression results of the incentive determinants of pyramidal organizational structure. The dependent variable is the number of pyramidal layers between the controlling owner and the listed firm. Independent variables include the following variables. The three incentive variables (Unemployment, Fiscal Surplus, and R&D) and the principal factor analysis (PCA) factor score Aggregate Incentive are included separately in columns (1) to (4). Column (5) presents a regression model with both PCA factor scores, Aggregate Institutions and Aggregate Incentive, as defined in Appendix II. Control variables include Firm Size, which is the logarithm of total assets at the end of the IPO year; Financial Leverage, which is the ratio of total liabilities to sales at the end of the IPO year; Growth, which is the ratio of market-to-book equity at the end of the IPO year; and Regulated Industry, which equals one if the firm is in a highly regulated industry and zero otherwise. All regressions include year dummy variables but they are not reported. The firm-level independent variables with continuous values are winsorized at the top 1% level. Ordered Probit is used in the regressions with clustering error by provinces. Absolute Z-values are in parentheses. Asterisks denote the level of statistical significance: *** 1%, ** 5%, and * 10%.

	(1)	(2)	(3)	(4)	(5)
	Unemployment	Fiscal Surplus	R&D	Aggregated Incentive	Two Aggregated Measure
Institutional Determinant					0.115 (3.01)***
Incentive determinant	-0.133 (1.92)*	0.539 (3.71)***	0.109 (3.04)***	0.147 (3.81)***	0.079 (2.17)**
Firm Size	0.181 (2.08)**	0.184 (1.88)*	0.199 (2.21)**	0.172 (1.87)*	0.134 (1.46)
Financial Leverage	0.019 (0.55)	0.018 (0.51)	0.020 (0.57)	0.020 (0.59)	0.012 (0.34)
Growth	0.044 (1.99)**	0.040 (1.85)*	0.049 (2.39)**	0.043 (1.99)**	0.033 (1.47)
Regulated Industry	0.115 (1.19)	0.138 (1.44)	0.129 (1.35)	0.119 (1.27)	0.071 (0.80)
N	742	742	742	742	739
Pseudo R-square	0.084	0.088	0.084	0.089	0.105

Table 3 Two-staged Regression Results of the Determinants of Corporate Pyramids

This table presents the two-staged regression results of the determinants of pyramidal organizational structure. The dependent variable in the first-stage OLS regression is Aggregate Institutions, which is the principal component analysis (PCA) factor score of the six institutional variables (Marketization, Legal Environment, Property Rights, Deregulation, FDI, and Openness), all defined in Appendix II. The independent variables include Seaports, which is the number of seaports in the region, Commercial Ports, which equals one if the region had treaty ports forced open to foreigners in the Qing Dynasty, and zero otherwise, and Leased Territories, which equals one if the region had territories leased to foreigners in the Qing Dynasty, and zero otherwise. Additional control variables in first stage include Total Assets, which is the mean of log value total assets of all sample firms in the region, Leverage, which is the mean of ratio total liability to total assets of all sample firms in the region, Growth, which is the mean value of market-to-book equity ratio of all sample firms in the region. Regulated industry, which is the percentage of firms in regulated industries in the region. In the second stage, the dependent variable is the number of pyramidal layers. Independent variables include Predicted Aggregate Institutions, the predicted value of Aggregate Institutions from the first-stage model; Aggregate Incentive, the PCA factor score of the three incentive variables; Firm Size, the logarithm of total assets at the end of the IPO year; Financial Leverage, the ratio of total liabilities to sales at the end of the IPO year; Growth, which is market-to-book equity ratio at the end of IPO year; and Regulated Industry, which equals one if the firm is in a highly regulated industry, and zero otherwise. All the financial variables used in first stage are the mean that of all firms from the region. All of the regressions include year dummy variables but they are not reported. The firm-level independent variables with continuous values are winsorized at the top 1% level. Ordered Probit is estimated in the second-stage regressions with clustering error by province. Absolute t-values are in parentheses of the first-stage results, and absolute Z-values are in parentheses of the second-stage results. Asterisks denote the level of statistical significance: *** 1%, ** 5%, and * 10%.

