Do Institutions Not Matter in China? Evidence from Manufacturing Enterprises

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Abstract

This study addresses the apparent puzzle that China achieved spectacular economic performance despite weak institutions. Using a World Bank survey of 1,566 manufacturing enterprises in 18 Chinese cities, we investigated whether property rights protection mattered for enterprise performance. We found that property rights protection had a positive and statistically significant impact on enterprise productivity. Two-step GMM estimation and heterogeneous response estimation further established the causal impacts of property rights protection on enterprise productivity. These findings were robust to various controls, exclusion of outliers, and alternative measures of productivity and property rights protection.

Key Words: Institutions, Property Rights, Productivity, External Dependence, Entry Barriers

JEL Codes: O43 P48 D21 L25 O12

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1. Introduction

> "Against this large and cumulative backdrop of the solid empirical demonstration of the virtuous effects of efficient financial and legal institutions, China appears to be a staggering anomaly", Huang (2008: 32).

Numerous cross-country and within-country studies have shown that institutions are fundamental to economic performance (Besley, 1995; Knack and Keefer, 1995, 1997; Mauro, 1995; Hall and Jones, 1999; La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1999; and Acemoglu, Johnson, and Robinson, 2001, 2002). Indeed, the World Bank and International Monetary Fund have stressed the importance of sound institutions in the growth of developing economies (Carothers 2006; *Economist*, March 15, 2008).

However, the record of the Chinese economy over the past thirty years seems to contradict the scholarly finding that institutions are essential to economic performance. Until recently, China provided little formal protection of private property; in particular, protection of private property was not written into China's Constitution until 2004 (Blanchard and Kremer, 1997; Rodrik, 2004a and 2004b; Allen, Qian, and Qian, 2005; *Economist*, March 15, 2008). Nevertheless, China's economic performance has been nothing less than spectacular.

Did institutions really not matter for the performance of the Chinese economy? One explanation is that de facto institutional quality varied widely across China (Du, Lu, and Tao, 2008; World Bank, 2008; Lu and Tao, 2009a), and that China's economic development was concentrated in those regions where institutions are reasonably good.[1] This might possibly explain the apparent contradiction between the poor state of China's institutions and the country's spectacular economic performance at the macro level.

Here, using detailed data at the enterprise level, we were able to address the China puzzle (i.e., that institutions were not important for economic performance) at the microeconomic level. We focused on the protection of private property, which is arguably the most important aspect of institutions (North, 1991; Acemoglu, Johnson, and

[1] Another possible explanation is that the importance of institutions varied across industries and that China's economic development was concentrated among industries for which institutions are less important.

Robinson, 2001; Besley and Ghatak, 2009). Specifically, we investigated whether enterprises enjoying better property rights protection exhibited better performance.

We drew on the *Survey of Chinese Enterprises*, conducted by the World Bank with the Enterprise Survey Organization of China in early 2003.[2] The data set covered 1,566 enterprises drawn from 9 manufacturing industries and 18 cities during a period when property rights were uncertain (recall that the Constitution guaranteed private property only in 2004). To measure enterprise performance, we used labor productivity, i.e., the logarithm of output per worker of an enterprise, and total factor productivity estimated using either the panel fixed-effect method or the methodology developed by Levinsohn and Petrin (2003). Our focus on productivity was motivated by Acemoglu, Johnson, and Robinson (2001), who studied the impact of institutions on income per capita, and interpreted the results as providing implications for the impact of institutions on economic growth.[3]

The quality of property rights protection can be measured by the effectiveness of various means for addressing disputes associated with private property. One means of resolving disputes is court litigation, and the other is to seek help from the state.[4] To measure the effectiveness of court litigation, we used the perceived likelihood that the legal system will uphold contract and property rights in business disputes. To measure the effectiveness of seeking help from the state, we used the perceived share of government officials oriented toward helping business.

Recent political economy studies showed that the state played a more important role in codifying and protecting private property than court litigation (Besley and Ghatak, 2009). This would be especially so in the case of China. Prior to 1978, under central planning, legal institutions were not needed at all. Subsequently, after the beginning of reform, the legal system adapted slowly to a complicated and fast-changing economic environment (e.g., Fan, 1985; Lieberthal and Oksenberg, 1988; Zhao, 1989; Li, Zhang,

[2] The data set has recently been used by Cull and Xu (2005), Ayyagari, Demirgüç-Kunt, and Maksimovic (2007), and Dong and Xu (2009), among others.

[3] By contrast, the existing literature on Chinese institutions focuses on the impacts of institutional quality on intermediate choices such as reinvestment, R&D investment and location (Cull and Xu, 2005; Du, Lu, and Tao, 2008; Lin, Lin, and Song, 2009). We focus on an end outcome of welfare and policy interest – enterprise productivity.

