Judicial Quality, Contract Intensity and Firm Exports: Evidence from China

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Abstract

There is a rich literature that has examined a country's comparative advantage arising from its judicial quality. China's continuous export growth and legal system offer an interesting case to study the effects of judicial quality on firms' exports. The analysis conveniently avoids the hard-to-control heterogeneity across different judicial systems in cross-country studies, and also provides a convincing case of examining the importance of institutions on micro agents. The dataset includes over 77 thousand firms across 30 provinces in China, and covers the whole spectrum of ownership types. We control firm heterogeneity of self-selection into exporters, and also use instrumental variables to control the potential endogeneity of contract enforcement on firms' exports. We find that, firms operating in provinces with better judicial quality export more products that require relationship-specific intermediate inputs. Our results are robust across a number of sensitivity analyses.

Keywords: Contract Enforcement, Relationship-Specificity, Firm Exports

JEL Classification：F14, L14, D23

1. Introduction

There is a growing literature examining the effects of contract enforcement on exports where contract enforcement is viewed as a source of comparative advantage. That rationale comes from some earlier work as Grossman and Hart (1986) and Hart and Moore (1990) that when investments are relationship-specific, under-investment occurs if contracts cannot be fully enforced. By implication, a country will have a comparative advantage in goods that use heavily relationship-specific intermediate inputs if that country has a better judicial quality to enforce contracts. This paper builds on the previous literature and studies how firms' exports are affected by contract enforcement through firms' reliance on relationship-specific intermediate inputs. Using Chinese firms' exports data, we study whether firms operating in cities with better contract enforcement export more goods for which relationship-specific investments are important.

To that aim, China's exports and China's judicial system offer an excellent case to study at the micro-level the importance of judicial quality on firms' exports. First, China has exported not only in record volume, but also has successfully realized product upgrading during the last 30 years (Rodrik, 2006; Schott, 2008). Exports from China over the past three decades have grown at an astonishing fast rate around 17% from 1980 to 2010, while the world trade grew at an average 6% during the same time period. In fact, in year 2009, China became the largest exporting country, overtaking Germany. Today, China has become one of the largest trading partners for all of the world's biggest economies. Geographically, China's exports initially concentrated in the eastern coastal areas, but have gradually spread to firms located in inland cities as well. While foreign-invested firms have been an important driver for China's exports, accounting for over half, other ownership types, especially private-owned firms have steadily increased their exports over the years. For instance, in 2007, for all China's exports of US$1,218 billion, 57.10% was exported by foreign-invested firms, 18.46% by state-owned enterprises, 20.32% by private-owned firms, 3.85% by collective-owned firms, and the remaining 0.27% by other ownership types.[1] While the share of exports by foreign-invested firms is relatively steady over the years, private-owned firms have gradually (and steadily) increased their share at the steady decline of the export shares by state-owned enterprises.[2] Not surprisingly, there are many studies that have attempted to examine the forces behind China's continuous export growth, its comparative advantage, and factors affecting firm exports across different ownership structure. The majority of the search has resorted to the conventional wisdom of resource endowments, exchange rate fluctuations,

[1] The shares are calculated by the authors based on data from the website of China's Ministry of Commerce.
[2] For example, in 2002, foreign-invested firms exported 52.20% of Chinese exports, state-owned enterprises exported 37.74%, collective firms 5.79%, and private firms 4.23%. But in 2005, the export shares for foreign, state-owned, collective and private firms are respectively are 58.23%, 22.13%, 4.79% and 14.71%.

together with China's major economic trade policy reforms, except Li and Wang (2009). The perspective taken by this paper is complimentary to others.

Second, the variations in judicial quality in different provinces within China are more easily to capture, as variations are not due to different legal systems, but due to different enforcement of the same set of regulations. Although China's legal system is not yet fully developed (La Porta et al., 1998, 2000; Djankov et al., 2003), every provincial level municipality in China is subject to a uniform regulatory system set by the Chinese central government, but the enforcement of regulations is up to local governments. In 2008, the World Bank conducted a thorough survey about China's business environment for 30 out of the 31 provincial-level provinces (except Tibet).[3] It writes in its Report (page 2) that "although commercial activities are subject to a uniform regulatory system set by the central government, local officials have a large degree of discretion in terms of economic policy and the enforcement of national legislation. As a result, the capability and vision of local governments can influence, to a great extent, the local business climate….and the efficiency of courts in enforcing contracts varies significantly across China." Clearly, the variations are not due to heterogeneity in judicial quality related with culture, language, history and rule of law, but "the variation rests in the relative efficiency of the local courts and information transparency." As argued by Acemoglu and Dell (2010), it is the variation in regulation implementation and law enforcement within a country that really matters.[4]

Third, the analysis is conducted at the firm-level, and it provides an interesting case to the understandings of the importance of judicial quality on micro agents. Acemoglu (2005) argues that when the importance of institutions is studied, it "will be almost impossible to answer with cross-country data alone, and micro data investigations, for example, exploiting differences in regulations across markets and regions, appear to be the most promising avenue". The effects of judicial quality on firms' exports are not difficult to understand. If a firm's products rely heavily on relationship-specific intermediate inputs, the firm would like to write binding long-term contract with its input suppliers to ensure on time and on quality delivery, so that the firm can effectively organize its production lines to meet its customers overseas. However, difficulties exist both in writing and in enforcing the contracts for very complex and differentiated products. One, it is often impossible to fully stipulate an order for

[3] China has 22 provinces (excluding Taiwan), 4 municipalities, 5 autonomous regions and 2 special administrative regions (Hong Kong and Macao). These are the provincial level (first level) of administrative division in China, but Hong Kong and Macao are excluded. The 22 provinces, 4 municipalities and 5 autonomous regions enjoy similar, although not exactly the same, political status. For simplicity, we refer to the municipalities and the autonomous regions all as "provinces", making a total of 31 provincial level governments in China.

[4] Regarding the variations within a country, either caused by different sets of regulations or by enforcement efforts, Johnson et al. (1998) argue that what really matters is how regulations and laws are actually implemented. They find that inter-regional judicial discretion is particularly large in developing and transition countries.

these products in a formal contract, rendering these contracts incomplete in nature (Berkowitz et al., 2006). Further, even if a contract is well stipulated for those products, it might be more difficult for institutions to determine whether a contract has been breached or fulfilled (Ma et al., 2010). Both reasons would lead to imperfect enforcement of contracts that makes warranties costlier. For firms that produce products relying more on inputs that require relationship-specific investments, the benefits associated with efficient contract enforcement will be higher, and thus cost advantages would be greater. With a good quality judicial institution, exports can be increased from both the intensive margin and the extensive margin. One, the non-exporting firms can now break into the exporting markets due to cost saving from legal fees, consistent with the heterogeneous firm theory in international trade (Eaton and Kortum, 2002; Melitz, 2003).[5] Increasing in the number of exporting firms leads to an increase in the extensive margin of exports. Two, existing exporters could increase their volume of exports (intensive margin), also due to cost savings.