	1st stage	2nd stage
Number of Sea Ports	0.206 (9.95)***	
Commercial Port	-0.088 (0.56)	
Leased Territories	1.575 (10.37)***	
Predicted Institutional Factor		0.121 (3.41)***
Aggregate Incentive		0.103 (2.68)***
Total Assets	2.169 (7.77)***	0.128 (1.38)
Leverage	2.729 (11.69)***	0.012 (0.33)
Growth	-0.062 (0.49)	0.035 (1.57)
Regulated Industry	0.236 (0.18)	0.072 (0.81)
Constant	-48.256 (8.25)***	
N	215	739
Adjusted/Pseudo R Square	0.83	0.11

Table 4 Pyramidal Structures and Management Professionalism**Panel A: CEO and Chairman**

This table presents the regression result of the professionalism and political connection of CEO and Chairman the first year after IPO year on Pyramid, the number of pyramidal layers between controlling shareholder and listed firm. Dependent variable is Professionalism, which equals one if CEO or Chairman of the company has CPA, lawyer certification or above college education, and zero otherwise, and Political Connection, which equals one if CEO or Chairman has government working experience, and zero otherwise in model (1) to (4) respectively. Additional independent variable include Firm Size, the logarithm value of total assets; Financial Leverage, the ratio of total liabilities to sales; Growth, the market-to-book equity ratio; and Regulated Industry, which equals one if the firm is in a highly regulated industry, and zero otherwise. All continuous variables are winsorized at the top and bottom 1% levels. The independent variables are measured at the end of first year after IPO. Year dummy variables are included but not reported. Logistic model is applied in Model (1) and (2), where absolute Z values are reported in parentheses. Logistic model is estimated with clustering error by province. Asterisks denote the level of statistical significance: * 10%, ** 5% and ***1%.

	Professionalism		Political Connection	
	(1)	(2)	(3)	(4)
Pyramid	0.554 (2.84)***	0.532 (2.97)***	0.085 (0.49)	0.072 (0.44)
Aggregate Institutions		-0.066 (1.01)		-0.080 (0.95)
Aggregate Incentive		0.173 (1.13)		0.071 (0.83)
Financial Leverage	-0.052 (0.80)	-0.043 (0.64)	0.085 (0.77)	0.073 (0.67)
Firm Size	0.065 (0.34)	0.062 (0.31)	-0.133 (1.06)	-0.146 (1.09)
Growth	-0.015 (0.38)	-0.019 (0.47)	-0.071 (1.38)	-0.077 (1.50)
Regulated Industry	2.034 (3.21)***	2.030 (3.22)***	0.466 (1.03)	0.467 (1.03)
Constant	-1.540 (0.40)	-1.496 (0.37)	3.231 (1.23)	3.553 (1.28)
N	625	622	625	622
Pseudo R square	0.097	0.100	0.062	0.063

Table 4 (continued)**Panel B: Board of Directors**

This table presents the regression result of the professionalism and political connection of board in one after IPO year on Pyramid, the number of pyramidal layers between controlling shareholder and listed firm. Dependent variable is Professionalism, which is the percentage of professional director on board, who has CPA, lawyer certification or above college education, and Political Connection, which is the percentage of politically connected director on board, who has government working experience. Additional independent variable include Firm Size, the logarithm value of total assets; Financial Leverage, the ratio of total liabilities to sales; Growth, the market-to-book equity ratio; and Regulated Industry, which equals one if the firm is in a highly regulated industry, and zero otherwise; Aggregate Institutions, the PCA factor scores extracted from regional institutional variables; Aggregate Incentive, the PCA factor scores extracted from government variables. All continuous variables are winsorized at the top and bottom 1% levels. The independent variables are measured at the end of year after IPO. Year dummy variables are included but not reported. Logistic model is applied in Model (1) and (2), where the absolute Z value is reported in parentheses. OLS model is with clustering error by province, where absolute t values are reported in parentheses. Asterisks denote the level of statistical significance: * 10%, ** 5% and ***1%.

