Contracting Institutions and Vertical Integration: Evidence from China's Manufacturing Firms

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Abstract

Existing studies on vertical integration focus on factors at the transaction parties' level, such as asset specificity and contractual incompleteness. What they overlook is the quality of the underlying institutions, in particular, that of the contracting institutions. In this paper, using a World Bank data set of manufacturing firms in China, we find that poorer contracting institutions cause firms to become more vertically integrated. Our results are robust to various checks, especially the inclusion of the quality of financial institutions.

Keywords: Contracting Institutions, Vertical Integration, Legal Origins, Financial Institutions
JEL Codes: L23, D23, P26, K12

1 Introduction

The choice of vertical boundary is a key decision for firms, as it has been found to affect firm performance and, consequently, economic growth (Novak and Stern, 2007; Forbes and Lederman, 2009). Indeed, this issue has been extensively studied since Coase's seminal work in 1937, with a focus on the relationship specificity of investments and the degree of contractual incompleteness. In recent years, researchers have begun to pay attention to the impacts of institutional quality on the organization of production. Khanna and Palepu (1997, 2000) note the prevalence of large and highly vertically integrated firms in developing countries such as India. Exploring Indian business groups, they find that the affiliates of business groups often outperform unaffiliated firms. They suggest that the poorly functioning market-supporting institutions in India make the benefits of business groups dominate its costs under certain circumstances. Although their studies are related to vertical integration, these authors did not explicitly examine the impacts of institutions, particularly contracting institutions, on vertical integration in developing countries.

As argued by Coase (1937), the vertical boundary decision hinges upon the external environment, the most important component of which is arguably institutional quality. Nonetheless, the theoretical prediction of the direct effect of institutions on vertical boundary is ambiguous.[1] There are two leading theories that address the vertical boundary of firm: the transaction cost theory (Williamson, 1971, 1985; Klein, Crawford, and Alchian, 1978) and the property rights theory (Grossman and Hart, 1986; Hart and Moore, 1990). According to the transaction cost theory, firms are more likely to be vertically integrated when the market transaction cost is higher. When the legal institutions that ensure contract enforcement are weak, the transaction costs in arms-length transactions are expected to be high. Given that the transaction cost theory is largely silent about the transaction cost within a firm, it predicts that an improvement in contracting institutions will lead to less vertical integration. The property rights theory, in contrast, takes the view that the imperfection of contracting institutions affects both in-house production and arms-length transactions. When a firm deals with an independent input supplier in an arms-length transaction, it is subject to the supplier's holdup problem. When the input supplier becomes an employee in in-house production in the vertical integration scenario, the firm still faces the potential contract disputes between the employer and the employee. The

[1] Acemoglu, Johnson, and Mitton (2009) and Macchiavello (2010a) instead find that contracting institutions have an indirect effect on vertical integration through the development of financial institutions (see below for further discussion of these two studies).

resolution of both types of contract disputes is affected by contracting institutions. Hence, the property rights theory produces no clear-cut predictions on how the vertical boundary is affected by the quality of contracting institutions.

However, the prevalence of large firms in developing countries with weak contracting institutions suggests that vertical integration may be able to mitigate transaction costs to some extent. It is likely that the transaction costs arising from the holdup problem between two contracting parties in arms-length transactions are, on average, more severe than those existing between the employer and the employee in in-house production in a vertically integrated firm. In arms-length transactions, in addition to bilateral negotiations, the resolution of the holdup problem relies primarily on external contract enforcement institutions, such as the courts, whereas, in vertically integrated firms, the owner's residual control rights may mitigate the transaction costs arising from the disputes between the employer and the employee to a certain extent. If this is the case, then we would expect to observe a negative relationship between vertical integration and contracting institutions and, consequently, a prevalence of vertically integrated firms in developing countries. In other words, vertical integration is an organizational response to poor contracting institutions.

Nonetheless, we may well find this organizational response to involve an excessive degree of vertical integration because of the failure of underlying institutions if we employ a country with ideal contracting institutions (such as the U.S.) as a benchmark for comparison. An excessive degree of vertical integration may reduce levels of specialization considerably and lead to efficiency losses. Clearly, in this scenario, policy recommendations for improved contracting institutions are called for, if countries wish to enhance economic growth.

There has been a recent renaissance in research considering the institutional determinants of vertical boundary, with a focus on the roles played by contracting institutions and financial institutions. Acemoglu, Johnson, and Mitton (2009), for example, show that the quality of contracting institutions has no direct impact on firm vertical boundary decision, and instead it has a negative, indirect impact through its interaction with the quality of financial institutions. Macchiavello (2010b) focuses on the role of financial institutions, and shows that its impact on vertical integration depends on the industry's external finance reliance and heterogeneity in firm size distribution. Pascali (2009) finds the quality of contracting institutions to affect firm vertical boundary through asset specificity, albeit not directly. Nonetheless, all of these studies utilize cross-country firm-level data sets, which may pose the difficulties in controlling for the impacts of political system, culture and

language, corporate tax policies, and national trade and investment policies across countries. In this paper, using a cross-region data set from the world's largest developing economy, China, we aim to identify the direct impact of contracting institutions on vertical integration.[2] At the same time, following Acemoglu, Johnson, and Mitton (2009), and Macchiavello (2010a, 2010b), we also investigate how contracting institutions may interact with financial institutions in determining the vertical boundary decision.

Our empirical analysis uses data from a World Bank survey of 1,566 firms located in 18 cities and nine manufacturing industries in China. We measure the degree of vertical integration in two ways: the ratio of value-added to sales, which is the most widely used measure in the literature (Adelman, 1955; Davies and Morris, 1995; Holmes, 1999), and a measure constructed on the basis of the replies to a survey question asking how large the proportion of inputs a firm produces in-house. Meanwhile, China offers an ideal setting in which to study the impacts of the quality of contracting institutions on vertical integration, because there are substantial cross-region variations in the de facto quality of these institutions in China as a result of substantial regional disparities in economic and institutional development (e.g., Du, Lu and Tao, 2008; World Bank, 2008; Lu and Tao, 2009).[3] Specifically, we measure the quality of contracting institutions as the perceived likelihood of the legal system upholding contracts and property rights in business disputes (e.g., Johnson, McMillan, and Woodruff, 2002; Cull and Xu, 2005).

Our basic ordinary least squares (OLS) regression results show the quality of contracting institutions to have a direct, specifically, negative and significant, impact on firm vertical integration. However, endogeneity could be a serious concern. For instance, there could be a possibility of reverse causality. The entrepreneurs behind vertically integrated firms may have less need to outsource intermediate goods and thus may be less likely to encounter commercial disputes with business partners. Accordingly, they may have less need to ask for court adjudication; this lack of experience with court resolution may lead to misperceptions of the quality of contracting institutions based on stereotypes among these entrepreneurs. In addition, our results

[2]Fan, Huang, Morck, and Yeung (2007) also examine how institutional quality (i.e., contract enforcement, government service, and market development) affects the make-or-buy decision. However, they use data on China's publicly listed firms, which do not constitute a representative sample of Chinese firms as they are large, vertically integrated, and politically connected. In addition, they do not control for industry dummies in their estimation, although doing so has been found to be important in identifying the impact of contracting institutions on vertical integration (Acemoglu, Johnson, and Mitton, 2009).

[3]For example, in coastal cities, it takes an average of 230 days to resolve an uncomplicated commercial dispute, whereas the corresponding number for Northeastern China is 363 days (World Bank, 2008).

could suffer from omitted variable bias. For example, a more capable entrepreneur may, on the one hand, have better connections that help her/him to secure better de facto contract enforcement and, on the other hand, be capable of managing a more vertically integrated business. Hence, the failure to control for entrepreneurial capability may lead to an underestimation of the impact of contracting institutions. To mitigate the potential biases stemming from the endogeneity problem, we conduct a series of econometric analyses and robustness checks.

First, we check whether our results are biased due to omitted variables. More specifically, we include a list of control variables that reflect CEO characteristics (such as human capital and political capital) and firm characteristics (such as firm size, firm age, percentage of private ownership, access to bank loans, and degree of computerization), as well as industry and city dummies. Our results remain robust to the inclusion of these controls.

Second, to further deal with the possible endogeneity issue, we use the two-step generalized method of moments (GMM) with two alternative instruments, viz., the average response by other firms located in the same city regarding the quality of contracting institutions and a dummy variable indicating whether the respective city was administered by Great Britain in the late Qing Dynasty of Imperial China. The two-step GMM estimation results reinforce our findings that the quality of contracting institutions has a negative impact on vertical integration.

Third, we apply the heterogeneous response method pioneered by Rajan and Zingales (1998). According to Acemoglu, Johnson, and Mitton (2009), the quality of contracting institutions has a greater impact on the vertical boundary decision for firms that are more susceptible to supplier hold-up problems. To proxy for a firm's reliance on external suppliers, we adopt two alternative measures: the number of suppliers as in Blanchard and Kremer (1997) and Rajan and Subramanian (2007), and capital intensity as in Acemoglu, Johnson, and Mitton (2009). Our results indicate that the negative impact of the quality of contracting institutions on vertical integration is indeed greater for firms with a greater degree of external reliance.