Using Chinese firm level data to study the importance of judicial quality on firm exports relates closely to a large literature which will be discussed in detail below.

2. The Related Literature

The literature on the importance of contract enforcement started with multinational firms' decisions regarding international procurement of intermediate inputs either through outsourcing or within the firm through foreign direct investment (Grossman and Helpman, 2002, 2003, 2005; Antras, 2005; Antras and Helpman, 2004). Trade economists are more interested in how contract enforcement could affect a country's exports advantage. As Spencer (2005) points out, "the growing importance of the international procurement of intermediate inputs either through outsourcing or within the firm, through foreign direct investment, cannot be explained by traditional trade theories that abstract from vertical fragmentation and contractual relationships between buyers and suppliers. Consequently, researchers have been motivated to enrich international trade theory with concepts from industrial organization and contract theory that explain the organizational form of the firm."

Some recent publications, studying contract enforcement as a new venue for a country's comparative advantage, have generally found that countries have comparative advantage in exporting the goods that rely more heavily on relationship-specific intermediate inputs if they have a better quality judicial institution to enforce contracts. For instance, using 1998 data of US imports grouped by industry and country of origin, Levchenko (2004) shows

[5] Empirical studies have documented the significant differences between exporters and non-exporters (Clerides et al., 1998; Bernard and Jensen, 1999, to name a couple). Exporters are more productive, larger and spend more on research and development—a self-selection phenomenon that more productive firms self-select to exporters.

that better institutional quality tends to increase the extent to which a country exports goods in industries that are contract intensive. In a similar vein, Berkowitz et al. (2006) and Ranjan and Lee (2007) find that countries with better contract enforcement have comparative advantages in highly differentiated final products. Nunn (2007), using the classifications in Rauch (1999) for the different reliance of industries on relationship-specific intermediate inputs, calculates an index to capture the share of relationship-specific intermediate inputs for different industries, and shows that countries with good contract enforcement export more products that rely intensively on relationship-specific investment.

The above cross-country industry-level studies show direct linkages between a country's exports and its judicial quality, which has opened a new window in search for a country's comparative advantage. Although it is natural to examine the relationship between a country's exports and its judicial quality from cross-country comparisons, cross-country studies tend to face three weaknesses. First, the variations in contract enforcement across countries are sometimes not directly comparable due to many factors that affect a country's judicial quality. Second, the cross-country heterogeneity, which is deeply embedded in many dimensions such as history, culture, language, and the origin of law, can hardly be adequately controlled for with a country dummy, as they are often used. Third, it might be difficult for aggregate level studies to sufficiently capture the importance of institutions on exports of micro agents (firms), since firms are the ultimate units that make the decision to export. While there are two studies that have tried to avoid the aforementioned weaknesses from different perspectives, such as Li and Wang (2009) and Ma et al. (2010), both have their limitations. Li and Wang avoid cross-country heterogeneity by examining how judicial quality in regions within China affects different industries' exports in each region, but it is at the more aggregate industry level. Ma et al. study the effects of judicial quality on firm exports in a cross-country setting, a micro-level study, but faces the same issue of cross-country heterogeneity existed in previous studies. This paper combines the approaches in Li and Wang and Ma et al. to avoid the weaknesses by studying how judicial quality affects firms' exports located in different regions within a country.

In addition, our estimation method takes into account of the high degree of firm heterogeneity from different perspectives and uses instrumental variables to control for the potential endogeneity of contract enforcement on firms exports. Based on a detailed firm-level dataset, and a World Bank survey on the business environment in 30 provinces in China, we find that judicial quality generates significant impact on firms' exports through the usage of relationship-specific intermediate inputs. The result is strong and robust across a number of sensitivity analyses.

The rest of the paper is organized as follows. Section 3 describes the main variables, Section 4 discusses the empirical strategy, Section 5 presents the results, Section 6 conducts some robust analyses, and Section 7 concludes.

3. Contract Intensity and Other Main Variables

3.1. Measuring Contract Intensity for Intermediate Inputs

Measuring firms' reliance on contract intensity is an important step in the study. Here, we adopt Nunn (2007)'s contract intensity index to measure the importance of relationship-specific investment across industries. Nunn's indices are based on the NAICS 1997 clarification of US input–output (I-O) table, compiled by the Bureau of Economic Analysis. In constructing his contract intensity index, Nunn first uses the 1997 US I–O table to identify input usage for each industry. In order to determine which intermediate input is relationship-specific, he uses the information from Raugh (1999), who sorted the four-digit SITC industries into three trading categories: goods that are mainly traded on organized exchanges, goods that are reference priced in trade journals (but not traded on organized exchanges), and goods that are neither reference priced nor traded on organized exchanges. Nunn argues that if an input is sold on an organized exchange, then the market for this input is thick, and the scope for hold-up is limited, because if a buyer attempts to renegotiate a lower price, the seller can simply sell it to another buyer. In other words, this type of inputs does not need relationship-specific contracts. If an input is not sold on an organized exchange, but is reference priced in trade publications, this input can be thought of having an intermediate level of relationship-specificity. Because, as Nunn puts it, trade journals only publish inputs' reference price if there is a potential large demand. The reference price will thus give input purchasers a useful guide if they have to re-negotiate a price for the inputs in question. In other words, there might be certain room for potential hold-up, however the reference price always serves as a useful benchmark. For those inputs that are neither sold on an organized exchange, or reference priced in trade publications, they are more likely to be relationship-specific, and thus require relationship-specific contracts. According to this categorization, Nunn develops a narrow indicator and a broad indicator, labeled as z_1 and z_2 respectively, to capture for each final good *i* (or industry *i*) the proportion of its intermediate inputs that is relationship-specific:

$$z_1 = \sum_j \theta_{ij} R_j^{neither}, \quad (1)$$

$$z_2 = \sum_j \theta_{ij} \left(R_j^{neither} + R_j^{reference} \right), \quad (2)$$

Where θ_{ij} is the proportion of input *j* used in industry *i*, $R_j^{neither}$ is the proportion of input *j*

(produced by industry *j*) that is neither sold on an organized exchange nor reference priced, and $R_j^{reference}$ is the proportion of input *j* that is not sold on an organized exchange but is reference priced. Clearly, z_1 is a narrow measure, but z_2 is a broad measure in that it treats reference priced inputs requiring relationship-specific contracts as well. Contract intensity indices for each industry are available from Nunn's website.[6]

Adopting Nunn's measures for firms' contract intensity for intermediate inputs, we implicitly assume that firms in a particular industry have the same input-output shares as the aggregate level (industry level). This assumption might sound strong, but due to data unavailability, it is also the common practice in the FDI literature when scholars study the effects on firms' productivity from FDI in upstream and downstream industries.[7]