	Professionalism		Political Connection	
	(1)	(2)	(3)	(4)
Pyramid	0.077 (4.48)***	0.080 (4.33)***	0.014 (0.81)	0.016 (0.96)
Aggregate Institutions		-0.007 (1.33)		-0.005 (0.80)
Aggregate Incentive		0.002 (0.15)		0.004 (0.68)
Financial Leverage	-0.004 (0.69)	-0.003 (0.59)	0.009 (0.95)	0.010 (1.00)
Firm Size	0.083 (5.91)***	0.086 (6.22)***	-0.003 (0.19)	-0.001 (0.08)
Growth	0.015 (3.60)***	0.016 (4.00)***	0.001 (0.22)	0.002 (0.59)
Regulated Industry	0.084 (2.38)**	0.085 (2.38)**	0.156 (4.25)***	0.155 (4.20)***
Constant	-1.254 (4.50)***	-1.314 (4.74)***	0.275 (0.88)	0.233 (0.79)
N	645	642	645	642
Adjusted R square	0.19	0.20	0.11	0.11

Table 5 Pyramidal Structures and Tobin's Q

This table presents the OLS regression results of Tobin's Q, measured as the sum of market value of equity and book value of liabilities all divided by total assets at the end of the IPO year, on Pyramid, which is the number of pyramidal layers between the listed company and the controlling owner. The control variables include: Firm Size, which is the logarithm of total assets; Financial Leverage, which is the ratio of total liabilities to sales; Sales Growth, which is the two-year average annual growth in firm sales prior to the IPO; and Regulated Industry, which equals one if the firm is in a highly regulated industry, and zero otherwise; Aggregate Institutions, the PCA factor scores extracted from regional institutional variables; Aggregate Incentive, the PCA factor scores extracted from government variables. All the independent variables are measured at the end of the IPO year and the continuous variables are winsorized at the top and bottom 1% levels. Year dummy variables are included but not reported. The regression is performed in the full sample and in the sub-samples stratified alternately by Aggregate Institutions and Aggregate Incentive, the PCA factor scores extracted from the regional institutional and government incentive variables, respectively. OLS model is estimated with clustering error by provinces. Absolute t-values are in parentheses. Asterisks denote the level of statistical significance: * 10%, **5% and ***1%.

	Tobin's Q (1)	Tobin's Q (2)
Pyramids	0.086 (1.76)*	0.058 (1.09)
Aggregate Institutions		0.040 (1.80)*
Aggregate Incentive		0.025 (0.99)
Sales Growth	0.846 (5.27)***	0.839 (5.00)***
Financial Leverage	-0.076 (0.86)	-0.079 (0.88)
Firm Size	-0.556 (8.17)***	-0.582 (8.62)***
Regulated Industry	0.169 (1.12)	0.143 (0.95)
Constant	13.488 (10.75)***	13.982 (11.25)***
Observations	562	559
Adjusted R-squared	0.34	0.34

Table 6 Pyramidal Structures and Employment Efficiency

This table presents the OLS regression results of Employment Efficiency, measured as the number of employees scaled by sales in the IPO year, on Pyramid, which is the number of pyramidal layers between the listed company and the controlling owner. Control variables include: Firm Size, which is the logarithm of total assets; Financial Leverage, which is the ratio of total liabilities to sales; Growth, which is the market-to-book equity ratio; and Regulated Industry, which equals one if the firm is in a highly regulated industry, and zero otherwise; Aggregate Institutions, the PCA factor scores extracted from regional institutional variables; Aggregate Incentive, the PCA factor scores extracted from government variables. All variables are measured at the end of the IPO year and all the continuous variables are winsorized at the top and the bottom 1% levels. Year dummy variables are included but not reported. The regression is performed in the full sample and in the sub-samples stratified alternately by Aggregate Institutions and Aggregate Incentive, the PCA factor scores extracted from the regional institutional and government incentive variables, respectively. Absolute t-values are in parentheses. OLS model is estimated with clustering error by provinces. Asterisks denote the level of statistical significance: * 10%, **5% and ***1%.

	Employee (1)	Employee (2)
Pyramid	-1.409 (2.88)***	-1.161 (2.93)***
Aggregate Institutions		-0.662 (4.48)***
Aggregate Incentive		-0.034 (0.17)
Financial Leverage	3.779 (3.02)***	3.802 (3.10)***
Firm Size	-3.726 (5.97)***	-3.372 (5.26)***
Growth	-0.569 (3.48)***	-0.481 (3.17)***
Regulated Industry	0.294 (0.26)	0.689 (0.62)
Constant	86.943 (6.79)***	79.797 (6.09)***
N	617	614
Adjusted R-squared	0.19	0.20