[4] These two means for resolving disputes are formally called litigation through courts and regulatory state (Djankov, Glaeser, La Porta, Lopez-de-Silanes, and Shleifer 2003).

and Wang, 1990; Clarke, 1991). Moreover, in China, the legal system lacked autonomous enforcement powers. Even after thirty years of economic reform, government officials remained heavily involved in interpreting and enforcing national laws and ordinances. Consequently, it seemed reasonable to focus on the effectiveness of seeking help from the state as the principal measure of property rights protection, while using the effectiveness of court litigation as an alternative measure of property rights protection as a robustness check.

Our identification strategy exploited regional variation in the quality of institutions.[5] We found that an enterprise perceiving better protection of property rights had a statistically significantly higher productivity. In order to conclude that this relation was indeed due to a causal impact, that stronger protection of property rights increased productivity, we ruled out a number of alternative explanations and conducted various robustness checks.

First, we checked that our finding was not driven by omitted variables. We introduced a host of covariates related to CEO characteristics (such as human capital and political capital) and enterprise characteristics (such as enterprise size, enterprise age, private ownership percentage, and skilled labor ratio) used in previous research, as well as industry and city dummies. Our result was robust to the inclusion of these controls. It is also important to note that the positive impact of property rights protection on productivity became smaller with the inclusion of city dummies, which supports our earlier conjecture that the China puzzle could be explained in part by the concentration of growth in particular geographical areas with better institutions.

Second, we worried that our finding might still be biased due to some unobserved characteristic correlated with both expropriation and productivity. To address such potential endogeneity, we used the two-step Generalized Method of Moments (GMM) estimation with two alternative instruments for property rights protection, viz., the average assessment of property rights protection by enterprises of other industries located in the same city, and the logarithm of population in the respective city around 1918-19.

[5] It is important to emphasize that regional differences in institutions across China are both significant and persistent. Using the Fan, Wang, and Zhu (1999-2010) data with consistent regional coverage, we correlated the absolute scores and ordinal ranking of the various provinces in 1997 and 2007. The correlations across the two years exceeded 0.80.

The two-step GMM estimates reinforced our findings that property rights protection had a positive and significant causal impact on productivity.

Third, we applied the heterogeneous response method of Rajan and Zingales (1998). Following Blanchard and Kremer (1997) and Rajan and Subramanian (2007), we used the number of suppliers to measure, for each enterprise, its reliance on the external environment. We found that enterprises which were more reliant on the external environment (in the sense of using more external suppliers) exhibited relatively higher productivity in cities with stronger property rights protection. In addition, following Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002), we used the number of days to register a new business to measure, for each enterprise, the level of entry barriers. We found that enterprises which faced lower entry barriers exhibited relatively higher productivity in cities with stronger property rights protection.

In further robustness checks, we explored alternative measures of productivity and property rights protection, used quantile regressions to deal with possible impact of outlying observations, and investigated whether the results were biased due to the inclusion of state-owned enterprises.

In related work, Fang and Zhao (2007) also addressed the China puzzle in a cross-section of 47 Chinese cities, using city-level measures of property rights from surveys by Ni et al. (2004, 2005) instrumented by lower primary enrolment in missionary schools in 1919. By contrast with the Fang and Zhao (2007) study, we analyzed individual enterprises rather than cities, hence revealing possible differences in the impact of institutions among enterprises and between industries within the same city.

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

2. Data and Variables

Our empirical analysis drew on data from the *Survey of Chinese Enterprises* (SCE), conducted by the World Bank in cooperation with the Enterprise Survey Organization of China in early 2003. For balanced representation, the SCE selected 18 cities from five

regions of China: Northeast – Benxi, Changchun, Dalian, and Haerbin; 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.

In each city, the SCE randomly sampled 100 or 150 enterprises from 9 manufacturing industries (garment and leather products, electronic equipment, electronic parts making, household electronics, auto and auto parts, food processing, chemical products and medicine, biotech products and Chinese medicine, and metallurgical products), and 5 service industries (transportation service, information technology, accounting and non-banking financial services, advertisement and marketing, and business services). The total number of enterprises surveyed was 2,400.

The SCE comprised two parts. One was a general questionnaire directed at the senior management seeking information about the enterprise, such as innovation, product certification, marketing, relations with suppliers and customers, access to markets and technology, relations with government, labor, infrastructure, international trade, finance and taxation, and the CEO and board of directors. The other questionnaire was directed at the accountant and personnel manager, covering ownership, various financial measures, and labor and training. Most of the information from the first part of SCE pertained to the survey year – 2002, while the second part pertained to the period 2000-2002.

We were concerned with the impact of institutions on the productivity of the enterprise. As manufacturing enterprises generally have more complicated supply chains than those of service enterprises, and furthermore, as their productivity is easier to measure and interpret, we focused on the subset of 1,566 manufacturing enterprises.