3.2. Measuring the Efficiency of Contract Enforcement in China

The efficiency of contract enforcement is derived from the World Bank Report, "*Doing Business in China 2008*". The Report covers four broad indicators in China's business environment: starting a business, registering property, getting credit (creating and registering collateral) and enforcing contracts. Regarding the efficiency of contract enforcement, the Report "measures the efficiency of the judicial system in enforcing contracts by following a hypothetical dispute related to a commercial sale through local courts. The data are collected through a study of the civil procedure codes and other court regulations as well as surveys completed by local litigation lawyers (page 22)". The Report uses two indicators to measure the efficiency of contract enforcement—time and cost. For time dimension, the survey measures "the number of days from the time the plaintiff files the lawsuit in court until the time of payment". This measure includes both the days on which actions take place and the waiting period between actions. For cost, it refers to "the official cost of going through court procedures, expressed as a percentage of the claim value", including "court costs, enforcement costs and attorney fees." Since longer court time does not necessarily lead to higher costs to settle a contract dispute, but cost itself directly affects firms' balance sheet, we choose to use the cost measurement to proxy the efficiency of contract enforcement in the later empirical analysis. The Report gives the cost as a percentage of the claim value for all 30 provincial capital cities in China except Lhasa in Tibet. The higher is the percentage, the less efficient is the contract enforcement. To make it easier to interpret, we compute the inverse of the percentage as our measure of contract enforcement efficiency, denoted as *JQ*, for judicial

[6] Li and Wang (2010), and Ma et al. (2010) followed the same specification of Nunn (2007) to determine industries' reliance on relationship-specific investment for intermediate inputs.

[7] In estimating the effects of industry level's FDI on firms' productivity or survival, researchers have generally assumed that firms in the same industry have the same pattern of I-O table as their industry-level ones, such as Jovarcik (2004), and Wang (2012).

quality. A higher number of *JQ* implies more efficiency of contract enforcement, and vice versa. Table 1 shows the *JQ* for all the 30 provincial-level capital cities, and the numbers indicate a wide variety of the *JQ* across China.

3.3. Firm-level Variables

In addition to contract intensity and judicial quality, we include a host of firm-level covariates that directly affect firms' ability to break into exporters and their export volume. Including firm characteristics is also consistent with the heterogeneous firm literature in international trade that firms have different abilities to become exporters. The firm-level data we use are taken from the firm survey, conducted by the Chinese National Statistics Bureau (NSB) in 2007. NSB collects firms' age, number of workers, wage, value-added, output, fixed assets, R&D expenditure, and industry classification. We calculate firms' labor productivity (value added divided by employment), and capital-labor ratio (total asset over employment), and include those covariates with others in the empirical analysis to control for firm-level heterogeneity. Table 2 lists the summary statistics for the variables. Based on previous studies, we expect that older firms, more productive firms and firms paying higher wages will be more likely to become exporters and will also export more, *ceteris paribus*.

4. The Estimation Strategy

The estimation strategy is designed based on the nature of the data. Like many other firm-level studies on firm exports, in China, only a small portion of firms (22%) are exporters, and the majority of them (78%) are non-exporters (zero amount of exports). Essentially, we have a non-negative latent variable (non-negative exports) and some independent variables. That fits the Tobit model well, and thus we will start with the Tobit model as the benchmark. In the later section, we will introduce Heckman two-stage procedure to explicitly control firms' self-selection into exporters. Here, the observable (exports) is some positive number when the latent variable is greater than zero, and is zero when the latent variable is equal to zero. To avoid taking log of zeros, we have the following estimation equation:

$$ln(exports_{fjc} + 1) = \alpha + \beta z_j JQ_c + \delta X_{fjc} + \sum_j \gamma_j Ind_j + \sum_c \gamma_c City_c + \epsilon_{fjc} \qquad (3)$$

$exports_{fjc}$ is the export volume of firm *f* operating in industry *j* and city *c*, *z* is contract intensity for industry *j* (z can be z_1 or z_2), *JQ* is judicial quality for city *c* in terms of cost, *X* is a vector containing all the relevant firm-level variables affecting firms' exports, *Ind* is industry dummy and *City* is city dummy. Finally, ε is the error term capturing all other effects.

In the above specification, as in Nunn (2007) and Ma et al. (2010), exports are explained by the interaction of contract intensity (*z*) and judicial quality (*JQ*), *z***JQ*. Nunn

adopts this functional form from Rajan and Zingales (1998) who test whether industrial sectors that are relatively more dependent on external financing develop faster in countries with better developed financial markets. In this setting, the interaction term captures the effects of judicial quality on firms' exports through firms' reliance on relationship-specific intermediate inputs. A positive coefficient on the interaction term indicates that firms that rely more heavily on relationship-specific intermediate inputs (contract intensity) will export more in cities with better judicial quality (more efficient contract enforcement). That is, better judicial quality provides a source of comparative advantage for firms' exports that rely more on contract intensive goods. We expect β to be positive.

In the empirical setting, the industry and city dummies can partially capture the absolute advantages of industries and cities respectively. See, for instance, if the coefficient on city "Guangzhou" is positive, it means that compared with the base city, firms located in Guangzhou will export more, *ceteris paribus*. Similarly, a positive coefficient for the textile industry implies that, other things equal, firms operating in textile industry will export more, compared with the base industry. Finally, we correct the standard errors by clustering the firms by city-industry.

5. The Regression Results

5.1. The Baseline Results from the Tobit Regressions

Columns (1) and (2) in Table 3 report the Tobit regression results, with both the broad and the narrow measurements of contract intensity respectively. Firm characteristics, along with industry and city dummies are included in all regressions.

In both columns, the coefficient on the interaction term, *zJQ*, is positive and significant at the 1% level. In Column (1), with the narrow measure of contract intensity, the coefficient on *zJQ* is 46.57. That result is the least surprising, and it implies that firms export more goods that rely more heavily on the relationship-specific intermediate inputs if they locate in cities with better judicial quality. As to the magnitude of the effects, the coefficient implies that, one standard deviation from the mean of contract enforcement efficiency index corresponds to 72.65% increase in (latent) average firm export. The calculation is as follows: one standard deviation in *JQ* (0.03) x mean of z_1 (0.52) x coefficient (46.57) =72.65%.

Column (2) instead uses the broad measure, and the coefficient is larger, 124.50, in terms of both statistical and economic importance. It implies that the importance of judicial quality is even more pronounced given that a larger share of intermediate inputs is treated requiring relationship-specific contracts.

Our results are consistent with previous findings as in Nunn (2007), Li and Wang (2009) and Ma et al. (2010). Using firm-level data in a cross-country studies (China is not included in

their sample), Ma et al. found that a one standard deviation increase in the judicial quality index corresponds to a 5.4% increase in firm exports (See column (2) of Table 4 in Ma et al. (2010)), which is smaller than 72.65% found here. The larger results here indicate that judicial quality has a larger impact in China for firms that rely more intensively on relationship-specific intermediate inputs. The larger results here also reflect that China is a large exporting country, and the marginal effects are larger.