Table 7 Pyramidal Structures and Total Factor Productivity

This table presents the OLS regression results of firm output, measured as the logarithm of sales in each of the three years after the IPO year, on Pyramid, the number of corporate layers between a listed company and a controlling owner, Labor, the logarithm of the number of employees at the end of the IPO year, Capital, the logarithm of total fixed assets, and Regulated Industry, which equals one if the company is in a highly regulated industry, and zero otherwise; Aggregate Institutions, the PCA factor scores extracted from regional institutional variables; Aggregate Incentive, the PCA factor scores extracted from government variables. All of the continuous variables are winsorized at the top and bottom 1% levels. Year dummy variables are included but not reported. OLS model is estimated with clustering error by firm and provinces. Absolute t-values are in parentheses. Asterisks denote the level of statistical significance: * 10%, **5% and ***1%.

	Output (1)	Output (2)
Pyramids	0.088 (1.72)*	0.075 (1.75)*
Aggregate Institutions		0.048 (1.40)
Aggregate Incentive		0.069 (2.13)**
Labour	0.197 (5.46)***	0.202 (6.47)***
Capital	0.513 (8.57)***	0.516 (9.34)***
Regulated	-0.588 (6.40)***	-0.631 (7.10)***
Constant	8.446 (8.35)***	8.333 (8.75)***
Observations	1922	1913
Adjusted R-squared	0.41	0.43

Table 8 Pyramidal Structure and Firm Profitability

This table presents the OLS regression results of profitability, measured as the ROS and ROA in three years after IPO, on Pyramid, which is the number of pyramidal layers between the listed company and the controlling owner. Control variables include: Firm Size, which is the logarithm of total assets; Financial Leverage, which is the ratio of total liabilities to sales; Growth, which is the market-to-book equity ratio; and Regulated Industry, which equals one if the firm is in a highly regulated industry, and zero otherwise; Aggregate Institutions, the PCA factor scores extracted from regional institutional variables; Aggregate Incentive, the PCA factor scores extracted from government variables. All variables are measured at the end of each year of three years after IPO and all the continuous variables are winsorized at the top and the bottom 1% levels. Year dummy variables are included but not reported. OLS model is estimated with clustering error by firm and provinces. Asterisks denote the level of statistical significance: * 10%, **5% and ***1%.

	ROS	ROS	ROA	ROA
	(1)	(2)	(3)	(4)
Layers	0.018 (1.73)*	0.021 (2.27)**	0.005 (1.47)	0.006 (1.77)*
Aggregate Institutions		-0.006 (2.44)**		-0.002 (1.98)**
Aggregate Incentives		-0.008 (1.22)		-0.002 (0.67)
Financial Leverage	0.007 (0.85)	0.007 (0.83)	-0.030 (11.97)***	-0.030 (11.75)***
Firm Size	0.005 (0.68)	0.009 (1.22)	0.012 (6.98)***	0.013 (7.27)***
Growth	0.011 (4.37)***	0.012 (4.43)***	0.007 (6.49)***	0.008 (7.24)***
Regulated	0.148 (8.90)***	0.151 (9.01)***	0.016 (3.00)***	0.017 (3.16)***
Constant	-0.010 (0.06)	-0.090 (0.57)	-0.177 (4.93)***	-0.200 (5.13)***
Observations	2224	2215	2224	2215
Adjusted R-squared	0.32	0.33	0.43	0.44

Table 9 Results of Survey on SOE Managers

The survey results are collected from 12 senior SOE executives with the assistance of Shanghai National Accounting Institute and Nankai University. Detailed survey procedures are reported in the text. The questionnaire is in Appendix IV. The following coding rule is applied to each of the questions regarding the extent of government restriction of a specific firm decision: 1-No restriction; 2-Some restrictions, 3-Many restrictions, and 4-Complete restriction.