Our dependent variable was enterprise productivity. One measure was labor productivity, which was calculated as the logarithm of total output divided by total employment.[6] An alternative measure is total factor productivity (TFP), estimated using

[6] Note that output was a revenue-based measure rather than quantity-based. In order to recover the quantity-based measure of output, we need the enterprise-level price to deflate the revenue. Since enterprise-level prices are rarely available, a commonly-used way in the literature is to deflate the revenue measure of output by the industry average price index. This procedure, however, introduces omitted price bias (Klette and Griliches, 1996). One way to address this problem is to assume a constant elasticity of substitution demand function and include industry total output as an additional control (Klette and Griliches, 1996; De Loecker, 2009). Accordingly, in most of our regressions, we included industry dummies, which, in a cross-section analysis, was essentially similar to the method of recovering the quantity-based output.

either the panel fixed-effect method or the Levinsohn and Petrin (2003) methodology. As information about material inputs was fragmentary (missing in more than 25% of the sample), we used labor productivity for the main analysis, and total factor productivity as a robustness check.

Table 1 reports summary statistics of the data, while Table 2 reports bivariate correlations. Referring to Table 1, the mean value of labor productivity was 4.322 (±1.562) thousand Yuan per worker, while TFP was 4.151 (±1.077), as estimated by the fixed-effect method, and 3.042 (±0.953), as estimated by the Levinsohn and Petrin (2003) method.

-- Table 1 ---

-- Table 2 ---

Our key explanatory variable was the quality of property rights protection, which is arguably the most important aspect of institutions (North, 1991; Acemoglu, Johnson, and Robinson, 2001; Besley and Ghatak, 2009). When there is a violation of private property (say, a buyer defaults on his payment after receiving a good from a seller, or the user of an asset refuses to pay the owner of the asset for usage), there are two ways through which the aggrieved party can seek redress. One is to sue the violator in the court (court litigation), and the other is to seek help from the state.

Recent studies in political economy have shown that the state can play a larger role in codifying and protecting private property than court litigation. For example, Besley and Ghatak (2009) argue that "while historically non-state actors have played a key role in the creation and enforcement of rights, in the modern world weak property rights boils down to the way that the state functions."

This is especially so in the case of China where legal institutions were weak but the state maintained strong control of the economy even after thirty years of transition towards a market economy. Due to substantial variations in endowments, socioeconomic development and culture across regions, as well as a fast-changing economic environment, Chinese laws and ordinances tend to be sketchy and incomplete. In this situation, the power to interpret the existing laws and national ordinances, to adapt them to the changing circumstances, and to extend their application to new cases constitutes the cornerstone of property rights protection (Pistor and Xu, 2002).

Courts are slow to adapt to changes because they are designed to be reactive enforcers in the sense that they do not initiate legal proceedings but only respond to the initiative of the parties to a dispute. Moreover, in China, courts lack autonomous powers of enforcement, and so, the enforcement of rulings hinges upon the cooperation of the state organizations such as the public security bureaus (e.g., Fan, 1985; Lieberthal and Oksenberg, 1988; Zhao, 1989; Li, Zhang, and Wang, 1990; Clarke, 1991). In contrast, government officials can exercise de facto lawmaking power by adapting rules to changing situations on a continuous basis and initiating enforcement procedures. They can proactively enforce contracts by interpreting laws and national ordinances, monitoring behavior, launching investigation, and sanctioning actions on their own initiative (Du and Xu, 2009).

As a result, we focus mainly on the effectiveness of seeking help from the state as the measure of property rights protection. Specifically, we constructed the measure, *Property Rights*, as the response to the question, "Among the government officials that your firm regularly interacts with, what is the share that is oriented toward helping rather than hindering firms?" The response varied from 0% to 100%, with mean of 35.5% (±32.0%), and where a higher value represented better protection of property rights. Cull and Xu (2005) and Lin, Lin, and Song (2009) used this same measure to study the impacts of property rights on reinvestment and R&D investment, respectively.

In a robustness check, we used the effectiveness of litigation (denoted by *Litigation*) as an alternative measure of property rights protection. Specifically, it was measured as the response to the question, "What's the likelihood that the legal system will uphold my contract and property rights in business disputes?" The response varied from 0% to 100%, with a mean value of 63.4% (±38.9%), and where a higher value represented better protection of property rights.

As a preliminary, we verified that the degree of property rights protection was indeed grounded in geographical differences. Appendix A reports a regression of *Property Rights* on industry and city dummies, along with a list of control variables related to enterprise and CEO characteristics. Evidently, there was substantial and statistically significant variation in property rights protection across Chinese cities.[7] This is because, even though China is a unitary state with uniform laws and national ordinances, the de facto property rights protection hinges upon the interpretation and

[7] Apparently, however, there was no significant systematic variation in property rights protection across industries.

enforcement of laws and national ordinances by the regional governments. Our measure, *Property Rights*, was based on the enterprise's overall perception of the effectiveness of seeking help from the state, thus capturing the de facto, rather than the de jure, protection of property rights.