For firm-level control variables, the corresponding estimated results are generally in line with previous findings. That is, firms that are older, paying higher wages, more productive, having a larger capital stock, and spending more on R&D tend to export more, some of which also found in Roberts and Tybout (1997) and Bernard and Jensen (1999, 2004). *Ceteris paribus*, older firms are more experienced, firms paying higher wages are more competitive in the labor market, more productive firms can overcome the initial sunk costs associated with exports, and larger firms (capital stock) have the necessary resources to become exporters. The only exception here is the negative coefficient on firm's capital-labor ratio (ln*K/L*). The negative coefficient reflects the fact that China is a labor abundant country, and many firms operating in China mainly exports labor-intensive products. Even for those firms that export high-tech products, the production stage in China often require low-skill assembly which does not require a high capital-labor ratio.[8]

5.2. Vertical Integration and the Effect of Contract Enforcement

So far, we have assumed that firms in a particular industry have the same input-purchasing shares, and thus judicial quality affects them similarly. This section will introduce firm heterogeneity from a particular perspective: vertical integration. Some firms might respond to poor contract enforcement environment by vertical integration as a substitute for formal contract enforcement to outsource intermediate inputs. If it is indeed the case, then one would expect that contract enforcement efficiency will be less important for firms that are more vertically integrated (Nunn, 2007; Ferguson and Formai, 2011). Firm-level data offer us a good opportunity to test this formally.

To quantify firm's vertical integration, we follow Levy (1985) and Lindstrom and Rozell (1993) to use the ratio of value added to sales, denoted as *vi*. A higher *vi* means a higher degree of vertical integration, and thus a less degree of firms' reliance on purchasing intermediate inputs from other firms. If we interact *vi* with *JQ*, a negative coefficient for this interaction term would imply that the effect of contract enforcement efficiency diminishes with the degree of vertical integration by firms. The associated results are reported in

[8] China has been frequently called "The World Factory" (for instance, Zhang, 2006), as Chinese exports tend to low-skilled and labor-intensive.

Columns (3) and (4) in Table 3, with both contract intensity measures respectively.

Column (3) (with the narrow measure of contract intensityz_1) shows that the coefficient for the interaction term, *JQ* x *vi*, is negative and significant at the 1% level. Compared with results in Column (1), the coefficients for all other covariates stay unchanged, which implies that the results are robust. The negative coefficient on *JQ* x *vi* implies that judicial quality is less important for firms' exports that source more internally for intermediate inputs. Column (3) implies that the effect of contract enforcement on export is more than 1.5 times larger for firms which are of lowest degree of vertical integration (with *vi* equal to 0) relative to firms for which vertical integration is highest (with *vi* equal to 1). Replacing with a broad measure of contract intensity leads to similar conclusions (Column (4)). The results show that even for firms locating in the same industry and city, they can adjust to judicial environment by having a higher or lower degree of vertical integration.

5.3. Firm Ownership Structure and Contract Enforcement

This subsection considers another aspect of firm heterogeneity, namely firms' ownership concentration and ownership structure. In a cross-country study, La Porta et al. (1998, 1999) find that in countries with weak rule of law, ownership is heavily concentrated. Their result suggests that concentration of ownership might be helpful for alleviating hold-up problems in purchasing intermediate inputs. That might be even more so in China. Given that the judicial system is controlled by the government, state-owned enterprises, which the various levels of governments have the largest equity share, might have some advantage in coping with the limitations of judicial institutions. At the same time, China has been very successful in attracting record amount of FDI, and has been known to have very favorable regulations to attract FDI. To maintain the status of a most favored destination for FDI, governments at all levels might try to act on legal cases involving foreign firms swiftly, which might lead to some favorable biases. The effect of firm ownership concentration is an empirical question to be examined below.

For ownership concentration, we build *conc* as the following:

$$conc_f = \sum_O share_{f,O}^2, O = \{state, collective, private, HMT, foreign\} \qquad (4)$$

Where $share_{f,O}^2$ denotes the squared term of the equity share of *O* ownership type in firm *f*, and *O* indicates firm ownership types classified as state-owned, collective, private, HMT (Hong Kong, Macau and Taiwan) and foreign (foreign-owned other than HMT). The maximum of *conc* is 1 in that the firm is owned by one investor. We interact *conc* with *zJQ* to capture firms' ownership concentration effect.

Alternatively, rather than calculating an overall ownership concentration index for

each firm, we designate each firm with a specific ownership as specified in the NSB survey, even though that investor does not control 100% of the equity share. Based on that criterion, we have firms classified as state-owned, collective-owned, private-owned, HMT-owned and other foreign-owned. In the empirical analysis, we introduce the product terms of *zJQ* with the state-owned, HMT-owned and foreign-owned respectively. The collective- and private-owned firms are treated as the reference group.

Table 4 reports the corresponding results. Columns (1) and (2) document the results with *conc*, with both measures of contract intensity respectively. The negative and significant coefficient on *z***JQ***conc* indicates that the effect of contract enforcement efficiency on firm export in institutional dependent industries is diminished with the degree of ownership concentration, consistent with previous findings in La Porta et al. (1998, 1999).

Columns (3) and (4) show the results with ownership dummy variables interacted with *zJQ*. Compared with collective- and private-owned firms (the reference group), state-owned, HMT-owned and foreign-owned firms all enjoy larger effects on exports from judicial quality through the usage of relationship-specific intermediate inputs. In other words, improvements in contract enforcement are found to have significant larger effects on state-owned, HMT-owned and foreign-owned enterprises, while the impact for other type of firms are rather limited or even negative when the narrow measure of contract intensity is used. The results are in line with the argument that state-owned, HMT- and other foreign-owned firms might enjoy some favorable treatment biases in contract enforcement.

5.4. Other Dimensions of Firm Heterogeneity

Firms are heterogeneous not only in ownership structure, but also along other dimensions of firm characteristics. There is a potential possibility that the effect of contract enforcement may depend on firm characteristics, such as size, productivity and its R&D expenditure. In the Chinese context, we are more interested in firm productivity and capital stock, as lots of exporting foreign-invested firms are labor-intensive and thus do not carry out a lot of R&D activities. Columns (1)-(4) report the results with the narrow contract intensity measure of z_1, and Columns (5)-(8) with z_2.

On productivity difference, our results indicate that more productive firms do not seem to source differently on inputs from different industries, but the importance of judicial quality on exports for more productive firms significantly decline. The results suggest that judicial quality is more important for less productive firms. To a certain degree, the results here are consistent with the previous findings that state-owned benefit more from better judicial quality as state-owned firms are the least productive in China.

As to capital stock, judicial quality generates larger effects for firms with more fixed

assets. The result is not surprising. Firms with more fixed assets tend to have a higher degree of capital specificity, and the higher the degree of capital specificity, the more firms will rely on contract enforcement on their intermediate inputs, and thus could export more with the improvement of contract enforcement efficiency.