Finally, in further robustness checks, we repeat our analysis employing an alternative measure of vertical integration, an alternative measure of the quality of contracting institutions, and three sub-samples of firms (i.e., firms with focused businesses, private firms, and small firms). Again, our results remain robust to all of these specifications.

Our results point to a fairly robust direct impact of contracting institutions on firm vertical boundary decision. As we discuss in Section 3, our results differ from those of existing studies, such as Acemoglu, Johnson, and Mitton (2009), primarily because of the lack of regional industry specializa-

tion in China and the different approaches we adopt to measure degree of vertical integration and quality of contracting institutions.

To corroborate the findings in the literature (Acemoglu, Johnson, and Mitton, 2009; Macchiavello, 2010a, 2010b), we further investigate the role played by financial institutions and its interaction with contracting institutions in determining the degree of vertical integration. We find that overall financial institutions have no direct impact on vertical integration, although firms with greater reliance on external finance are less vertically integrated in regions with better financial institutions, which is consistent with the theoretical prediction of Macchiavello (2010b). Unlike Acemoglu, Johnson, and Mitton (2009), however, we find contracting institutions to have no interacting effect with financial institutions. Nevertheless, our main findings on the direct impact of contracting institutions on vertical integration remain robust throughout these exercises.

This study is part of a large and growing body of literature on the importance of economic institutions to economic growth (e.g., Acemoglu, Johnson, and Robinson, 2001, 2002), incentives for investment (e.g., Besley, 1995; Johnson, McMillan, and Woodruff, 2002), and such corporate decisions as firm size (Laeven and Woodruff, 2007), foreign direct investment (FDI) location choice (Du, Lu, and Tao, 2008), and family control of business (Lu and Tao, 2009).

The remainder of the paper is structured as follows. Section 2 introduces the data and variables used in the empirical study, and Section 3 presents our main empirical results. The paper concludes with Section 4.

2 Data and Variables

The data used in this paper come from the *Survey of Chinese Enterprises* (SCE), conducted by the World Bank in cooperation with the Enterprise Survey Organization of China in early 2003.[4] To ensure balanced representation, the SCE encompassed 18 cities from five geographic areas of China: Northeast – Benxi, Changchun, Dalian, and Harbin; Coastal region – Hangzhou, Jiangmen, Shenzhen, and Wenzhou; Central China – Changsha, Nanchang, Wuhan, and Zhengzhou; Southwest – Chongqing, Guiyang, Kunming, and Nanning; and Northwest – Lanzhou and Xi'an. It includes 1,566 firms in nine manufacturing industries: garments & leather products, electronic equipment, electronic parts making, household electronics, automobile & automo-

[4]This is a cross-sectional data set that includes most of the variables concerning firm operation and performance in 2002, although it also contains some financial information for the 2000-2002 period.

bile parts, food processing, chemical products & medicine, biotech products & Chinese medicine, and metallurgical products.

Our dependent variable is the degree of vertical integration in a firm. Following the literature (i.e., Adelman, 1955; Davies and Morris, 1995), we employ the ratio of value added to sales to measure the degree of vertical integration. Specifically, it is constructed as the ratio of the difference between sales and purchased raw materials to sales, and is denoted by *Value Added Ratio*. Table 1 reports summary statistics of the data. Referring to Table 1, we can see that the mean value of *Value Added Ratio* is 0.487 ($\pm$0.247).

The ratio of value added to sales, however, has the drawback of being sensitive to the stage of the production process that a firm specializes in (Holmes, 1999). Thus, for a robustness check, we use an alternative measure of the degree of vertical integration. Specifically, it is constructed on the basis of a firm's reply to a survey question asking how large the proportion of inputs (in terms of value) the firm produces in-house, and is denoted by *Self-Made Input Percentage*. However, as this measure is based on the managers' subjective evaluations, it is susceptible to substantial measurement error. Indeed, referring to Table 1, we can see that the standard deviation of *Self-Made Input Percentage* (0.401) is higher than that of *Value Added Ratio*. As the two measures of vertical integration have their own strengths and weaknesses, we employ both in our analysis to cross-check the robustness of our findings.

Our key independent variable is the quality of contracting institutions. Here we follow Johnson, McMillan, and Woodruff (2002) and Cull and Xu (2005), and measure such quality as the effectiveness of the legal system in dispute resolution. Specifically, in the SCE, there is a question asking CEOs: "In your opinion, what is the likelihood that the legal system will uphold your contracts and property rights in business disputes?" Answers range from zero to 100 percent. The variable, *Contracting Institutions*, is constructed on the basis of the responses to this question, with a higher value indicating better contracting institutions. As most business disputes are resolved in local courts in China, this variable reflects the perceived quality of contracting institutions in different cities.[5]

As shown in Table 1, *Contracting Institutions* has a mean value of 0.634 and a standard deviation of 0.389, thus indicating significant variation across firms. Part of this variation comes from the inter-city variation in the quality of contracting institutions. For example, the average quality of contracting

[5] According to the Civil Procedure Law of China (Articles 18-21), civil lawsuits heard in the first instance are, in general, taken care of by local courts at the city and county levels, although the plaintiff and the defendant have the right to appeal to a higher-level court.

institutions is 0.498 in Xi'an, Shaanxi Province, whereas the corresponding figure for Hangzhou, Zhejiang Province is 0.712. Indeed, when regressing *Contracting Institutions* on industry and city dummies (along with a list of control variables related to firm and CEO characteristics), we find the latter but not the former to be highly statistically significant (results available upon request). This is because, although China has a unified legal system, there is substantial variation in the interpretation and enforcement of laws and national ordinances enacted by the central government across regions (see, for example, Clarke (1996), and Lu and Tao (2009) for more detailed discussions). Our measure, *Contracting Institutions*, is based on a firm's overall perception, thus capturing the de facto rather than de jure quality of contracting institutions. However, this subjective measure may suffer from both the endogeneity problem and measurement error problem. To address these concerns, we thus conduct a series of robustness checks.

In a robustness check, we follow Cull and Xu (2005) in using an alternative measure of the quality of contracting institutions. Specifically, it is the percentage of business disputes encountered by a firm that are settled by the courts as opposed to government arbitration or private resolutions, and is denoted by *Court Litigation*.

In our empirical analysis, we also control for other factors that possibly affect vertical integration, including the various firm and CEO characteristics that have been used in previous studies (Cull and Xu, 2005; Li, Meng, Wang, and Zhou, 2008) and industry, city, and industry-city dummies.

Variables related to firm characteristics include: *Firm Size* (measured by the logarithm of employment), *Firm Age* (measured by the logarithm of the number of years since establishment), *Percentage of Private Ownership* (measured by the percentage of ownership held by parties other than government agencies), *Bank Loans* (a dummy variable indicating whether the firm has any outstanding bank loans), and *Degree of Computerization* (measured by the percentage of the workforce using computers regularly).[6]

Variables related to CEO characteristics include: his/her human capital

[6]Larger firms and those with a longer history are likely to be more vertically integrated as they have a large production scale and sufficient expertise to incorporate a large number of production stages. A firm with a higher percentage of private ownership may be more vertically integrated because private enterprises, without government backup, may be disadvantaged in locating and making deals with intermediate goods suppliers. It has been argued that underdeveloped financial intermediaries promote vertical integration (Acemoglu, Johnson, and Mitton, 2009). In countries with credit market imperfections, the enterprises that have obtained bank loans are typically large and well-established firms that are more likely to be vertically integrated through the self-production of intermediate goods. The degree of computerization may well reflect the degree of sophistication of a firm's production process.

– *Education* (years of schooling), *Tenure* (years as CEO), and *Deputy CEO Previously* (an indicator of whether the CEO had been the deputy CEO of the same firm before becoming CEO); and his/her political capital – *Government Cadre Previously* (an indicator of whether the CEO had previously been a government official) and *Party Membership* (an indicator of whether the CEO was a member of the Chinese Communist Party).[7]

As noted in the Introduction, to deal with the potential endogeneity problems associated with the quality of contracting institutions, we apply the two-step GMM estimation method using two alternative instruments: the average response of other firms located in the same city as the focal firm with regard to the quality of contracting institutions (denoted by *City Average of Contracting Institutions*) and a dummy variable indicating whether the city in question was administered by Great Britain in the late Qing Dynasty (denoted by *British Administration*). We discuss the identification strategy using these two instruments in Section 3.2.

As a further robustness check, we also apply the heterogeneous response method of Rajan and Zingales (1998). Specifically, following Acemoglu, Johnson, and Mitton (2009), we examine whether the quality of contracting institutions has a greater impact on vertical integration for firms that are more susceptible to supplier hold-up problems. To measure a firm's reliance on external suppliers, we first use its total number of suppliers (denoted by *Suppliers*), as in Blanchard and Kremer (1997) and Rajan and Subramanian (2007). Second, as in Acemoglu, Johnson, and Mitton (2009), we employ capital intensity, measured by the log of the ratio of fixed assets to sales and denoted by *Capital Intensity*.[8] We expect firms with a larger number of suppliers and a higher level of capital intensity to be more likely to encounter severe contract disputes and to require the help of contracting institutions in resolving those disputes.