In the empirical analysis, we also controlled for other factors that might possibly affect enterprise productivity, including enterprise and CEO characteristics, that were variously used in previous studies of investment and productivity (Cull and Xu 2005; Li, Meng, Wang, and Zhou 2008), as well as industry and city dummies. The enterprise characteristics included enterprise size (measured by the logarithm of employment in the previous year), enterprise age (measured by the logarithm of years of establishment up to the end of 2002), private ownership percentage (measured by the share of equity owned by parties other than government agencies), and skilled labor ratio (measured by the ratio of skilled labor in the total employment in the previous year). The CEO characteristics included measures of human capital – CEO education (years of schooling), CEO tenure (years as CEO), and deputy CEO previously (an indicator of whether the CEO had been the deputy CEO of the same enterprise before becoming CEO); and measures of political capital – government cadre previously (an indicator of whether the CEO had previously been a government official), party member (an indicator of whether the CEO was a member of the Chinese Communist Party), and CEO being government appointed (an indicator of whether the CEO was appointed by the government). Finally, we included dummy variables for industry and city to account for possible differences in enterprise productivity across industries and cities.

In investigating the impact of property rights protection on enterprise productivity, the enterprise-level perception of property right protection should yield more precise estimates than the city-average perception. Enterprise-level productivity depends on various organizational and strategic decisions – including who to engage as investors and partners, whether to use capital or labor-intensive modes of production, how much to out-source the production of inputs, and whether to distribute through direct or indirect channels – all of which depend on the management's perception of property rights protection.

However, using an enterprise-level measure of property rights may introduce endogeneity in the form of omitted variables bias or reverse causality. For example, even with many controls included, there could still be some uncontrolled variables, such as favorable individual treatment, which correlate with both the enterprise-level measure of

property rights protection and enterprise performance. And it could also be possible that more productive enterprises have more resources, such as more political connections, which lead to more secure de facto property rights protection.

To address these endogeneity issues, we applied two-step Generalized Method of Moments (GMM) estimation using two alternative instruments. One instrument was the average perception among enterprises of other industries located in the same city regarding the quality of property rights protection. The other instrument was the logarithm of population in the respective city around 1918-19. We discuss the identification strategy using these instruments in Section 3.2.

As a further robustness check, we applied the method of Rajan and Zingales (1998). First, we tested whether property rights protection had differential impacts on enterprises with different degrees of dependence on the external environment. Following Blanchard and Kremer (1997: 1116) and Rajan and Subramanian (2007: 323), we used the number of suppliers to operationalize reliance on the external environment.[8] An enterprise with more suppliers would have a more complex production system and supply chain, hence would be more reliant on the external environment. This measure showed substantial variation, with a mean value of 42 (±199). Second, following McMillan and Woodruff (2002), we tested whether property rights protection had differential impacts on enterprises facing different levels of entry barriers. Following Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002), we used the number of days to register a new business to operationalize the level of entry barriers. This measure also exhibited substantial variation, with a mean value of 8.817 (±11.811).

3. Empirical Analysis

3.1 OLS Estimation

To investigate the impact of property rights protection on enterprise productivity, we used the following basic specification:

$$y_{eic} = \mu + \alpha R_{eic} + \varepsilon_{eic}, \qquad (1)$$

[8] Owing to data limitations, Blanchard and Kremer (1997) and Rajan and Subramanian (2007) used industry-level measures of reliance. By contrast, our measure was at the enterprise level.

where y_{eic} is enterprise productivity (i.e., *Labor Productivity* or *Total Factor Productivity*) of enterprise, *e*, belonging to industry, *i*, and located in city, *c*; μ is a constant; R_{eic} measures the quality of property rights protection as reported at the enterprise level (i.e., *Property Rights Protection* or *Litigation*); and ε_{eic} is an independently and identically distributed error with a normal distribution and mean zero. To deal with possible heteroskedasticity, we used the robust standard error clustered at the industry-city level. [9]

Table 3, column (i), presents OLS estimates of specification (1). Property rights protection had a positive and statistically significant impact on labor productivity. To gauge the economic significance of this result, we calculated that a one standard deviation increase in property rights protection was associated with an increase of 0.511 x 0.320 = 0.164 in labor productivity or 3.8% relative to the mean labor productivity. This impact is reported in the last row of Table 3.