	Number of layers					
	One layer (N=3)		Two Layers (N=4)		More than two layers (N=5)	
	Mean	Median	Mean	Median	Mean	Median
Long-term strategic decisions						
Set production plans	2.00	2.00	1.50	1.50	1.60	1.00
Make investment decisions	3.00	3.00	2.50	3.00	2.20	2.00
Appoint executives	3.67	4.00	2.75	3.00	2.80	3.00
Set dividend policy	2.00	2.00	2.50	2.50	1.80	1.00
Close/sell a subsidiary	3.33	3.00	2.25	2.50	2.20	2.00
Pay equity compensation to executives	3.00	3.00	2.75	3.00	2.60	3.00
Borrow loans from banks	2.33	2.00	1.50	1.00	1.80	1.00
Raise additional capital from stock market	3.00	4.00	2.50	2.50	2.20	2.00
Mergers and acquisitions	3.00	3.00	2.50	2.50	2.40	2.00
Mean of long-term strategic decisions	2.81	2.89	2.31	2.39	2.18	1.78
Short-term operating decisions						
Purchase raw materials	1.00	1.00	1.25	1.00	1.20	1.00
Purchase electricity and other energy input	1.50	1.50	1.25	1.00	1.20	1.00
Set product prices	2.67	3.00	1.75	1.00	1.80	1.00
Choose customers	2.00	2.00	1.00	1.00	1.20	1.00
Choose suppliers	1.67	1.00	2.00	1.50	1.20	1.00
Set worker bonus level	1.67	2.00	2.00	2.00	1.60	1.00
Set worker salary differentials	2.00	2.00	2.25	2.50	1.80	2.00
Set worker bonus differentials	1.67	1.00	1.75	1.50	1.40	1.00
Recruit employees	1.67	2.00	1.25	1.00	1.40	1.00
Dismiss employees	2.00	2.00	1.75	1.50	1.40	1.00
Mean short-term decisions	1.85	2.25	1.63	1.45	1.42	1.10

Table 10 Results of Survey on Bureaucrats in State Asset Management Systems

This table presents the summary statistics of the responses from 15 government bureaucrats in the state asset management systems of the Tianjin City and Shangdong Province with regards to the different extents of government intervention between a firm directly linked with the government (Firm A) and another otherwise identical firm associated with the pyramid structure (Firm B). The survey procedure is described in the text. The questionnaire is in Appendix V. The response is coded as 1, -1, and 0 if the respondent answers more intervention in Firm A, more intervention in Firm B, and no difference, respectively. ***, **, and * denotes the level of statistical significance at the 1%, 5%, and 10% level, respectively. The null hypothesis of the tests is that the mean/median intervention score of a firm decision is zero.

Question	N	Mean	Median	Std. Dev.	Min	Max
Long-term strategic decisions						
Set production plans	15	0.53***	1***	0.52	0	1
Make investment decisions	15	0.93***	1***	0.26	0	1
Appoint executives	11	0.64**	1**	0.81	-1	1
Set dividend policy	15	0.67***	1***	0.72	-1	1
Closure/sell of subsidiary	15	0.67***	1***	0.72	-1	1
Pay equity compensation to executives	15	0.73***	1***	0.70	-1	1
Borrow loans from banks	15	0.27	1	0.88	-1	1
Raise additional capital from stock market	15	0.80***	1***	0.41	0	1
M&A activities	15	0.67***	1***	0.62	-1	1
Short-term operating decisions						
Purchase raw material	14	0.14	0	0.53	-1	1
Purchase electricity and other energy input	14	0.29**	0**	0.47	0	1
Set product prices	14	0.14	0	0.53	-1	1
Choose customers	14	0.21*	0*	0.43	0	1
Choose suppliers	14	0.29**	0*	0.47	0	1
Set bonus level	14	0.29	0	0.61	-1	1
Set salary level	14	0.14	0	0.77	-1	1
Set bonus differentials	14	0.36*	0*	0.63	-1	1
Recruit employees	14	0.29**	0**	0.47	0	1
Dismiss employees	14	0.29**	0**	0.47	0	1

Appendix I State Asset Reform in Shanghai and the Creation of Shanghai Construction Group

Starting in 1993, Shanghai government took the lead in implementing the reform of its state asset management system, with an objective of separating the government administration from state asset management. The government's roles in state assets are regulated following the Three-Separation (三分开) Principle: 1) separation between the government and enterprises: the government will authorize state asset supervisory agencies (bureaus of state assets) to perform the role as capital providers and shareholders but not to involve the management of enterprises; 2) separation of the government and capital: state asset supervisory agencies will not take up any other public administration role, and other government agencies will not take up any state asset management role; 3) separation of ownership and management: state asset supervisory agencies will not be directly involved in the operation or management of enterprises (Project Team, 2002).