6. Some Robust Analyses

This section conducts some robustness analyses to use an alternative method in line with the analysis in the recent development of heterogeneous firm trade theory. Also, we will consider the potential endogeneity between firm exports and judicial quality, and introduce instrumental variables (IVs).

6.1. A Two-stage Export Selection Model

As the data show, the majority of firms (78%) are non-exporters. Based on Melitz (2003) heterogeneous firm theory, we model firms' exports as a two-stage decision process: firms first decide whether to export or not, and conditional on the export decision, firms then decide how much to export, given the environment where they operate. A country's exports expand on the extensive margin if more firms choose to become exporters, and expand on the intensive margin if firms choose to export more. Econometrically, we use the modified version of Heckman (1979)'s two-stage selection model by Helpman et al. (2008).[9] In the modified version in Helpman et al., the first stage includes all firms and models their decision to become exporters, with the dependent variable being an export dummy indicator (*Exporter*). The second stage estimates the intensive margin of exports conditional on the export decision in the first-stage, i.e., including only exporting firms in the estimation. The two-stage estimation equations are:

$$prob\left(Exporter_{fjc}=1\right)=\Phi(\theta \mathrm{W})=\Phi\left(\mathrm{z_j JQ_c}, \mathrm{X_{fjc}}, \mathrm{RegCost_c}\right) \quad (5)$$

$$ln\left(exports_{fjc}\right)=\alpha+\beta z_j JQ_c+\delta X_{fjc}+\sum_j \gamma_j Ind_j+\sum_c \gamma_c City_c+\rho\mu\left(\tilde{\theta}\ Z_{fjc}\right)+\epsilon_{fjc} \quad (6)$$

Equation (5) is the first-stage export selection equation to model firms' export decision, and Equation (6) is to model firms' export intensity. From Equation (5), we calculate the inverse Mills ratio, coded as $\left(\tilde{\theta}Z\right)$, where $\tilde{\theta}$ is the estimated parameter in the first-stage probit model, and Z is the vector including all variables in that regression. In the second stage, we include the inverse Mills ratio as a stand-alone variable to control for the selection bias in firms' decision to become exporters. The two-stage selection model requires some exclusion

[9] In essence, Helpman et al. (2008) modify Heckman (1979)'s procedure to fit the data when they study bilateral trade flows that have many zeros. In the first stage, they use a probit selection equation to model country's decision to export to a particular partner, and in the second stage, they estimate the intensive margin of exports conditional on that fact that country has already chosen to export to a particular partner.

variables that directly affect firms' decision to become exporters, but not on the volume of exports. We follow Helpman et al. (2008) and Ma et al. (2010) to choose regulatory costs, coded as *RegCost* in Equation (5). The regulatory cost indictors are also taken from the World Bank report. The Report compiles the cost of starting a business at each of the 30 provincial level cities in China as "time of starting a business", coded as $entry\_time_c$ and "cost of starting a business", coded as $entry\_cost_c$. We include both measures as regulatory costs. The corresponding results are reported in Table 6.

Columns (1) and (2) of Table 6 use the narrow contract intensity z_1, and Columns (3) and (4) uses broad contract intensity measure z_2. Columns (1) and (2) indicate a few findings. One, firms operating in regions with better judicial quality are more likely to become exporters. Two, there is a good degree of firm heterogeneity in the decision to become exports: firms that are more experienced (older), paying higher wages (more competitive in the labor market), more productive, conduct more R&D and are larger (capital assets) are more likely to become exporters. Higher capital intensity does not make firms more likely to become exporters in the Chinese context, probably because most of the exporting firms in China are labor intensive. Three, there is a significant selection bias for exporters as the coefficient on the Inverse Mills ratio is significant at the 1% level. Four, after correcting the selection bias, we still find that firms operating in regions with better judicial quality export more goods that use relationship-specific intermediate inputs. The broad measure of contract intensity leads to similar results.

As to the magnitudes, compared with those obtained from the Tobit regressions, the importance of judicial quality on firm exports is smaller here with both measures of contract intensity. So does the effects from age, wage, capital stock and R&D. The coefficient on firm productivity even became negative in the export equation (second stage). These results confirm the existence of selection bias in the first stage. That is, judicial quality environment and firm characteristics are important factors for firms to decide to become an exporter or not.

6.2. The Impact of Potential Endogeneity

We have assumed that judicial quality is exogenous to firms' exports. But that assumption might not be valid if firms choose to locate in cities with good judicial quality in the first place—in this case the endogeneity arises in reverse causality, and the more exporting firms locate in a city, the more incentives the city has to develop and to maintain a high efficient contract enforcement institution, and the larger the comparative advantages the city has in exporting goods that use relationship-specific intermediate inputs. We therefore choose to tackle this explicitly by using instrumental variables (IVs) for judicial quality.

The choice of IVs builds on the work of Meng et al. (2010), who argue that provinces that had high mortality rate during the great famine in China (1959-1961) are due to weak institutions (and thus inflexible policy). As documented in Meng et al. (2010), rural mortality rates are positively correlated with per capita food production in that province. They argue that the drop in food production can only explain the occurrence of the great famine, but has no power in explaining the spatial variation in mortality rates afterwards. They argue that the inflexibility of the grain procurement policy combined with the drop in production in 1959 can explain the observed variation in famine severity across rural areas. Based on their analysis, we expect that a region's inflexible policy is directly related with its mortality rates. We take a step further by assuming that regions' inflexible policy is positively related to its weak institution. Regions with weak institutions are less likely to react swiftly to economic shocks, which then gives rise to inflexible policy and subsequent high mortality rates, and vice versa. And because institutions are path dependent (Acemoglu et al., 2001), thus, a region with a weaker institution in the past (1958-1961) is much more likely to have a weaker institution today.

As a visual test, we plot mortality rates in 1958 and 1959 in each province and the provincial capital city's contract efficiency in 2007. The Figures indicate a strong relationship between mortality rates in 1958 and 1959 and the contract enforcement efficiency in 2007.[10] Because the mortality rates during the great famine are exogeneous to firms' exports in 2007, they are then chosen as our IVs.

We choose to correct the endogeneity both in the Tobit regression and also in the two-stage Heckman's selection model. The Tobit regression results from IV are reported in the left-hand side of Table 7. We use Stock et al. (2002) method to test the validity of IVs in the first stage. The F-statistics is 23571.81, much larger than the Stock-Yogo criterion of 10, indicating that the instruments are valid. Results in Columns (1) and (2) indicate that our main results are robust, and all of the previous major conclusions hold here. As to the magnitudes, with the narrow measurement of contract intensity (z_1), the results are quite similar to those obtained in Table 3. For the broad measure of (z_2), the coefficient on z*JQ* is much larger, though the rest is compatible with those obtained in Table 3.