Finally, to investigate the role played by financial institutions and its

[7] We expect CEOs with more education and managerial experience to be more likely to run vertically integrated enterprises because their human capital enables them to coordinate various production stages smoothly. The impact of political capital on vertical integration may be ambiguous. On the one hand, entrepreneurs endowed with political capital may be more capable of dealing with suppliers in market transactions by smoothing the process of obtaining government approval or licenses etc. On the other hand, entrepreneurs with political capital may find it easier to expand their production scale by winning government support, thereby rendering vertical integration more likely.

[8] As Acemoglu, Johnson, and Mitton (2009) point out, there seems to be little variation in the capital intensity of industries across countries. However, it is difficult to match the Chinese industry classification with that of the U.S. if U.S. industry capital intensity is used as the benchmark. Instead, we employ the sample firms' capital intensity to measure their vulnerability to holdup problems.

interaction with contracting institutions in determining vertical integration, we construct two additional variables. The first is a measure of financial institutions, in which we use a dummy variable indicating whether the firm has any outstanding bank loans (denoted by *Financial Institutions*).[9] The second is the firm's reliance on external finance, measured by 1 minus the ratio of internal funding for working capital, following Rajan and Zingales (1998) and denoted by *External Finance Reliance*.

3 Empirical Analysis

3.1 OLS Estimates

We first conduct regression analysis using the following specification:

$$y_{fic} = \alpha + \beta \cdot R_{fic} + \varepsilon_{fic}, \tag{1}$$

where y_{fic} is the measure of vertical integration (i.e., *Value Added Ratio* and *Self-Made Input Percentage*) for firm f located in city c and industry i; R_{fic} is the quality of contracting institutions perceived by firm f in city c and industry i; and ε_{fic} is the error term. Robust standard error, clustered at the industry-city level, is used to deal with the heteroskedasticity problem.

Column 1 of Table 2 presents the OLS estimates of specification (1). It is found that *Contracting Institutions* has a negative and statistically significant impact on *Value Added Ratio*. In terms of magnitude, a one-standard-deviation increase in *Contracting Institutions* is associated with a decrease of $0.389 \times 0.053 = 0.021$ in *Value Added Ratio* or 4.3% relative to the mean value of *Value Added Ratio*.

The foregoing estimation results may be biased due to the omission of relevant variables, i.e., $E\left(R_{fic} \cdot \varepsilon_{fic}\right) \neq 0$. To the extent that we can find a comprehensive set of control variables, X_{fic}, such that the residual error term, $\eta_{fic} = \varepsilon_{fic} - X'_{fic}\gamma$, is not correlated with R_{fic}, then we can unbiasedly estimate the impact of contracting institutions on vertical integration. We therefore stepwisely include, as controls, industry dummies, firm characteristics (firm size, firm age, percentage of private ownership, bank loans, and degree of computerization), CEO characteristics (human capital and political capital), city dummies, and industry-city dummies. Accordingly, the new

[9] Note that this is a firm-level measure reflecting the de facto quality of financial institutions, rather than the de jure quality measured at the city-level. As long as firms determine their vertical boundaries in response to their de facto access to external finance, this firm-level measure produces a more precise estimate.

estimation specification is:

$$y_{fic} = \alpha + \beta \cdot R_{fic} + X'_{fic}\gamma + \eta_{fic}. \quad (2)$$

Columns 2-7 of Table 2 report the estimation results. It is clear that among all of these specifications, *Contracting Institutions* always has a negative and statistically significant impact on *Value Added Ratio*, thus implying that firms perceiving higher quality of contracting institutions are less vertically integrated.[10]

It should be pointed out that our results are in contrast to the findings of Acemoglu, Johnson, and Mitton (2009), who find the impacts of contracting institutions on vertical integration to disappear once the industry dummies are included. There are several possible explanations for our strikingly different findings.

First, the effects of industrial structure on firm vertical boundary could be rather different in their setting and in ours. One way that Acemoglu, Johnson, and Mitton (2009) explain their results is to posit that those countries and regions with weaker contracting institutions may have a greater concentration of industries that typically have a higher degree of vertical integration. In other words, countries and regions can choose their industry structure or composition as a means of preventing the adverse effects of weak contracting institutions. In our setting, it is highly unlikely that a region's industry composition is shaped by contracting institutions. A prominent feature of the Chinese industrial structure is that it is fairly congruent across regions. In China, the considerations of self-sufficiency and self-containedness have long been the guiding principles for the industrial structure arrangement. In the pre-reform Cold War period, worries over war breaking out in the eastern

[10]Note that in most of these regressions, we include the city dummy, and hence the inference comes largely from within-city, rather than cross-city, variations in the quality of contracting institutions. In other words, our findings reflect the impact of heterogeneous institutional access rather than the quality of contracting institutions *per se*. Given that firms determine their vertical boundaries in response to the de facto quality of the contracting institutions in their operating environment, our measure may produce more precise estimates. Nonetheless, we do admit that the firm-level measure may suffer from both the endogeneity problem and measurement error problem. To address these concerns, we adopt various robustness checks in the following sections, including controls for various entrepreneurial and firm characteristics and the employment of instrumental variable estimation. In addition, to mitigate the impacts of the variation in institutional access across entrepreneurs in a given city, we also conduct a reduced-form regression using the city-average measure of contracting institutions, which presumably reflects primarily the cross-city variation in the de facto quality of contracting institutions. We obtain qualitatively similar results (available upon request), suggesting that our results still reflect the effects of de facto contracting institution quality on firm organizational choice.

coastal areas and the wish to accelerate the industrialization and urbanization of the western hinterland prompted the central government to relocate a substantial fraction of existing industrial capacity from the east coast to the western inland regions and to favor inland areas in the allocation of new resources for industrial development. As a result, the leadership established a comprehensive set of industries in each province to ensure that the national economy would not be severely disrupted even if the country temporarily lost certain provinces, especially those on the east coast, in periods of war (called *Xiao Er Quan* in Chinese, i.e., each region is small but comprehensive). This trend has continued in the post-reform, post-Cold War era due to the local protectionism unleashed by fiscal decentralization (Young, 2000; Bai, Du, Tao, and Tong, 2004; Lu and Tao, 2009). Local protectionism deters interregional resource allocation and regional industrial specialization. This lack of regional specialization prevents regions with weak contracting institutions from specializing in vertically integrated industries, which may explain why our results remain robust to the inclusion of industry dummies. Interestingly, the congruence in China's interregional industrial structure actually provides an ideal setting in which to examine the impact of contracting institutions on firm organizational structure. It minimizes the impact of the choice of regional industrial specialization and industry characteristics on firms' vertical boundary decision, and allows us to focus on how contracting institutions shape firms' choice of organizational structure in any given industry.

Second, the difference in our measurement of contracting institutions could partially account for the differences in the results. Acemoglu, Johnson, and Mitton (2009) use various indicators of procedural complexity to gauge the efficiency of contracting institutions across countries. Procedural complexity is measured by the number of procedures required to collect a commercial debt or bounced check. These measures are constructed on the basis of objective measures reflecting de jure aspects of contracting institutions, which are convenient for international comparison. However, as countries differ substantially in the efficiency of their administrative, judicial, and commercial entities, procedural complexity may not correspond perfectly with the actual efficiency of contracting institutions. In this paper, in contrast, we employ both the subjective assessment of contracting institution efficiency and the proportion of contract disputes resolved through litigation. Given the national uniformity of legal procedures across regions in China, our measures could reflect the de facto efficiency of contracting institutions in different regions to a large extent. The different approaches used in this study and theirs to capture contracting efficiency may be an additional reason for the differences in the findings.

Finally, differences in the measurement of vertical integration could also

contribute to the different findings. In their cross-country study, Acemoglu, Johnson, and Mitton (2009) use information from the input-output table to construct a firm-level vertical integration index, which largely reflects the opportunity for vertical integration. In contrast, we employ the value added ratio and the proportion of in-house input production to measure vertical integration. Our measures, albeit imperfect and subject to measurement error, are relatively more direct.

3.2 GMM Estimates

Although we have a list of control variables (X_{fic}), it is still possible that, after controlling for X_{fic}, residual error term (η_{fic}) is correlated with the quality of contracting institutions (R_{fic}), i.e., $E\left(R_{fic} \cdot \eta_{fic}\right) \neq 0$, and hence the estimation results may be biased due to this endogeneity issue. Specifically, the residual error term, η_{fir}, can be decomposed into two parts, ω_{fic} and ν_{fic}, where ω_{fic} is a firm/CEO characteristic observed by the firm but not by the econometrician, whereas ν_{fic} is the error term observed by neither the firm nor the econometrician.[11] Hence, the correlation between R_{fic} and η_{fic} comes only from that between R_{fic} and ω_{fic}, i.e., $E\left(R_{fic} \cdot \omega_{fic}\right) \neq 0$.

To deal with this endogeneity issue, we adopt the instrumental variable estimation approach. Specifically, we decompose the quality of contracting institutions (R_{fic}), as perceived by firm f in city c, into two parts: the general quality of contracting institutions in city c (R_c) and a firm-specific idiosyncratic component of contracting institutions (r_{fic}) that is independently and identically distributed, i.e., $R_{fic} = R_c + r_{fic}$.