A consequence of the reform is the emergence of pyramidal structure in the state asset management system. In this structure, Shanghai Bureau of State Asset Management sits on the apex of the pyramid as the ultimate owner. But it does not directly manage or operate state assets. One level down the pyramid is a state asset management company. Under the original state asset management system before the reform, the state assets were managed by industrial bureaus. For example, Shanghai Bureau of Construction managed state assets in the construction industry. After the reform, the industrial bureaus were restructured into state asset management companies. The state asset management companies, despite their state ownership background, were separate economic entities from the public administration system. Neither did they directly manage and operate the state assets. Instead, the state asset

management companies created new subsidiaries, injected the state assets into the subsidiaries, and delegated the subsidiary managers to manage the assets.

In addition to the change in organization structure, the personnel policy in state owned enterprises has changed significantly in the following ways: 1) the government confines its direct appointment of and control over personnel only within Bureau of State Asset Management and state asset management companies, the top two layers of the pyramid, whereas the personnel decisions of the bottom layer subsidiaries are delegated to the state asset management companies; 2) the executives of state asset management companies and other affiliated firms do not have government titles or ranks; 3) the CEO and CFO of a publicly listed subsidiary are nominated by the chairman of the board and appointed by the board of directors; and 4) market-based incentive schemes, such as annual compensation and equity based compensation are introduced to publicly listed subsidiaries. The organizational transformation associated with the state asset reform can be illustrated by the formation of Shanghai Construction Group as reported in Zhang and Cai (1996).

Shanghai Bureau of Construction, a government agency founded in 1953, was in charge of operations in the construction industry in the Shanghai region. In the planned economy era, all construction projects were planned, financed and executed by the Bureau. In 1994, the Bureau was restructured into Shanghai Construction Group under the guidance of Shanghai Bureau of State Assets, employing almost 70 thousand employees and registering more than one billion Ren Min Bi of capital. The assets originally managed by the Bureau were transferred to newly formed subsidiaries of the Group. Managers of the subsidiaries reported to their corresponding boards of directors, in contrast to the old days when they had to report to government officials. The original public administration function of Bureau of

Construction was transferred to a separate government agency, Committee of Construction (市建设委员会) which was not involved in any operation of the state assets.

Consistent with Shanghai Government's state asset reform principles, the restructuring and the establishment of Shanghai Construction Group is to draw a bright line between the government and the construction business, and empowering managers. The organizational restructuring was associated with subsequent expansion in market share, substantial increase in research and development expenditure and new technology development. The Group also expanded its oversea operations through opening branch offices and establishing subsidiaries.

Appendix II

Variable Definitions and Data Sources

Variable	Description	Sources
Marketization	This is a comprehensive index that captures the following aspects of regional market development: (1) relationship between government and market, including the role of market in allocating resources and firms' policy burden in addition to taxes; (2) development of non-state business in terms of the ratio of industrial output by private sector to total industrial output; (3) development of product markets in terms of the degree of regional trade barriers; (4) development of factor markets captured by foreign direct investment and labor mobility; and (5) development of market intermediaries and legal environment. These various components of the index are constructed based on prior research such as Beck and Levine (2002), Brandt and Li (2003), Javorcik (2004), Johnson, McMillan, and Woodruff (2002), LaPorta et al. (1999, 2002), and Wurgler (2000). We use the average of the 1999 and 2000 indexes in our analyses.	Fan and Wang (2001)*
Legal Environment	This index measures the development of market intermediaries, protection of property rights, copyrights, and consumers. We use the average of the 1999 and 2000 indexes in our analyses.	Fan and Wang (2001)
Property rights	This index is calculated based on the total economic value of legal cases settled standardized by GDP of the region. This measure is based on the design in Johnson, McMillan, and Woodruff (2002) to capture the court's ability to enforce contracts. We use the average of the 1999 and 2000 indexes in our analyses.	Fan and Wang (2001)
Deregulation	The amount of preferential treatments granted to a region by the central government to set up special economic zones during 1978 to 1998.	Demruger et al. (2002)
FDI	The annual flow of foreign direct investment scaled by the GDP of the region for the year.	China Information Network Data Co., Ltd.
Openness	The total foreign imports and exports scaled by the GDP of the region for the year.	China Information Network Data Co., Ltd.
Aggregate Institutions	The factor score for the first component extracted from the principal component analysis of the four institutional indexes: Marketization, Legal Environment, Property Rights, and Deregulation. This is the only component that satisfies the Kaiser criterion, capturing 76% of the total variance.	Authors' estimation
Unemployment	The unemployment rate officially reported for each province, autonomous region, and municipality. The data are available annually.	China Information Bank
Fiscal Surplus	A dummy variable, which equals one if the fiscal revenue minus government expenditure scaled by GDP of a region is above the top quartile level of all regions in China, and zero otherwise. The data are available annually.	China Information Network Data Co., Ltd.