-- Table 3 ---

Do these results truly reflect the causal effect of property rights protection on labor productivity? An immediate concern is that the estimates could be biased owing to the omission of relevant variables. Then,

$$E(R_{eic} \cdot \varepsilon_{eic}) \neq 0. \quad (2)$$

To the extent that we can find a comprehensive set of control variables, X_{eic}, and coefficients, γ, such that the residual error term, $\eta_{eic} \equiv \varepsilon_{eic} - X_{eic}' \cdot \gamma$, is not correlated with R_{eic}, then we can isolate the causal effect of property rights protection on labor productivity (Goldberger, 1972; Barnow et al., 1981). We specified, as controls, CEO characteristics (human capital and political capital), enterprise characteristics (enterprise size, enterprise age, private ownership percentage, and skilled labor ratio), industry dummies, and city dummies. Accordingly, the specification was:

$$y_{eic} = \mu + \alpha R_{eic} + X_{eic}' \cdot \gamma + \eta_{eic}. \quad (3)$$

[9] The standard errors for micro-level data need to be adjusted for the possibility that error terms could be correlated within a cluster (Liang and Zeger, 1986). However, when the number of clusters is small (specifically, fewer than 42), the clustered standard errors could be misleading (e.g., Wooldridge, 2003, 2006a; Angrist and Pischke, 2009). As our study includes just 18 cities and 9 industries, we did not use the clustered standard errors at the city-level or industry-level. Instead, we used standard errors clustered at the industry-city level.

Table 3, columns (ii)-(vi), reports the results. To avoid issues of multicollinearity and poor controls (Angrist and Pischke, 2009), we included the control variables in a stepwise fashion. Among enterprise characteristics, the coefficient of enterprise size was positive and significant in all specifications. Apparently, enterprises with larger workforces exhibited relatively higher labor productivity, suggesting the presence of economies of scale. This would be consistent with evidence of local protectionism within China (Young, 2000; Bai, Du, Tao, and Tong, 2004), which would result in production at sub-optimal scale.

The coefficient of enterprise age was negative and significant. Enterprises with longer history exhibited relatively lower labor productivity. This is consistent with the experience of China's economic reform that new firms drove economic development, particularly by ending the monopoly of state enterprises (McMillan and Woodruff, 2002).

The coefficient of skilled labor ratio was positive and significant. Apparently, enterprises with more skilled labor exhibited higher labor productivity. This is consistent with the importance of skilled labor in less developed countries (e.g., Acemoglu and Zilibotti, 2001), and the observed shortage of skilled labor in China (Asian Development Bank, 2003; Wang, 2006).

Among the CEO characteristics, the coefficient of CEO education was positive and significant, while the coefficient of government appointment was negative and significant in all specifications. Previous research into education and growth focused on the impact of the education of the workforce (e.g., Barro, 2001). The novelty of our result is the impact of the CEO's education on the overall productivity of the enterprise. The negative impact of government appointment is a phenomenon that would be unique to a transitional economy. It is consistent with the view that government appointment of CEOs is based on political considerations rather than managerial talent.

With respect to the central issue, the coefficient of property rights protection was positive and statistically significant in all specifications, ranging from 0.245 to 0.448. Accordingly, we infer that our finding that property rights protection increased labor productivity was robust to the various controls.

It is important to note that the magnitude of the impact of property rights protection on enterprise productivity was about 21% lower with the inclusion of city dummies. This is consistent with our preliminary analysis, reported in Appendix A, that a substantial part of the variation of property rights protection across enterprises was due

to variation across cities. It is also consistent with our conjecture that part of the China puzzle (that institutions seem unimportant for economic performance) could be explained by the concentration of economic activities in geographic areas with better institutions.

3.2 GMM Estimation

While we included a comprehensive set of control variables, X_{eic}, it could still be possible that the residual error, η_{eic}, even after including the controls X_{eic}, might be correlated with the index of property rights protection, R_{eic}, so that $E(R_{eic} \cdot \eta_{eic}) \neq 0$, in which case the estimates would be biased. To address this endogeneity issue, we applied the two-step GMM using two alternative instruments for property rights protection.

3.2.1 Instrumental Variable 1: Average Perceived Property Rights Protection Among Other Industries in Same City

Motivated by Hausman, Leonard and Zona (1994), we first used the average perception of the quality of property rights protection among enterprises belonging to other industries and located in the same city as an instrument for the enterprise-level perception of property rights protection.

Suppose that the quality of property rights as perceived by an enterprise is determined by the time and effort devoted by city government officials to protecting private property. Government officials are of two types -- general officials who deal with all industries and industry-specific officials who supervise a particular industry.[10] Then, the quality of property rights protection as perceived by enterprise, *e*, belonging to industry, *i*, and located in city, *c*,

$$R_{eic} = \lambda \cdot r_{ic} \cdot G_c + \theta \cdot G_{ic} + \tau_{eic}, \qquad (4)$$

where G_c and G_{ic} denote respectively the time and effort devoted by general government officials and industry-specific government officials to protecting private property;[11] r_{ic}

[10] We thank an anonymous referee for this observation.