Our identification strategy depends on whether the general quality of contracting institutions in city c (R_c) is orthogonal to the unobserved firm characteristics (ω_{fic}), i.e.,

$$E\left(R_c \cdot \omega_{fic}\right) = 0. \tag{3}$$

Because the unobserved firm/CEO characteristic, ω_{fic}, is the residue remaining after the control for a host of variables, particularly CEO human capital and political capital, it is unlikely that this unobserved firm/CEO characteristic would be correlated with the general quality of contracting institutions in the city.

Given that assumption (3) is satisfied, the general quality of contracting institutions in the city, R_c, is a valid instrument for our key explanatory

[11] Note that all variables at the industry, city, and industry-city level have been controlled by the inclusion of industry and city dummies (Column 6 of Table 2) and industry-city dummies (Column 7 of Table 2).

variable, R_{fic}. Specifically, we employ the average perception of contracting institutions among the other firms in the same city as a proxy for R_c. In addition, to check robustness to assumption (3), we also use an alternative instrumental variable, viz., the indicator of whether a city was administered by Great Britain in the late Qing Dynasty. The of this variable is motivated by the recent literature on economic institutions (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1997, 1998).

3.2.1 Instrumental Variable I: Average Assessment of Contracting Institutions by Other Firms in the Same City

To proxy for the general quality of contracting institutions in city c (R_c), we use the average assessment of such quality by other surveyed firms in the same city. Specifically, the first instrumental variable, *City Average of Contracting Institutions* ($IV1_{fc}$), for firm f located in city c is:

$$IV1_{fc} = \frac{1}{n_c - 1} \sum_{\substack{j \in \Omega_c \\ j \neq f}} R_{jc} = R_c + \frac{1}{n_c - 1} \sum_{\substack{j \in \Omega_c \\ j \neq f}} r_{jc}, \tag{4}$$

where Ω_c is the set of firms located in city c; n_c is the number of firms located in city c; and R_{jc} is the quality of contracting institutions perceived by another firm j in city c.

The validity of the instrumental variable estimation hinges upon two conditions, the relevance condition and the exclusion restriction. The relevance condition states that the instrumental variable is correlated with the endogenous variable, i.e., $E\left(IV1_{fc} \cdot R_{fic}\right) \neq 0$, which can be confirmed via regression analysis and several econometric tests. And the exclusion restriction states that the instrumental variable is orthogonal to the error term, i.e., $E\left(IV1_{fc} \cdot \eta_{fic}\right) = 0$, which can be proved as follows:

$$\begin{aligned} E\left(IV1_{fc} \cdot \eta_{fic}\right) &= E\left(\left[R_c + \frac{1}{n_c - 1} \sum_{\substack{j \in \Omega_c \\ j \neq f}} r_{jc}\right] \cdot \eta_{fic}\right) \\ &= E\left(\left(R_c + \frac{1}{n_c - 1} \sum_{\substack{j \in \Omega_c \\ j \neq f}} r_{jc}\right) \cdot \omega_{fic}\right) \\ &= E\left(R_c \cdot \omega_{fic}\right) + E\left(\frac{1}{n_c - 1} \sum_{\substack{j \in \Omega_c \\ j \neq f}} r_{jc} \cdot \omega_{fic}\right) = 0, \end{aligned} \tag{5}$$

where the last equality comes from assumption (3) and i.i.d. of r_{jc}.

The regression results using this instrumental variable ($IV1_{fc}$) are reported in Column 1 of Table 3.[12] The relevance condition of the instrumental variable is confirmed by the highly significant correlation between the instrumental variable ($IV1_{fc}$) and the quality of contracting institutions as perceived by the firm (R_{fic}) and the result of the Anderson canonical correlation LR statistic (Panel B of Table 3). Meanwhile, weak instrument concern is ruled out by the large Shea partial R-squared and the result of the Cragg-Donald F-statistic (Panel B of Table 3).[13]

Panel A of Table 3 shows that *Contracting Institutions*, instrumented by the average assessment of the quality of contracting institutions by other surveyed firms in the same city, has a negative and statistically significant impact on *Value Added Ratio*. In Panel C, we report the corresponding OLS estimate for *Contracting Institutions* and the Dubin-Wu-Hausman test. The insignificance of the Dubin-Wu-Hausman test indicates that the OLS estimate is statistically no different from the two-step GMM estimate.

Note that the magnitude of the GMM estimate coefficient of *Contracting Institutions* is about four times as large as the OLS estimate coefficient. Apparently, some omitted variables that are correlated with our outcome variable and the key explanatory variable in the same directions bias the impact of contracting institutions downward in magnitude. For example, a more capable entrepreneur may, on the one hand, have better connections that help her/him to secure better de facto contract enforcement and, on the other, be capable of managing more vertically integrated businesses. Hence, the lack of control for entrepreneurial capability may again lead to an underestimation of the impact of contracting institutions. Another possibility is that the existence of measurement errors associated with the perceived quality of contracting institutions biases the OLS estimates downward in magnitude towards zero.

Most of the control variables produce statistically insignificant estimates, although there are two exceptions. First, the degree of computerization exhibits positive and significant estimated coefficients, which suggests that firms that are engaged in more technologically advanced production have higher value added ratios. The fact that we obtain significant estimated coefficients for *Contracting Institutions* after including the degree of computerization demonstrates that our results are unlikely to be driven by the

[12] As the instrumental variable is at the city-level, which precludes the use of city dummies, we include *Logarithm of GDP per capita* and *Logarithm of Population* to control for the city-level general environment.

[13] The Cragg-Donald F-statistic values for our regressions are significantly higher than the value of 10 considered the critical value by Staiger and Stock (1997).

concentration of firms with sophisticated technology in regions with weaker contracting institutions. Second, party membership exhibits positive and significant estimated coefficients, which shows that entrepreneurs can leverage political capital at different stages of the production process to facilitate vertical integration.

Further checks on the identification strategy. The identification strategy for the foregoing two-step GMM estimation requires that the instrumental variable be orthogonal to the error term, i.e., $E\left(IV1_c \cdot \eta_{fic}\right) = 0$ (equation (5)). A potential concern is that the Chinese courts are strongly influenced by local government officials. This is because local governments provide finance to the courts, and they also appoint judges. To address this concern, we add *Ability of Government Officials* (measured by the city-average perceived percentage of competent officials among the government officials that the firm regularly interacts with) as an additional control variable, and find that our results remain robust (Column 2 of Table 3).

As a further check on our identification strategy, we conduct another test following Acemoglu, Johnson, and Robinson (2002). Specifically, we re-write the orthogonal condition (equation (5)) in the form of mean-independence, i.e.,

$$E\left(\eta_{fic}|IV1_{fc}, R_{fic}, X_{fic}\right) = E\left(\eta_{fic}|R_{fic}, X_{fic}\right). \tag{6}$$

In other words, after both the endogenous variable (R_{fic}) and X_{fic} are controlled for, the instrumental variable ($IV1_{fc}$) no longer has any partial impact on the outcome variable. As shown in Column 3 of Table 3, in the reduced-form regression of the outcome variable on the instrumental variable (along with X_{fic} but not R_{fic}), the instrumental variable has a negative and statistically significant estimated coefficient, which is consistent with our earlier findings.[14] However, in Column 4 of Table 3, when the endogenous variable (R_{fic}) is included as an additional control, we see that the instrumental variable no longer has any statistical significance, which implies the satisfaction of equation (6) and the validity of our instrumental variable estimation.

3.2.2 Instrumental Variable II: British Administration in Late Qing Dynasty

The second instrumental variable we adopt is a dummy variable (*British Administration*) indicating whether a city was administered by Great Britain

[14] As Angrist and Krueger (2001), Chernozhukov and Hansen (2008), and Angrist and Pischke (2009) point out, if the instrumental variable has no statistical significance in this reduced-form regression, then the implication is that the endogenous variable may not have any statistically significant impact on the outcome variable either.

in the late Qing Dynasty of Imperial China, as in Lu and Tao (2009).[15] Motivated by the recent literature on legal origins (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1997, 1998), Lu and Tao (2009) exploit a unique historical period in the late Qing dynasty of Imperial China when Chinese territories were administered by different foreign powers with different legal origins, and employ *British Administration* as the instrumental variable for the quality of contracting institutions (for details on the rationale behind this instrumental variable, see the Appendix and Lu and Tao (2009)).[16]

The regression results using this instrumental variable are summarized in Column 1 of Table 4. With regard to the relevance condition for an effective instrument, *British Administration* is highly and positively correlated with the quality of contracting institutions (R_{fic}). The relevance condition is further confirmed by the Anderson canonical correlation LR statistic. At the same time, weak instrument concern is ruled out by the large Shea partial R-squared and the result of the Cragg-Donald F-statistic (Panel B of Table 4). With respect to the central issue of the IV regression results, Panel A of Table 4 shows that *Contracting Institutions*, instrumented by *British Administration*, has a negative and statistically significant impact on *Value Added Ratio*.