R&D (%)	The expenditure on fundamental research, applied research, experimental development and capital construction for scientific research in a region scaled by the GDP of the region. The data are as of year 2000.	National Bureau of Statistics
Aggregate Incentive	The factor score for the first component extracted from the principal component analysis of Unemployment, Fiscal Surplus, and R&D. This is the only component that satisfies the Kaiser criterion, capturing 54% of the total variance.	Authors' estimation

* Fan and Wang (2001) conduct the NERI Index project, which was sponsored by the National Economic Research Institute and the China Reform Foundation. The NERI indices capture the progress of institutional transition in China's 30 provinces (excluding Tibet, due to the lack of data). Appraisals of the regional institutions are made along several dimensions, namely, the relationship between the government and the market, the development of the non-state sector, the development of the factor markets, the development of the product markets, and the development of market intermediaries and the legal environment. The data in the NERI Index project mainly come from the statistical yearbooks of the National Statistics Bureau, which contain statistical information about prices and the administration of industry and commerce, the courts, consumers' associations, as well as the government's statistical information from banks' surveys and the entrepreneur survey system, and survey information about rural households from the National Statistics Bureau.

Appendix III

Institutional and Government Incentive Variables by Region

Region	Marketization	Legal Environment	Protection for property rights	Deregulation	FDI*	Openness*	Aggregate Institutions*	Unemployment (%)*	Surplus (%)*	R&D (%)	Aggregate Incentive*
Beijing	5.56	7.75	7.42	0.67	0.07	1.28	1.04	0.58	9.42	6.30	4.90
Tianjin	6.65	6.85	7.90	1.43	0.11	0.73	1.44	1.88	8.61	1.51	1.15
Shanghai	6.71	6.76	8.85	1.76	0.10	0.86	1.88	2.70	11.13	0.11	0.91
Chongqi	6.27	3.69	4.09	-	0.02	0.06	-	3.50	4.14	0.64	-0.94
Hebei	6.36	5.04	5.72	1.24	0.02	0.10	-0.95	2.19	4.43	0.52	-0.01
Shanxi	4.52	5.46	6.67	0.33	0.01	0.08	-1.66	1.85	5.72	0.60	0.18
Neimenggu	4.70	4.85	4.68	0.67	0.01	0.10	-2.15	3.54	5.05	0.24	-1.13
Liaoning	6.24	5.38	7.04	1.24	0.05	0.37	-0.19	3.13	6.70	0.89	-0.42
Jilin	5.45	5.69	7.30	0.67	0.03	0.18	-0.81	2.37	5.84	0.74	0.18
Heilongjiang	5.01	5.28	6.32	0.67	0.02	0.12	-1.43	2.73	5.52	0.46	-0.22
Jiangsu	7.85	6.19	7.71	1.43	0.07	0.30	1.00	2.50	4.12	0.85	-0.12
Zhejiang	8.15	5.73	6.32	1.43	0.03	0.28	0.25	3.15	4.51	0.55	-0.37
Anhui	6.37	5.28	6.58	0.62	0.02	0.08	-1.04	3.13	4.74	0.66	-0.68
Fujian	7.98	6.21	6.82	2.71	0.14	0.60	2.19	2.46	5.38	1.12	0.31
Jiangxi	5.38	4.69	6.34	0.33	0.02	0.07	-1.75	2.44	4.82	0.41	-0.16
Shandong	7.07	5.44	5.27	1.43	0.04	0.22	-0.40	3.27	4.24	0.61	-0.83
Henan	5.58	4.84	4.19	0.33	0.01	0.05	-2.21	2.67	4.30	0.48	-0.27
Hubei	5.53	4.92	6.30	0.62	0.03	0.09	-1.40	3.04	4.44	0.81	-0.47
Hunan	5.45	2.44	2.53	0.33	0.02	0.06	-3.45	3.72	4.58	0.52	-1.09
Guangdong	8.26	7.12	7.83	2.86	0.18	1.95	4.07	2.46	7.61	1.10	0.77
Guangxi	5.96	4.86	6.33	1.24	0.04	0.12	-0.87	3.59	4.94	0.40	-1.00
Hainan	6.40	6.27	8.66	1.57	0.18	0.54	1.80	3.72	6.88	0.17	-0.85
Sichuan	5.62	4.56	5.28	0.62	0.01	0.08	-1.84	3.76	5.04	1.12	-0.53
Guizhou	4.54	4.24	4.76	0.33	0.01	0.06	-2.59	5.21	5.67	0.42	-1.95
Yunnan	4.81	3.82	5.99	0.67	0.01	0.10	-2.19	2.68	10.06	0.36	0.25
Shannxi	4.08	3.04	5.50	0.33	0.03	0.13	-2.83	3.87	5.46	2.98	0.10
Gansu	4.89	3.88	5.28	0.33	0.01	0.06	-2.49	4.48	5.48	0.74	-1.62
Qinghai	3.17	4.63	5.36	0.33	0.00	0.07	-2.78	5.88	1.87	0.49	-2.47
Ningxia	3.96	5.02	8.74	0.33	0.01	0.09	-1.48	5.12	5.26	0.65	-2.11
Xinjiang	2.75	3.86	4.82	0.67	0.01	0.11	-3.04	3.67	3.23	0.20	-1.26