[11] For the individual government officials, the choice of time and effort in protecting private property could be continuous, discrete, or binary (does or does not). These alternative specifications do not affect the mechanism of our instrumental variable estimation.

represents the share of the time and effort devoted by general officials to industry *i*; and τ_{eic} is an enterprise-specific idiosyncratic perception. We expect λ and θ to be positive.

Since the shares must add up to one,

$$\sum_j r_{jc} = 1, \tag{5}$$

equation (4) simplifies to

$$R_{eic} = \lambda \cdot \left(1 - \sum_{j \neq i} r_{jc}\right) \cdot G_c + \theta \cdot G_{ic} + \tau_{eic} = \lambda \cdot G_c - \lambda \sum_{j \neq i} r_{jc} \cdot G_c + \theta \cdot G_{ic} + \tau_{eic}. \tag{6}$$

Hence, given the total time and effect invested by general officials, the quality of property rights protection as perceived by the enterprise, R_{eic}, is negatively correlated with the time and effect devoted by general officials to other industries, $\sum_{j \neq i} r_{jc} \cdot G_c$.

In the regression, we control for industry and city dummies, hence, the main effect of general officials, G_c , is absorbed by city dummies. Being unable to directly observe $\sum_{j \neq i} r_{jc} \cdot G_c$, we use as a proxy the average perception of the quality of property rights protection among enterprises belonging to other industries and located in the same city. Specifically, we construct the instrument as

$$IV_{ic} = \frac{1}{N_c - N_{ic}} \sum_{j \neq i} \sum_e R_{ejc}, \tag{7}$$

where N_c and N_{ic} are respectively, the total number of enterprises in city *c* and the number of enterprises in city *c* and industry *i*.

Substituting from (6) in (7), and simplifying,

$$IV_{ic} = \frac{1}{N_c - N_{ic}} \sum_{j \neq i} \sum_{e} \left[\lambda \cdot G_c - \lambda \sum_{k \neq j} r_{kc} \cdot G_c + \theta \cdot G_{jc} + \tau_{ejc} \right]$$
$$= \frac{1}{N_c - N_{ic}} \sum_{j \neq i} \left[\lambda r_{jc} \cdot G_c + \theta \cdot G_{jc} + \sum_{e} \tau_{ejc} \right], \quad (8)$$

after substituting from (5). Accordingly, the first-stage of our instrumental variable estimation is

$$R_{eic} = \hat{\mu} + \hat{\lambda} \cdot IV_{ic} + X_{eic}' \cdot \hat{\gamma} + \hat{\tau}_{eic}. \quad (9)$$

By (6) and (9), IV_{ic} is positively correlated with $\sum_{j \neq i} r_{jc} \cdot G_c$, which is negatively associated with R_{eic}. Thus, provided that some government officials are general, $\hat{\lambda}$ in (9) will be negative.[12] The identification of our instrumental variable estimation depends on the instrument, IV_{ic}, being uncorrelated with the error term in the second-stage regression, that is, $E(IV_{ic} \cdot \eta_{eid}) = 0$. Note that with the inclusion of industry and city dummies, the only possible remaining omitted variables would be at the levels of industry-city or individual enterprise. As our instrument reflects mainly the characteristics of other industries, it should not be correlated with industry-city or individual enterprise-level characteristics. Hence, the exclusion condition for two-step GMM estimation should be satisfied.[13]

-- Table 4 ---

Table 4, columns (i)-(ii), reports the two-step GMM estimates. We included the various control variables -- CEO characteristics, enterprise characteristics, industry dummies, and city dummies in all estimates. Regarding the relevance condition for a valid instrument, the correlation between the instrument and the endogenous variable was negative and highly significant (as shown in column (i)), consistent with the intuition presented above. Moreover, the Anderson canonical correlation LR statistic and the Cragg-Donald Wald statistic provided further support for the satisfaction of the relevance condition. We also checked for a weak instrument, which was ruled out by the large Shea partial R^2 and the Cragg-Donald F-statistic.[14]

[12] We reported below several econometric tests on the relevance of our instrumental variable.
[13] As reported below, we showed formally that the exclusion condition was satisfied.
[14] The F-statistic well exceeded the critical value of 10 (Staiger and Stock 1997).

With respect to the central issue, the coefficient of property rights protection, instrumented by the average perceived property rights protection among enterprises belonging to other industries located in the same city, was positive and statistically significant. The coefficient was 1.331 (± 0.766), which was almost four times larger than the OLS estimate. Correspondingly, the estimated impact of a one standard deviation increase in property rights protection on labor productivity was 0.426, or 9.9% of the mean labor productivity, which was almost four times larger than the OLS estimate. Apparently, any bias due to endogeneity served to bias the impact of property rights protection *downward* rather than upward. Another possibility is that there were measurement errors associated with the measure of property rights protection, which biased the OLS estimates downward towards zero.