Further checks on the identification strategy. A potential concern with this instrumental variable estimation is that legal origins are shown to have impacts on many aspects of the economy other than the quality of contracting institutions. For example, the common law system has been shown to be associated with more developed financial institutions (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1997, 1998; Djankov, McLiesh, and Shleifer, 2007), less entry regulation and less corruption (Djankov, La Porta, Lopez-de-Silanes, and Shleifer, 2002), less government ownership of banks and lower interest rates (La Porta, Lopez-de-Silanes, and Shleifer, 2002), higher-quality government services (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1999), and lower levels of labor regulation (Botero, Djankov, La Porta, Lopez-de-Silanes, and Shleifer, 2004). These other aspects of the economy could potentially affect a firm's willingness to integrate vertically. For example, more stringent government regulation of entry can result in the prevalence of large-scale firms, which tend to be vertically integrated. If these other aspects of the economy exert significant impacts on a firm's willingness to integrate vertically, then this means that legal origins may affect our outcome variable

[15] Nine of the eighteen cities (Changsha, Chongqing, Guiyang, Hangzhou, Nanchang, Shenzhen, Wenzhou, Wuhan, and Zhengzhou) in our sample were administered by Great Britain, with the remainder occupied by France or Russia.

[16] Berkowtiz and Clay (2005, 2006) similarly look at the relation between legal origin and the quality of contracting institutions within the United States.

through channels other than the quality of contracting institutions, thereby causing the violation of the exclusion restriction of the instrumental variable estimation.

To address this concern, we construct additional control variables related to each of these possible channels, and include them in the regression in stepwise fashion as robustness checks. Specifically, we include *Ability of Government Officials* (measured by the city-average perceived percentage of competent officials among the government officials that the firm regularly interacts with) as a proxy for the quality of government services, *Regulation of Labor* (measured by the percentage of firms with labor redundancy), *Interest Rate* (measured by the city-average annual interest rate), *Financial Development* (measured by the percentage of firms with outstanding bank loans), and *Regulation of Entry* (measured by the city average ratio of unofficial payments to the total costs of obtaining a business registration or license).

As shown in Columns 2-6 of Table 4, our main result concerning the impact of the quality of contracting institutions on vertical integration remains robust to these controls.

3.3 Heterogeneous Response Estimation

As a further robustness check, we apply the heterogeneous response method pioneered by Rajan and Zingales (1998). The identification of this method hinges upon the theoretical mechanisms through which contracting institutions may affect vertical integration.

According to the theory put forward by Acemoglu, Johnson, and Mitton (2009), the quality of contracting institutions has a greater impact on vertical integration decision among firms that are more susceptible to supplier holdup problems. Firms that deal with many suppliers or have high capital intensity are expected to be more reliant on external suppliers and thus more likely to encounter supplier holdup problems. Specifically, we estimate the following equation:

$$y_{fic} = \alpha + \beta \cdot R_{fic} + \delta \cdot R_{fic} \times S_{fic} + \eta \cdot S_{fic} + X'_{fic}\gamma + \eta_{fic}, \qquad (7)$$

where S_{fic} is a measure of a firm's reliance on external suppliers, which is either the total number of suppliers, as in Blanchard and Kremer (1997) and Rajan and Subramanian (2007), or capital intensity, i.e., the logarithm of the ratio of fixed assets to total sales, as in Acemoglu, Johnson, and Mitton (2009).

The regression results are reported in Table 5, in which the total number of suppliers is used in Column 1 whereas capital intensity is used in Column 2.

It is clear in both cases that indeed the impact of contracting institutions on vertical integration is greater among firms that rely more heavily on external suppliers, which is consistent with the theoretical predictions and empirical findings of Acemoglu, Johnson, and Mitton (2009). Moreover, the direct effect of contracting institutions on vertical integration remains robust in these exercises.

3.4 Robustness Checks

We also conduct six additional sets of robustness checks of our findings on the impact of the quality of contracting institutions on vertical integration. First, we employ an alternative measure of vertical integration, i.e., the percentage of inputs (in terms of the value) produced in-house by the firm itself (denoted by *Self-Made Input Percentage*). The OLS and two-step GMM (using the average assessment of the quality of contracting institutions by other surveyed firms in the same city as the instrument) estimates are reported in Columns 1-2 of Table 6, respectively. The quality of contracting institutions is found to have a negative impact on vertical integration in both regressions, although only the two-step GMM estimate is statistically significant. And the Dubin-Wu-Hausman test is statistically significant, thus implying that the OLS estimate may be biased due to the endogeneity issue and/or the measurement error problem.

Second, we use an alternative measure of the quality of contacting institutions, i.e., the percentage of business disputes encountered by a firm that are settled by the courts (denoted by *Court Litigation*). The OLS and two-step GMM (using the average assessment of the quality of contracting institutions by other surveyed firms in the same city as the instrument) estimates are reported in Columns 3-4 of Table 6, respectively. The quality of contracting institutions still has a negative impact on vertical integration in both regressions, although only the OLS estimate is statistically significant. The Dubin-Wu-Hausman test is statistically insignificant, which indicates no statistical difference between the two-step GMM estimate and the OLS estimate.

Third, for firms involved in many businesses, the degree of vertical integration may vary from one business to another. Thus, our measure of vertical integration may reflect the average degree of vertical integration across various businesses, which may bias our estimations of the impacts of the quality of contracting institutions on vertical integration. To alleviate this concern, we focus on the sub-sample of firms with focused business (defined as firms whose main business contributes at least 90% to their total sales). The results shown in Columns 1-2 of Table 7 suggest that our main findings remain

robust to this sub-sample.

Fourth, China's state-owned firms were the main players under the central planning system. Even during China's economic transition, these firms remain favored by the government, and thus enjoy better de facto treatment from contracting institutions. At the same time, influenced by the principle of self-sufficiency that prevailed under the central planning system, state-owned firms are generally still characterized by vertical integration. To ensure that our results are not biased due to the inclusion of state-owned firms, we focus on the sub-sample of private firms (defined as firms with at least 90% of shares in private hands). As shown in Columns 3-4 of Table 7, our main findings remain robust to this sub-sample.

Lastly, there could be concern that our results are driven by larger firms, which are more likely to integrate vertically and thus less vulnerable to the risks of poor contracting institutions. To deal with this concern, we focus on the subsample of smaller firms (excluding the top 10% of firms in terms of employment).[17] As shown in Columns 5-6 of Table 7, the impacts of the quality of contracting institutions on vertical integration remain negative and significant.

3.5 Role of Financial Institutions

The recent literature on the relationship between institutional quality and vertical integration has paid a great deal of attention to the role played by financial institutions. Acemoglu, Johnson, Mitton (2009), for example, find no direct effects of contracting institutions and financial development on the extent of vertical integration, although they do detect greater vertical integration in countries with both weaker contracting institutions and better financial development. Macchiavello (2010b) shows the impact of financial institutions on vertical integration to be complicated, hinging upon the firm size distribution within an industry. That is, in industries in which small firms are more prevalent, financial institutions reduce the degree of vertical integration. We expect this to hold in our data set, in which the firms are relatively small. Following Macchiavello (2010b), we thus estimate the following equation:

$$y_{fic} = \alpha + \beta \cdot F_{fic} + \delta \cdot F_{fic} \times E_{fic} + \eta \cdot E_{fic} + X'_{fic}\gamma + \eta_{fic}, \qquad (8)$$

where F_{fic} measures the quality of financial institutions, and E_{fic} is a measure of external finance reliance (à la Rajan and Zingales, 1998).

[17] We obtain similar results when the top 25% or 50% of firms are excluded from the sample.

The regression results are reported in Table 8. In Column 1, we include only the single term of the quality of financial institutions, and find that it has no direct effect on vertical integration, in line with the complicated relations between financial institutions and vertical integration elucidated by Macchiavello (2010b). In Column 2, we interact financial institutions with external finance reliance, and find that firms with greater reliance on external finance are less vertically integrated in environments with better financial institutions.[18] Given the generally small size of the firms in our sample, this finding is consistent with Macchiavello (2010b)'s theoretical predictions and empirical findings.

In Columns 3-4, we add the quality of contracting institutions and its interaction term with external finance reliance. It is found that the quality of contracting institutions continues to have a negative and statistically significant impact on vertical integration, thus reinforcing our main results in earlier sections. Meanwhile, the interaction between financial institutions and external finance reliance remains robust to the control of contracting institutions, thus implying the importance of financial institutions for vertical boundary decision.

Lastly, in Column 5, we further include the interaction term between financial institutions and contracting institutions. Unlike Acemoglu, Johnson, and Mitton (2009), we find contracting institutions to have no differential impact on vertical integration through financial institutions. This finding is understandable because, as Macchiavello (2010b) points out, the impact of financial institutions on vertical integration is complicated, primarily functioning through interactions with firms' external finance reliance and the firm size distribution within an industry.

4 Conclusion

The make-or-buy decision is an important one for business strategy, firm performance, and ultimately economic growth. In explaining the determinants of vertical integration, the existing literature focuses primarily on contractual incompleteness and asset specificity by taking the existence of sound contracting institutions for granted. Given that the quality of contracting institutions is actually imperfect, even in some developed economies, and far more problematic in developing countries, an investigation of the impacts

[18] Estimation using external finance reliance data on U.S. industries (adopted from Rajan and Zingales, 1998) shows that the interaction term is also negative, albeit statistically insignificant. Presumably, this is due to the imperfect matching between the U.S. industry classification and the industry classification used in our data.

of the quality of contracting institutions on vertical integration is greatly needed.