Columns (3) and (4) report the results from the Heckman two-step procedure (only reporting second stage results due to space limitations). Comparing with those in Table 6, it is clear that the coefficients are compatible. The results also suggest that the Heckman two-stage procedure itself already controls for the firm-selection bias, and that the endogeneity of judicial quality is not a major concern.

[10] In both figures, Chongqing is not included as Chongqing as a provincial level municipality came into existence only in 1997.

6.3. Using Chinese Specific Contract Intensity Index

This subsection conducts another robustness test by using Chinese-specific contract intensity. Chinese-specific contract intensity is slated as a sensitivity analysis because it is more aggregate at the two-digit level (for a total of 29 industries), rather than the one at the four-digit level in Nunn (2007) (for a total of 293 industries), and thus adopting Chinese-specific contract intensity will lead to more aggregate measures of contract intensity. We nonetheless computed China's I-O table (θ_{ij}) (only available at the two-digit level from NSB). In order to get corresponding $R_j^{neither}$ and $R_j^{reference}$ for each 2-digit industry, we aggregate Raugh's $R_j^{neither}$ and $R_j^{reference}$ to 2-digit level based on the concordance obtained from National Bureau of Statistics. Using Chinese-specific $R_j^{neither}$ and $R_j^{reference}$ and the 2-digit Chinese I-O tables, we calculate Chinese-specific z_1 and z_2 respectively. Table 8 reports the results, obtained from the Tobit model and from the Heckman two-stage model respectively.

From the Tobit regressions, judicial quality ceases to be an important source as comparative advantage (Columns (1) and (2)) for firm exports. But after correcting the self-selection bias (Heckman procedure), judicial quality is once again an important source to boost firm exports for firms that require relationship-specific intermediate inputs. This exercise lends two insights. One, measures at the more aggregate level tend to blur the importance of judicial quality on firm exports. Two, the Heckman two-step selection procedure models firms' exports better, as the procedure treats firm exports as a two-stage decision process, consistent with the heterogeneous firm theory in international trade.

7. Conclusions

Several recent studies have provided some evidences that the quality of judicial institutions play an important role to shape up a country's exports in goods that require relationship-specific intermediate inputs. This paper contributes to that literature by using firm-level study within a large exporting country of China by analyzing how firms' exports are affected by the judicial quality of the cities where firms locate. This has two advantages. One, the importance of judicial quality can be better studied using firm-level data given that firms are the ultimate micro agents to decide the volume to export. Two, variations in judicial quality across provinces within China are relatively easy to measure and are more comparable, unless in cross-country studies, since all provinces are subject to the same set of regulations set by the central Chinese government, and the provinces are relatively heterogeneous in culture, language, history, and origin of rule of law.

We utilize both the Tobit model and the modified Heckman two-stage self-selection model to capture the importance of judicial quality on firms' exports. We find that, judicial

quality plays an important role to increase firms' exports of goods that require relationship-specific intermediate inputs. The result is robust across a number of sensitivity analyses. The results imply that to increase firms' exports advantages, in addition to the traditional means such as to boost firm productivity, regions could provide an efficient legal environment, so that firms that require relationship-specific intermediate inputs can reliably count on the legal system to settle any disputes in more efficient way.

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Table 1. Contract Enforcement Variations by City

City	No. of Surveyed Firms	JQ (inverse of the percentage of the claimed cost)
Beijing	6397	0.104
Changchun	1019	0.054
Changsha	2046	0.038
Chengdu	3166	0.028
Chongqing	3916	0.068
Fuzhou	2654	0.073
Guangzhou	4987	0.103
Guiyang	512	0.043
Harbin	952	0.069
Haikou	187	0.089
Hangzhou	8674	0.032
Hefei	1083	0.024
Hohhot	295	0.042
Jinan	1823	0.045
Kunming	889	0.027
Lanzhou	555	0.033
Nanchang	940	0.061
Nanjing	2096	0.074
Nanning	807	0.058
Shanghai	15099	0.111
Shenyang	4383	0.040
Shijiazhuang	2127	0.082
Taiyuan	519	0.038
Tianjin	6361	0.088
Wuhan	1688	0.049
Urumqi	362	0.030
Xian	937	0.046
Xining	193	0.040
Yinchuan	282	0.035
Zhengzhou	2079	0.032

Table 2. Summary Statistics

Variable	Definition	Obs.	Mean	Std. Dev.	Min	Max
Panel A: Firm-level variables						
ln(*Exports*+1)	**log(1+export)**	**77028**	**2.15**	**4.115**	**0**	**18.082**
ln*Age*	**log(age)**	**75445**	**1.923**	**0.847**	**0**	**7.499**
ln*Wage*	**log(wage)**	**76100**	**2.912**	**0.65**	**-3.975**	**8.948**
ln*Productivity*	**log(value added/employment)**	**74581**	**-4.461**	**1.191**	**-15.828**	**6.08**
ln*K/L*	**log(total asset/employment)**	**76144**	**5.49**	**1.147**	**-5.903**	**13.392**
ln*K*	**log(total asset)**	**75831**	**8.408**	**1.856**	**0**	**18.525**
ln*RD*	**log(R&D expenditure)**	**77022**	**0.869**	**2.306**	**0**	**14.477**
Vi	**value added/sales**	**73829**	**0.306**	**0.175**	**0**	**1**
Panel B: industrial characteristics						
z_1 (Chinese specific measures)	**A narrow measure of industry's contract intensity for its intermediate inputs**	**29**	**0.523**	**0.244**	**0.062**	**0.89**
z_2 (Chinese specific measures)	**A broad measure of industry's contract intensity for its intermediate inputs**	**29**	**0.895**	**0.129**	**0.483**	**0.996**
Panel C: Contract Enforcement Efficiency index						
JQ	**the inverse of contract enforcement cost**	**30**	**0.055**	**0.03**	**0.024**	**0.111**

Table 3. Results from the Tobit Regression

(Dependent ariable: ln(*exports*+1))

Variables	(1)	(2)	(3)	(4)
z_1*JQ	46.570**		47.430**	
	(0.031)		(0.029)	
z_2*JQ		124.500***		125.000***
		(0.002)		(0.002)
*JQ*vi*			-16.960***	-16.680***
			(0.003)	(0.004)
ln*Age*	0.550***	0.551***	0.584***	0.583***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*Wage*	3.350***	3.348***	3.352***	3.350***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*Productity*	0.370***	0.371***	0.289**	0.293**
	(0.002)	(0.002)	(0.038)	(0.036)
ln*K/L*	-2.029***	-2.037***	-2.073***	-2.080***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*K*	2.506***	2.509***	2.516***	2.518***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*RD*	0.438***	0.435***	0.435***	0.432***
	(0.000)	(0.000)	(0.000)	(0.000)
No. of Obs.	69746	69746	69677	69677
pseudo R^2	0.093	0.093	0.093	0.093
Log likelihood	-81206.9	-81206.9	-81163.3	-81163.7

Note: regression results on constant, industry and city dummies are not reported due to space limitations. *** and ** indicate significance level of 1% and 5% respectively. Figures in parentheses are P-values, with standard error obtained by industry-city clustering.