To formally check that the instrumental variable satisfied the exclusion condition, i.e., was not correlated with the residual error, η_{eic}, we conducted a test following Acemoglu, Johnson, and Robinson (2002). The premise for the test is that, if the instrumental variable affects labor productivity only through property rights protection, then instrumental variable should not have any significant impact on labor productivity conditional on property rights protection. Indeed, as shown in Table 4, columns (iii)-(iv), the instrumental variable had a positive and significant impact on labor productivity, but the effect vanished with the inclusion of the explanatory variable, *Property Rights Protection*.

3.2.2 Instrumental Variable 2: City Population Around 1918-19

Motivated by the literature on economic institutions (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1997, 1998; Acemoglu, Johnson, and Robinson, 2001, 2002), we developed a historical proxy, R_c^*, for the general level of property rights protection in each city. A historical proxy should not be correlated with unobserved characteristics of enterprises in 2002, and hence should satisfy the exclusion condition, $E(R_c^* \cdot \eta_{eic}) = 0$.

The historical proxy of the city's property rights protection would arguably be correlated with the contemporary level of property rights protection, $E(R_c^* \cdot R_c) \neq 0$. A large body of empirical work has shown that differences in economic institutions across countries persist over time (Young, 1994; Acemoglu, Johnson, and Robinson, 2001, 2002;

La Porta, Lopez-de-Silanes, and Shleifer, 2008).[15] Some reasons include the persistence of culture, beliefs, and ideologies across generations (e.g., Bisin and Verdier, 2000; Dohmen, Falk, Huffman, and Sunde, 2006; Tabellini, 2007a, 2007b, 2009).

Specifically, with regard to China, there is also evidence that geographical differences in economic institutions have persisted over time, despite radical changes in the political regime, beginning with the collapse of the Qing Dynasty in the early 20th century. For example, areas with higher industrial and commercial activities in the pre-Communist era were faster and more effective in market reform in recent years (e.g., Zhu, 2001; Fu, 2003). And areas with larger population during the Qing Dynasty continue to be relatively more prosperous in the Communist era (e.g., Li and Lu, 2009).

To proxy for the historical level of city's property rights protection, we used the logarithm of population in the respective city around 1918-19. Absent systematic national censuses, our source of data on city populations was a study conducted by the China Continuation Committee, an organization of Protestant churches and missions (Special Committee on Survey and Occupation of China Continuation Committee, 1987). The Committee based its estimates on various sources, including reports by police commissioners and local missions, the 1910 census by the Ministry of the Interior, and a 1919-20 census by the Post Office. Given the fragmentary state of information on China's population (Chen 1947; Ho 1959), we believe that the China Continuation Committee study is a reasonable source for the population of Chinese cities at the time.

China was besieged by foreign powers in the late 1800s and early 1900s. During the same period, it was beset by civil war. Absent a strong central government and in the face of financial difficulties, expropriation of private property by regional governments was widespread (Wu, 1955; Li, Li, Li, Yang, and Gong, 1994; Dong, Zhang, and Jiao, 2000). Given geographical mobility, especially among wealthy people, the population of a city in 1918-19 could reasonably reflect the state of property rights protection at that

[15] "[A]lthough we commonly described the independent polities as 'new states', in reality they were successors to the colonial regime, inheriting its structures, its quotidian routines and practices, and its more hidden normative theories of governance" (Young, 1994: 283). Acemoglu, Johnson, and Robinson (2001) discussed three mechanisms that would result in institutional persistence: (i) it was costly to set up institutions that restricted government expropriation; (ii) the formation of institutions was influenced by the elites which were quite persistent; (iii) the established institutions would induce irreversible investments that were complementary to the existing institutions, which made people more willing to support those institutions. La Porta, Lopez-de-Silanes, and Shleifer (2008) argued that cultures, religions and ideologies are likely to persist over time despite regime changes.

time, with a larger population indicating better property rights protection. Appendix B provides the detailed rationale for this proxy.

-- Table 5 ---

Table 5, column (i), reports the two-step GMM estimates using the logarithm of population in the city around 1918-19 as the instrument for property rights protection. We included the various control variables -- CEO characteristics, enterprise characteristics, industry dummies, and city characteristics -- in all estimates. With regard to the relevance condition for an effective instrument, the logarithm of population in the city around 1918-19 was highly and positively correlated with the enterprise perception of property rights protection. The condition was further confirmed by the Anderson canonical correlation LR statistic and the Cragg-Donald Wald statistic. Any concern about a weak instrument was ruled out by the large Shea partial R^2 and the Cragg-Donald F-statistic.