In this paper, using a data set of manufacturing firms in China, we investigate how the cross-city variation in the quality of contracting institutions in China affects the degree of vertical integration. We find the quality of contracting institutions to have a negative and significant impact on vertical integration. This result is robust to the inclusion of a comprehensive list of controls variables, to the use of instrumental variable estimation and heterogeneous response estimation, to alternative measures of the key variables, to the use of various sub-samples, and to the control for the quality of financial institutions. Our findings highlight the importance of contracting institutions in firm organizational choice, and offer potential policy recommendations as such choice subsequently affects firm performance and economic growth.

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Appendix

During the late Qing Dynasty (1840-1911), China was defeated in a series of wars against foreign powers, including two Opium Wars with the Great Britain, the Sino-Japanese War of 1894-95, and the Boxer Rebellion. In the wake of military defeats, the Qing government was forced to sign unequal treaties including territorial concessions. The wave of territorial partitioning climaxed at the end of the nineteenth century. The Great Britain administered nine regions (Guizhou, Sichuan, Hubei, Hunan, Jiangxi, Anhui, Jiangsu, Henan, and Zhejiang provinces); France controlled Yunnan, Hainan, Guangxi, and the majority of Guangdong province; Germany administered Shandong province; Japan governed Fujian province; and Russia controlled Xinjiang, Mongolia, and the three north-eastern provinces (Qian, 1978). Shanghai and Tianjin, the two leading commercial centers of China at the time, were divided into various foreign concessions.

Three main reasons account for the geographical pattern of territorial partitioning by the foreign powers. First, the geographic proximity between the foreign powers and China's regions is a primary force in shaping the pattern of territorial concessions (Dougherty and Pfaltzgraff, 2000). For example, Russia, located to the north of China, occupied most of China's northern regions such as Xinjiang, Mongolia, and the three northeastern provinces. France, stepping from its colony of Vietnam that lies to the southwest of China, extended its colonial power to the four southwestern provinces in China, i.e., Yunnan, Hainan, Guangxi, and the majority of Guangdong province (Yang, 2006). Japan, defeated by Russia in its aggression in the Northeast China, chose to occupy China's regions such as Taiwan and Fujian that are close to its southern territories. The second reason for the territorial partitioning is for the control of certain products that the foreign powers needed at the time. For example, the Great Britain, which was a big importer of tea and silk from China, chose to occupy those regions in China that produced these two products (Sa and Pan, 1996). Finally, the territorial occupation of Germany, a power which was late in joining the occupation of China, was a result of bargaining and negotiation with other foreign powers (China History Society, 1959). Hence, the geographical pattern of territorial concessions had nothing to do with the initial institutional strength and the industrial development capacity of different regions. It can be regarded as an exogenous process. On the contrary, the quasi-colonial experience contributes to the variations in institutional strength across regions in China.

Within their respective domains of control, the foreign powers effectively established their sovereign authorities (McAleavy, 1967). Typically, the foreign powers imposed their own civil and military administration, including

legal system, police, and education (Dong, Zhang, and Jiao, 2000). In particular, lawsuits taking place in those domains controlled by foreign powers were adjudicated using the legal systems of respective reigning foreign powers (e.g., Yang and Ye, 1993; Tan, 1996). The foreign powers imposed their own civil and military administration by force and hence, the administrative systems could be considered as being exogenous to the local communities.

Contemporary China is a united sovereign nation with a unified legal system. However, there are substantial variations in the interpretation and enforcement of laws and national ordinances enacted by the central government across China's various regions (e.g., Clarke, 1996). Due to the substantial variations in endowments, technologies and economic development across regions in China, local governments often issue various rules and regulations regarding laws and national ordinances so as to make them more adapted to the local circumstances (e.g., Chen, 2004; Clarke, Murrell, and Whiting, 2008). Furthermore, the enforcement of rules and regulations hinges upon the cooperation of local people as well as local authorities (e.g., Fan, 1985; Lieberthal and Oksenberg, 1988; Zhao, 1989; Li, Zhang, and Wang, 1990; Clarke, 1991), which again varies substantially across China's regions due to the differences in culture, beliefs, and ideologies (e.g., Tai, 1957; Cheng, Liu, and Cheng, 1982; Yearbook of People's Court, 1990; Clarke, 1996).

The imposition of the legal systems by the foreign powers in various parts of China in the late Qing Dynasty is expected to influence not only the legal rules and the legal institutions (including judicial independence and legal procedures) at that time, but also the fundamental legal culture, i.e., human capital and beliefs of the key participants in the legal systems (Zweigert and Kotz, 1998; La Porta, Lopez-de-Silanes, and Shleifer, 2008). Indeed, the foreign powers in China were actively engaged in transplanting and cultivating their beliefs and ideologies to the local people by setting up and operating schools and colleges. Speaking at the Second Protestantism Propagators Congress held in Shanghai in China in 1890, F.L. Hawks Pott, President of Saint John's University, declared that "in our school, we trained China's future teachers and propagators, making them the leaders and comperes in the future and casting the greatest influences on the future China" (Yang and Ye 1993). The legal institutions, human capital and beliefs that were transplanted and cultivated by different foreign powers are expected to persist over time (Zweigert and Kotz, 1998; Balas, La Porta, Lopez-de-Silanes, and Shleifer, 2009). Indeed, there is a growing body of literature on the persistence of culture, beliefs, and ideologies over time (e.g., Bisin and Verdier, 2000; Dohmen, Falk, Huffman, and Sunde, 2006; Tabellini, 2007a, 2007b, 2009). The persistent legal culture shapes the beliefs and behavioral patterns of the current generation. The regional variation in legal culture could

determine the variation in the de facto law enforcement across regions. The leeway that each region enjoys in interpreting national laws and ordinances and adapting them to local circumstances serves as a medium through which the variation in the legal culture could be revealed in the current legal practices, including the effectiveness of contract enforcement.

The foreign powers belong to different legal families. According to La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997, 1998), legal origin affects the effectiveness of contract enforcement. Specifically, contract enforcement is more effective under the common law system used by the Great Britain than under the civil law system used by France, Germany, Japan, and Russia (e.g., Acemoglu and Johnson, 2005). Accordingly, we expect that the local legal and business culture in the British-administered regions in China may be more conducive to contract enforcement than those in regions under the administration of other foreign powers. Hence, we take whether a city of China was administered by the Great Britain during the late Qing Dynasty as a reasonable instrument for the effectiveness of contract enforcement in 2002.

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Table 1, Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Value Added Ratio	1349	0.487	0.247	0.006	1.000
Contracting Institutions	1361	0.634	0.389	0.000	1.000
City Average of Contracting Institutions	1361	0.634	0.125	0.444	0.878
British Administration	1566	0.510	0.500	0.000	1.000
Firm Size	1563	5.040	1.453	0.000	9.899
Firm Age	1566	2.494	0.777	1.099	3.970
Percentage of Private Ownership	1566	0.796	0.389	0.000	1.000
Bank Loans	1540	0.273	0.446	0.000	1.000
Degree of Computerization	1548	0.222	0.265	0.000	1.000
Education	1553	15.359	2.511	0.000	19.000
Tenure	1548	6.240	4.580	1.000	33.000
Deputy CEO Previously	1548	0.280	0.449	0.000	1.000
Government Cadre Previously	1548	0.036	0.185	0.000	1.000
Party Membership	1524	0.648	0.478	0.000	1.000
Logarithm of GDP per capita	1566	0.420	0.592	-0.457	2.784
Logarithm of Population	1566	6.303	0.664	4.938	8.044
Ability of Government Officials	1566	0.517	0.084	0.365	0.649
Regulation of Labor	1566	0.272	0.097	0.150	0.500
Interest Rate	1566	0.055	0.010	0.034	0.078
Financial Development	1566	0.028	0.026	0.000	0.080
Regulation of Entry	1566	0.710	0.102	0.565	0.924
Suppliers	1509	0.042	0.199	0.000	7.100
Capital Intensity	1538	5.718	70.490	0.0002	2267.389
External Finance Reliance	1276	0.869	0.292	0.000	1.000
Self-Made Input Percentage	1459	0.339	0.401	0.000	1.000
Court Litigation	1543	0.044	0.171	0.000	1.000