* The reported values are the 1992-2000 average values.

Appendix IV Questionnaire for SOE Executives

What's the level of restriction from the bureau of state asset management (or an equivalent government agent) when senior managers make the following decisions?

	No Restriction	Some Restrictions	Many Restrictions	Complete Restriction
Long-term strategic decisions:				
Set production plans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Make investment decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appoint executives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Set dividend policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Close/sell a subsidiary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pay equity compensation to executives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Borrow loans from banks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Raise additional capital from stock market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mergers and acquisitions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Short-term operating decisions:				
Purchase raw materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Purchase electricity and other energy input	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Set product prices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Choose customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Choose suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Set worker bonus level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Set worker salary differentials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Set worker bonus differentials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recruit employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dismiss employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Who is your company's immediate controlling owner?

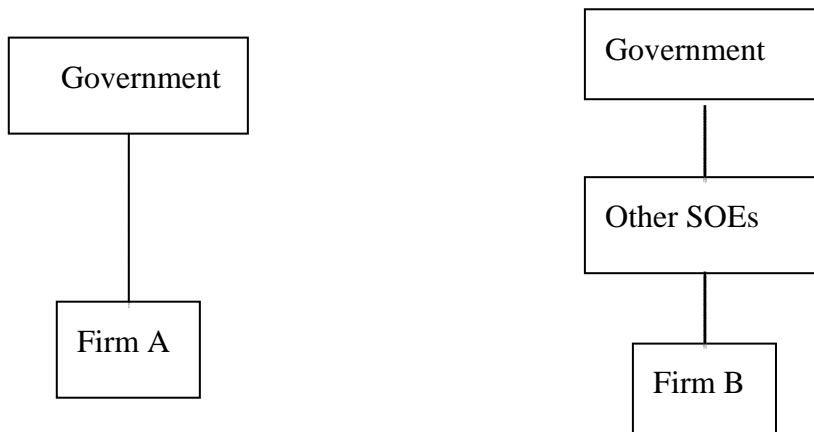
- A government agent
- A state-controlled enterprise
- An entrepreneur or a private company

If the immediate controlling owner of your company is a SOE, who is the immediate controlling owner of the SOE?

- A government agent
- A state-controlled enterprise

What is your job title in the company? _____

Appendix V Questionnaire for Bureaucrats of State Asset Management Systems



As a majority shareholder, do you intervene the following decisions differently in Firm A and Firm B?

Long-term strategic decisions

Set production plans	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Make investment decisions	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Appoint executives	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Set dividend policy	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Closure/sell of subsidiary	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Pay equity compensation to executives	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Borrow loans from banks	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Raise additional capital from stock market	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
M&A activities	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference

Short-term operating decisions

Purchase raw material	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Purchase electricity and other energy input	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Set product prices	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Choose customers	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Choose suppliers	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Set bonus level	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Set salary differentials	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Set bonus differentials	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Recruit employees	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference
Dismiss employees	<input type="checkbox"/> More on A	<input type="checkbox"/> More on B	<input type="checkbox"/> No difference