Table 4. Ownership Structure and the Effects of Contract Enforcement

	(1)	(2)	(3)	(4)
z_1*JQ	96.81***		-11.55	
	(0.000)		(0.542)	
z_1*JQ*conc	-57.10***			
	(0.000)			
z_1*JQ*SOE			1.244***	
			(0.007)	
z_1*JQ*HKT			12.15***	
			(0.000)	
z_1*JQ*Foreign			14.92***	
			(0.000)	
z_2*JQ		169.1***		67.66*
		(0.000)		(0.055)
z_2*JQ*conc		-48.02***		
		(0.000)		
z_2*JQ*SOE				0.722**
				(0.011)
z_2*JQ*HKT				8.805***
				(0.000)
z_2*JQ*Foreign				11.31***
				(0.000)
ln*Age*	0.524***	0.516***	0.917***	0.933***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*Wage*	3.310***	3.294***	1.665***	1.354***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*Productity*	0.370***	0.371***	0.281***	0.253**
	(0.002)	(0.002)	(0.006)	(0.012)
ln*K/L*	-2.043***	-2.054***	-1.954***	-2.018***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*K*	2.487***	2.482***	1.868***	1.811***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*RD*	0.418***	0.413***	0.589***	0.606***
	(0.000)	(0.000)	(0.000)	(0.000)
No. of Obs.	69671	69671	69746	69746
pseudo R^2	0.094	0.094	0.122	0.128
Log likelihood	-81109.4	-81084.9	-78580.9	-78072.1

Note: regression results on constant, industry and city dummies are not reported due to space limitations. *** and ** indicate significance level of 1% and 5% respectively. Figures in parentheses are P-values, with standard error obtained by industry-city clustering.

Table 5. Firm Heterogeneity across Other Dimensions

variables	(1)	(2)	(5)	(6)	(3)	(4)	(7)	(8)
z_1*JQ	46.83**	49.37**	49.24**	48.62**				
	(0.031)	(0.023)	(0.022)	(0.024)				
z_1* ln*Productity*	-0.192							
	(0.707)							
z_1*ln*K*			0.749**					
			(0.029)					
z_2*JQ					125.1***	137.8***	131.4***	132.1***
					(0.002)	(0.001)	(0.001)	(0.001)
z_2* ln*Productity*					-0.134			
					(0.885)			
z_2*ln*K*							2.180***	
							(0.003)	
*JQ** ln*Productity*		-14.70***				-15.05***		
		(0.000)				(0.000)		
*JQ*ln*K*				6.627**				6.728**
				(0.015)				(0.014)
ln*Age*	0.552***	0.539***	0.549***	0.565***	0.551***	0.540***	0.554***	0.566***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ln*Wage*	3.351***	3.311***	3.361***	3.324***	3.348***	3.308***	3.356***	3.321***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ln*Productity*	0.484	1.584***	0.374***	0.384***	0.495	1.614***	0.373***	0.386***
	(0.122)	(0.000)	(0.002)	(0.001)	(0.561)	(0.000)	(0.002)	(0.001)
ln*K/L*	-2.030***	-2.054***	-2.010***	-2.004***	-2.038***	-2.063***	-2.036***	-2.012***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ln*K*	2.506***	2.506***	2.051***	1.933***	2.509***	2.509***	0.472	1.927***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.506)	(0.000)
ln*RD*	0.437***	0.435***	0.431***	0.446***	0.435***	0.432***	0.432***	0.443***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	69746	69746	69746	69746	69746	69746	69746	69746
pseudo R^2	0.093	0.093	0.093	0.093	0.093	0.093	0.093	0.093
Log likelihood	-81206.5	-81176.1	-81191.2	-81191.4	-81206.9	-81174.7	-81190.2	-81191.0

Note: regression results on constant, industry and city dummies are not reported due to space limitations. *** and ** indicate significance level of 1% and 5% respectively. Figures in parentheses are P-values, with standard error obtained by industry-city clustering.

Table 6. Results from the Heckman Two-step Selection Model

variables	z_1		z_2	
	(1) 1st stage	(2) 2nd stage	(3) 1st stage	(4) 2nd stage
z_1*JQ	4.545***	25.95***		
	(0.000)	(0.000)		
z_2*JQ			11.45***	60.04***
			(0.000)	(0.000)
ln*Age*	0.0564***	0.141***	0.0563***	0.144***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*Wage*	0.334***	1.005***	0.333***	1.025***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*Productity*	0.0464***	-0.228***	0.0465***	-0.225***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*K/L*	-0.200***	-0.909***	-0.200***	-0.927***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*K*	0.238***	1.139***	0.238***	1.155***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*RD*	0.0464***	0.122***	0.0460***	0.123***
	(0.000)	(0.000)	(0.000)	(0.000)
entry_time	0.00424		-0.0139	
	(0.868)		(0.592)	
entry_cost	-0.0256		0.0743	
	(0.580)		(0.164)	
Inverse Mills Ratio		4.005***		4.100***
	(0.000)	(0.000)	(0.000)	(0.000)
No. of Obs.	69746	16490	69746	16490
pseudo R^2	0.2036	0.2794	0.2036	0.2799
Log likelihood	-30378.003		-30379.289	

Note: regression results on constant, industry and city dummies are not reported due to space limitations. *** and ** indicate significance level of 1% and 5% respectively. Figures in parentheses are P-values, with standard error obtained by industry-city clustering.

Table 7. Controlling the Endogeneity of Judicial Quality

	Tobit		Heckman Two-Step (Results in the second stage)	
variables	**Column 1 (z_1)**	**Column 2 (z_2)**	**Column 3 (z_1)**	**Column 4 (z_2)**
z_1**JQ*	46.83***		26.57***	
	(0.003)		(0.000)	
z_2**JQ*		183.9***		66.40***
		(0.000)		(0.000)
ln*Age*	0.499***	0.506***	0.131***	0.129***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*Wage*	3.341***	3.333***	1.034***	1.021***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*Productity*	0.300***	0.302***	-0.244***	-0.246***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*K/L*	-1.949***	-1.950***	-0.892***	-0.890***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*K*	2.503***	2.501***	1.168***	1.160***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*RD*	0.469***	0.467***	0.140***	0.137***
	(0.000)	(0.000)	(0.000)	(0.000)
Inverse of mills ratio			4.316***	4.266***
			(0.000)	(0.000)
First stage F test	23571.81	----	6604.119	5112.551
Overidentification test			0.7161	0.0780
No. of Obs.	64730	64730	14472	14472
Log likelihood			-26958.7	-26965.5

Note: regression results on constant, industry and city dummies are not reported due to space limitations. *** and ** indicate significance level of 1% and 5% respectively. Figures in parentheses are P-values, with standard error obtained by industry-city clustering.