Table 2, OLS estimates

	1	2	3	4	5	6	7
Dependent Variable	Value Added Ratio						
Contracting Institutions	-0.053***	-0.054***	-0.058***	-0.053***	-0.053***	-0.049**	-0.047**
	[0.019]	[0.019]	[0.019]	[0.020]	[0.020]	[0.021]	[0.022]
Firm Characteristics							
Firm Size			0.004	0.000	0.000	0.002	0.004
			[0.006]	[0.007]	[0.007]	[0.007]	[0.008]
Firm Age			0.016	0.018*	0.018*	0.015	0.010
			[0.010]	[0.010]	[0.010]	[0.011]	[0.011]
Percentage of Private Ownership			-0.003	0.018	0.018	0.011	0.013
			[0.019]	[0.020]	[0.020]	[0.022]	[0.024]
Bank Loans			0.002	-0.002	-0.002	0.001	-0.003
			[0.016]	[0.017]	[0.017]	[0.017]	[0.019]
Degree of Computerization				0.060*	0.060*	0.070**	0.057
				[0.033]	[0.033]	[0.035]	[0.038]
CEO Characteristics							
Human Capital							
Education				0.006*	0.005	0.003	0.003
				[0.003]	[0.003]	[0.003]	[0.004]
Tenure				-0.001	-0.001	0.000	0.000
				[0.002]	[0.002]	[0.002]	[0.002]
Deputy CEO Previously				0.011	0.007	0.009	0.009
				[0.015]	[0.015]	[0.015]	[0.016]
Political Capital							
Government Cadre Previously					-0.047	-0.046	-0.049
					[0.047]	[0.047]	[0.051]
Party Membership					0.035**	0.024	0.029*
					[0.014]	[0.014]	[0.015]
Industry Dummy		Yes	Yes	Yes	Yes	Yes	
City Dummy						Yes	
Industry-city Dummy							Yes
Constant	0.523***	0.761***	0.727***	0.619***	0.590***	0.547***	0.081
	[0.015]	[0.083]	[0.108]	[0.116]	[0.118]	[0.123]	[0.084]
Observations	1183	1183	1167	1140	1118	1118	1118
R-squared	0.0069	0.0374	0.0437	0.0503	0.0569	0.0836	0.1626
p-value for F-test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Standard errors, clustered at industry-city level, are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 3, GMM estimates I

	1	2	3	4
Estimation	GMM		OLS	
Panel A	Second Stage: Dependent Variable is Value Added Ratio		Dependent Variable is Value Added Ratio	
Contracting Institutions	-0.200**	-0.275*		-0.049**
	[0.085]	[0.142]		[0.020]
City Average of Contracting Institutions			-0.200**	-0.165
			[0.100]	[0.100]
Firm Characteristics				
Firm Size	0.003	0.005	-0.001	0.000
	[0.007]	[0.007]	[0.007]	[0.007]
Firm Age	0.013	0.011	0.021**	0.019*
	[0.010]	[0.011]	[0.010]	[0.010]
Percentage of Private Ownership	0.007	0.000	0.023	0.019
	[0.023]	[0.026]	[0.020]	[0.020]
Bank Loans	0.006	0.011	-0.004	-0.001
	[0.018]	[0.020]	[0.016]	[0.017]
Degree of Computerization	0.080**	0.092**	0.054	0.061*
	[0.035]	[0.038]	[0.035]	[0.034]
CEO Characteristics				
Human Capital				
Education	0.004	0.003	0.005*	0.005
	[0.004]	[0.004]	[0.003]	[0.003]
Tenure	0.000	0.000	-0.001	-0.001
	[0.002]	[0.002]	[0.002]	[0.002]
Deputy CEO Previously	0.005	0.004	0.010	0.008
	[0.015]	[0.016]	[0.015]	[0.015]
Political Capital				
Government Cadre Previously	-0.052	-0.055	-0.046	-0.047
	[0.047]	[0.048]	[0.047]	[0.047]
Party Membership	0.033**	0.031*	0.034**	0.033**
	[0.014]	[0.016]	[0.014]	[0.014]
Industry Dummy	Yes	Yes	Yes	Yes
City Characteristics				
Logarithm of GDP per capita	-0.002	-0.004	0.000	-0.001
	[0.022]	[0.023]	[0.022]	[0.022]
Logarithm of Population	0.028	0.028	0.026	0.027
	[0.021]	[0.021]	[0.019]	[0.020]
Ability of Government Officials		0.150	0.070	0.084
		[0.187]	[0.139]	[0.143]
Constant	0.311***	0.299**	0.479***	0.492***
	[0.113]	[0.121]	[0.150]	[0.149]

Panel B	First Stage: Dependent Variable is Contracting Institutions			
City Average of Contracting Institutions	0.852***	0.729***		
	[0.110]	[0.113]		
Anderson Canonical Correlation LR Statistic	[48.44]***	[26.97]***		
Shea Partial R-squared	0.0519	0.0243		
Cragg-Donald F-statistic	[58.02]	[28.22]		
Panel C	Corresponding OLS estimates			
Contracting Institutions	-0.056***	-0.054***		
	[0.020]	[0.020]		
Dubin-Wu-Hausman Test	[2.59]	[2.55]		
Observations	1118	1118	1118	1118

Note: In Columns 1-2, the first stage of the GMM estimates and the corresponding OLS estimates include the same control variables as in the second stage of the GMM estimates but the estimated coefficients of these control variables are not reported to save space (available upon request). Standard errors, clustered at industry-city level, are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 4, GMM estimates II

	1	2	3	4	5	6
Panel A	Second Stage: Dependent Variable is Value Added Ratio					
Contracting Institutions	-0.527*	-0.418**	-0.467**	-0.494**	-0.414**	-0.336*
	[0.309]	[0.196]	[0.211]	[0.210]	[0.202]	[0.180]
Firm Characteristics						
Firm Size	0.010	0.008	0.01	0.011	0.010	0.009
	[0.010]	[0.009]	[0.009]	[0.010]	[0.009]	[0.008]
Firm Age	0.002	0.006	0.001	0.001	0.004	0.006
	[0.017]	[0.013]	[0.015]	[0.016]	[0.015]	[0.013]
Percentage of Private Ownership	-0.017	-0.012	-0.013	-0.016	-0.009	-0.003
	[0.037]	[0.031]	[0.032]	[0.033]	[0.031]	[0.028]
Bank Loans	0.023	0.019	0.022	0.023	0.023	0.018
	[0.025]	[0.021]	[0.022]	[0.023]	[0.022]	[0.021]
Degree of Computerization	0.119**	0.113***	0.117***	0.123***	0.111***	0.102**
	[0.050]	[0.042]	[0.042]	[0.043]	[0.043]	[0.041]
CEO Characteristics						
Human Capital						
Education	0.001	0.002	0.001	0.001	0.002	0.002
	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.004]
Tenure	0.000	0.000	0.000	0.000	0.000	0.000
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Deputy CEO Previously	-0.001	0.001	-0.001	-0.002	0.000	0.002
	[0.019]	[0.018]	[0.019]	[0.019]	[0.018]	[0.017]
Political Capital						
Government Cadre Previously	-0.058	-0.06	-0.064	-0.065	-0.063	-0.061
	[0.054]	[0.051]	[0.052]	[0.053]	[0.050]	[0.048]
Party Membership	0.029	0.028	0.024	0.023	0.023	0.024
	[0.020]	[0.019]	[0.020]	[0.021]	[0.019]	[0.017]
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes
City Characteristics						
Logarithm of GDP per capita	0.024	0.000	0.033	0.027	0.033	0.057
	[0.034]	[0.025]	[0.031]	[0.035]	[0.032]	[0.037]
Logarithm of Population	0.073	0.038	0.059**	0.056*	0.063**	0.073**
	[0.047]	[0.025]	[0.029]	[0.031]	[0.029]	[0.030]
Ability of Government Officials		0.285	0.241	0.310	0.183	0.002
		[0.234]	[0.232]	[0.258]	[0.254]	[0.242]
Regulation of Labor			-0.203*	-0.190	-0.184*	-0.221**
			[0.113]	[0.117]	[0.105]	[0.101]
Interest Rate				-0.629	-0.901	-0.931
				[1.106]	[1.072]	[0.982]
Financial Development					-0.156	-0.215**
					[0.096]	[0.102]
Regulation of Entry						-0.500

						[0.468]
Constant	0.292**	0.283**	0.358**	0.396**	0.393**	0.398***
	[0.139]	[0.134]	[0.149]	[0.167]	[0.161]	[0.149]
Panel B	First Stage: Dependent Variable is Contracting Institutions					
British Administration	0.073**	0.102***	0.102***	0.110***	0.118***	0.139***
	[0.033]	[0.027]	[0.027]	[0.026]	[0.027]	[0.031]
Anderson Canonical Correlation LR Statistic	[7.43]***	[15.20]***	[14.78]***	[16.55]***	[17.57]***	[19.01]***
Shea Partial R-squared	0.075	0.0148	0.0145	0.0159	0.0166	0.0187
Cragg-Donald F-statistic	[7.28]	[15.21]	[14.84]	[16.69]	[17.49]	[18.68]
Panel C	Corresponding OLS estimates					
Contracting Institutions	-0.056***	-0.054***	-0.055***	-0.055***	-0.054***	-0.054***
	[0.020]	[0.020]	[0.020]	[0.020]	[0.020]	[0.020]
Dubin-Wu-Hausman Test	[3.37]**	[3.96]**	[5.03]**	[5.52]**	[4.05]**	[2.98]*
Observations	1118	1118	1118	1118	1118	1118

Note: The first stage of the GMM estimates and the corresponding OLS estimates include the same control variables as in the second stage of the GMM estimates but the estimated coefficients of these control variables are not reported to save space (available upon request). Standard errors, clustered at industry-city level, are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 5, Heterogeneous response estimates

	1	2
Dependent Variable	Value Added Ratio	
Contracting Institutions	-0.047**	-0.051**
	[0.022]	[0.021]
Contracting Institutions * Suppliers	-0.231*	
	[0.136]	
Suppliers	0.005	
	[0.010]	
Contacting Institutions * Capital Intensity		-0.002*
		[0.001]
Capital Intensity		0.002***
		[0.001]
Firm Characteristics		
Firm Size	0.007	0.004
	[0.008]	[0.007]
Firm Age	0.008	0.010
	[0.012]	[0.011]
Percentage of Private Ownership	0.012	0.013
	[0.024]	[0.024]
Bank Loans	-0.005	0.000
	[0.020]	[0.020]
Degree of Computerization	0.058	0.058
	[0.039]	[0.038]
CEO Characteristics		
Human Capital		
Education	0.003	0.003
	[0.004]	[0.003]
Tenure	0.000	0.000
	[0.002]	[0.002]
Deputy CEO Previously	0.008	0.011
	[0.016]	[0.016]
Political Capital		
Government Cadre Previously	-0.044	-0.038
	[0.050]	[0.051]
Party Membership	0.027*	0.029*
	[0.015]	[0.015]
Industry-city Dummy	Yes	Yes
Constant	0.050	0.049
	[0.085]	[0.083]
Observations	1101	1110
R-squared	0.1662	0.1685
p-value for F-test	0.0000	0.0000

Note: Standard errors, clustered at industry-city level, are reported in brackets.
*** p<0.01, ** p<0.05, * p<0.1.

Table 6, Alternative measures

	1	2	3	4
Estimation	OLS	GMM	OLS	GMM
Dependent Variable	Self-Made Input Percentage		Value Added Ratio	
Contracting Institutions	-0.030	-0.239**		
	[0.032]	[0.112]		
Court Litigation			-0.078***	-0.305
			[0.024]	[0.424]
Firm Characteristics				
Firm Size	0.012	0.017*	-0.001	0.001
	[0.008]	[0.008]	[0.006]	[0.007]
Firm Age	0.023	0.018	0.023**	0.025**
	[0.019]	[0.020]	[0.010]	[0.011]
Percentage of Private Ownership	0.048	0.034	0.013	0.012
	[0.031]	[0.034]	[0.020]	[0.020]
Bank Loans	0.018	0.025	-0.008	-0.004
	[0.026]	[0.027]	[0.015]	[0.018]
Degree of Computerization	-0.009	0.017	0.069**	0.070**
	[0.049]	[0.055]	[0.030]	[0.028]
CEO Characteristics				
Human Capital				
Education	0.008*	0.007	0.005	0.005
	[0.005]	[0.005]	[0.003]	[0.003]
Tenure	0.004	0.004	-0.002	-0.002
	[0.003]	[0.003]	[0.002]	[0.002]
Deputy CEO Previously	0.025	0.021	0.012	0.012
	[0.023]	[0.024]	[0.014]	[0.014]
Political Capital				
Government Cadre Previously	-0.146***	-0.154***	-0.047	-0.041
	[0.052]	[0.055]	[0.048]	[0.051]
Party Membership	-0.008	-0.010	0.041***	0.045***
	[0.028]	[0.027]	[0.013]	[0.013]
Industry Dummy	Yes	Yes	Yes	Yes
City Characteristics				
Logarithm of GDP per capita	-0.031	-0.010	-0.013	-0.003
	[0.025]	[0.031]	[0.018]	[0.024]
Logarithm of Population	-0.009	0.022	0.01	0.018
	[0.021]	[0.030]	[0.015]	[0.021]
Constant	0.153	0.233	0.316**	0.250**
	[0.170]	[0.173]	[0.122]	[0.119]
Tests				
Anderson Canonical Correlation LR Statistic		[48.52]***		[9.16]***
Shea Partial R-squared		0.0475		0.081
Cragg-Donald F-statistic		[57.55]		[9.26]

Dubin-Wu-Hausman Test		[3.29]*		[0.29]
Observations	1222	1222	1251	1251

Note: Standard errors, clustered at industry-city level, are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 7, Sub-samples

	1	2	3	4	5	6
Estimation	OLS	GMM	OLS	GMM	OLS	GMM
Sub-sample	Firms with Focused Business		Private Firms		Small Firms	
Dependent Variable	Value Added Ratio		Value Added Ratio		Value Added Ratio	
Contracting Institutions	-0.088***	-0.210**	-0.075***	-0.254**	-0.057***	-0.227**
	[0.029]	[0.088]	[0.023]	[0.110]	[0.019]	[0.088]
Firm Characteristics						
Firm Size	-0.004	-0.005	0.004	0.005	-0.002	0.003
	[0.010]	[0.010]	[0.008]	[0.007]	[0.008]	[0.008]
Firm Age	0.022	0.020	0.010	0.004	0.021*	0.015
	[0.015]	[0.014]	[0.013]	[0.013]	[0.011]	[0.011]
Percentage of Private Ownership	0.019	0.005	-2.067	-2.726	0.000	-0.014
	[0.029]	[0.032]	[1.719]	[1.795]	[0.022]	[0.025]
Bank Loans	0.001	0.009	0.003	0.012	0.002	0.012
	[0.021]	[0.022]	[0.020]	[0.021]	[0.018]	[0.019]
Degree of Computerization	0.100**	0.116***	0.039	0.065	0.061	0.084**
	[0.044]	[0.044]	[0.038]	[0.040]	[0.037]	[0.038]
CEO Characteristics						
Human Capital						
Education	0.005	0.004	0.007*	0.005	0.006	0.004
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Tenure	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Deputy CEO Previously	0.025	0.025	0.001	-0.004	-0.001	-0.005
	[0.018]	[0.019]	[0.018]	[0.019]	[0.018]	[0.018]
Political Capital						
Government Cadre Previously	-0.066	-0.052	-0.061	-0.063	-0.081	-0.087*
	[0.057]	[0.058]	[0.059]	[0.057]	[0.050]	[0.050]

Party Membership	0.051**	0.049**	0.040***	0.039**	0.038***	0.036**
	[0.020]	[0.020]	[0.015]	[0.016]	[0.014]	[0.015]
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes
City Characteristics						
Logarithm of GDP per capita	0.005	0.02	-0.002	0.016	-0.018	-0.002
	[0.024]	[0.025]	[0.023]	[0.027]	[0.024]	[0.025]
Logarithm of Population	0.016	0.034	0.016	0.044	0.009	0.032
	[0.020]	[0.023]	[0.021]	[0.028]	[0.018]	[0.023]
Constant	0.324**	0.292**	2.55	2.972*	0.376**	0.323**
	[0.156]	[0.133]	[1.719]	[1.789]	[0.146]	[0.126]
Tests						
Anderson Canonical Correlation LR Statistic		[38.96]***		[41.01]***		[47.72]***
Shea Partial R-squared		0.671		0.571		0.590
Cragg-Donald F-statistic		[51.59]		[49.68]		[57.74]
Dubin-Wu-Hausman Test		[1.84]		[2.38]		[3.27]*
Observations	716	716	862	862	998	998

Note: Standard errors, clustered at industry-city level, are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 8, Role of financial institutions

	1	2	3	4	5
Dependent Variable	Value Added Ratio				
Contracting Institutions			-0.047**	-0.275***	-0.279***
			[0.022]	[0.064]	[0.064]
Contracting Institutions * External Finance Reliance				0.265***	0.264***
				[0.071]	[0.072]
Financial Institutions	-0.001	0.103*	-0.003	0.115**	0.104
	[0.017]	[0.061]	[0.019]	[0.056]	[0.067]
Financial Institutions * External Finance Reliance		-0.110*		-0.129**	-0.130**
		[0.068]		[0.062]	[0.062]
External Finance Reliance		0.020		-0.140**	-0.139**
		[0.030]		[0.057]	[0.057]
Contracting Institutions * Financial Institutions					0.016
					[0.051]
Firm Characteristics					
Firm Size	0.001	0.002	0.004	0.006	0.006
	[0.007]	[0.008]	[0.008]	[0.007]	[0.007]
Firm Age	0.020*	0.026*	0.01	0.02	0.02
	[0.011]	[0.014]	[0.011]	[0.014]	[0.014]
Percentage of Private Ownership	0.01	0.003	0.013	0.011	0.011
	[0.023]	[0.026]	[0.024]	[0.027]	[0.027]
Degree of Computerization	0.076**	0.051	0.057	0.034	0.035
	[0.035]	[0.036]	[0.038]	[0.038]	[0.039]
CEO Characteristics					
Human Capital					
Education	0.003	0.004	0.003	0.005	0.005
	[0.003]	[0.004]	[0.004]	[0.004]	[0.004]
Tenure	-0.002	-0.003	0.000	-0.002	-0.002
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Deputy CEO Previously	0.006	0.006	0.009	0.011	0.011
	[0.014]	[0.016]	[0.016]	[0.017]	[0.017]
Political Capital					
Government Cadre Previously	-0.052	-0.075	-0.049	-0.077	-0.076
	[0.050]	[0.046]	[0.051]	[0.048]	[0.048]
Party Membership	0.033**	0.027*	0.029*	0.029*	0.029*
	[0.015]	[0.016]	[0.015]	[0.016]	[0.016]
Industry-city Dummy	Yes	Yes	Yes	Yes	Yes
Constant	0.760***	-0.02	0.081	0.119	0.121
	[0.059]	[0.084]	[0.084]	[0.081]	[0.081]
Observations	1263	1075	1118	954	954
R-squared	0.1454	0.1795	0.1626	0.2173	0.2174
p-value for F-test	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Standard errors, clustered at industry-city level, are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.