Figure 1. Mortality Rates in 1958 and Contract Enforcement Efficiency in 2007

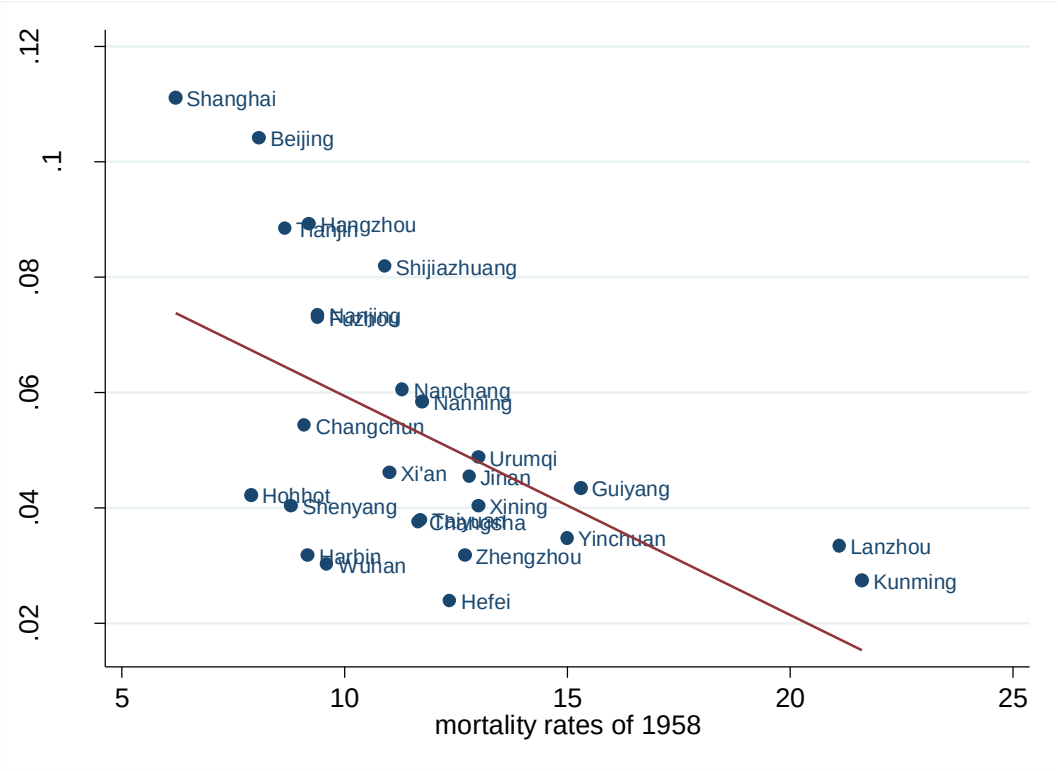

Figure 2. Mortality Rates in 1959 and Contract Enforcement Efficiency in 2007

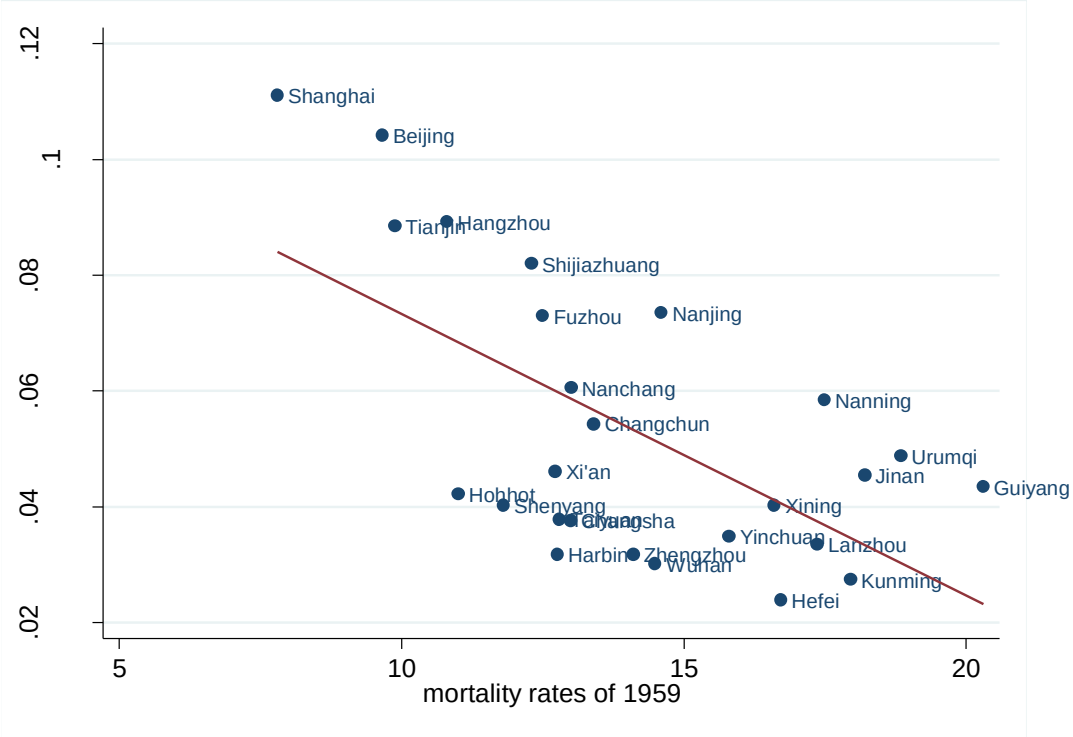

Table 8. Using Chinese-specific Contract Intensity Measures

	Tobit		Heckman Two-Step (Results in the second stage)	
variables	**Column 1 (z_1)**	**Column 2 (z_2)**	**Column 3 (z_1)**	**Column 4 (z_2)**
z_1*JQ	46.31***		31.62***	
	(0.129)		(0.000)	
z_2*JQ		32.74***		25.01***
		(0.360)		(0.001)
ln*Age*	0.534***	0.529***	0.137***	0.139***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*Wage*	3.310***	3.312***	0.992***	1.022***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*Productity*	0.360***	0.360***	-0.233***	-0.229***
	(0.002)	(0.002)	(0.000)	(0.000)
ln*K/L*	-2.012***	-2.025***	-0.904***	-0.929***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*K*	2.506***	2.511***	1.138***	1.161***
	(0.000)	(0.000)	(0.000)	(0.000)
ln*RD*	0.436***	0.433***	0.121***	0.123***
	(0.000)	(0.000)	(0.000)	(0.000)
Inverse of mills ratio			4.015***	4.142***
			(0.000)	(0.000)
N	72396	72396	16490	16490
Log likelihood	-81489.2	-81493.1		

Note: regression results on constant, industry and city dummies are not reported due to space limitations. *** and ** indicate significance level of 1% and 5% respectively. Figures in parentheses are P-values, with standard error obtained by industry-city clustering.