The two-step GMM estimated coefficient of property rights protection, as instrumented by the logarithm of population in China's respective city around 1918-19, was 4.787 (± 1.487), which was statistically significant. It was even larger than the estimates using the average perceived property rights protection by enterprises of other industries located in the same city as the instrument.

The identification strategy using the logarithm of population in the city around 1918-19 as the instrumental variable relied on the exclusion restriction, specifically, that the instrument affects labor productivity only through property rights protection. Intuitively, we did not expect the early 20th century population to be correlated with enterprise-level characteristics in 2002. However, since the instrumental variable was at the city-level, precluding the use of city dummies, there could be some city-level omitted variables through which the instrumental variable might affect labor productivity. While we were not able to check the exclusion restriction assumption with certainty as the data did not allow us to control for all city-level variables, we investigated several city-level factors that might be of particular concern.

First, the population in the city around 1918-19 might be negatively determined by the severity of the crime, which might persist over time. To control for this possibility, we included a proxy for the contemporaneous crime rate, specifically, the average losses due to theft among other enterprises situated in the same city.

Second, the population in the city around 1918-19 might be correlated with clustering of suppliers in the city, which might persist over time. To control for this possibility, we included a proxy for the contemporaneous clustering of suppliers in each city, which was measured by the average ratio of suppliers located in the same city over the total number of suppliers among other enterprises situated in the city.

Third, the population in the city around 1918-19 might reflect the behavior of government officials and elites towards protection of the local economy in the city, which might persist over time. To control for this possibility, we included a proxy for the contemporaneous degree of local protectionism in each city, which was measured by the average ratio of state ownership among other enterprises situated in the city, following Bai, Du, Tao and Tong (2004) and Lu and Tao (2009b).

We, stepwisely, included the above three city-level variables, along with the controls for CEO and enterprise characteristics, industry dummies and city characteristics. Table 5, columns (ii)-(iv), reports the results. It is clear that our central finding regarding the importance of property rights protection for labor productivity was robust to the inclusion of these additional controls.[16]

3.3 Heterogeneous Response

As an alternative way to check the causal impact of property rights protection on enterprise productivity, we applied the estimation strategy pioneered by Rajan and Zingales (1998). This approach establishes causality by focusing on the details of theoretical mechanisms through which property rights protection may affect enterprise productivity.

Our first hypothesis is that the impact of property rights protection on productivity varies across enterprises according to their degree of reliance on the external environment. The impact of private property protection would be higher on an enterprise with a greater reliance on the external environment. Thus, it is reasonable to expect that enterprises

[16] We acknowledge that the historical population is not a perfect instrument. A large population may be the result of multiple factors including natural resources, climate, transportation links, some of which may have persisted and affected enterprise productivity in recent times. To this extent, the estimated impact of *Property Rights Protection* would be upward biased. This might explain the relatively large coefficient, and accordingly, the coefficient should be interpreted with caution.

which are more reliant on the external environment should exhibit relatively higher labor productivity in cities with stronger property rights protection.

Following Blanchard and Kremer (1997) and Rajan and Subramanian (2007), we used the number of suppliers to measure, for each enterprise, its reliance on the external environment. Accordingly, we estimated the following equation:

$$y_{eic} = \mu + \alpha R_{eic} + \beta S_{eic} + \delta R_{eic} \cdot S_{eic} + X_{eic}' \cdot \gamma + \eta_{eic}, \quad (10)$$

where S_{eic} measures the number of suppliers, which proxies for reliance on the external environment, at the enterprise level; X_{eic} is a vector of controls (CEO and enterprise characteristics, industry dummies, and city dummies); and η_{eic} is an independently and identically distributed error with a normal distribution and mean zero.

Table 6, column (i), reports the OLS estimate of (10). Labor productivity was positively associated with property rights protection and also the degree of external dependence, as measured by the number of suppliers.[17] More importantly, the impact of property rights protection on labor productivity significantly increased with reliance on the external environment. In terms of economic magnitude, the impact of a one standard deviation improvement in property rights protection on labor productivity was 0.080, or 1.9% of the mean labor productivity, at the mean number of suppliers. [18] [19]

-- Table 6 ---

Our second hypothesis was that the impact of property rights protection on enterprise productivity would vary across enterprises facing different levels of entry barriers. An increase in expropriation of private property would raise the cost of entry,

[17] The positive estimated coefficient of the number of suppliers indicates the reduction of costs of intermediate products and hence the prices of final products brought by the upstream competition, which consequently leads to the improvement of labor productivity. We thank an anonymous referee for pointing out this interpretation.

[18] In the interaction between property rights protection and the number of suppliers, the number of suppliers was specified as its difference from the sample mean (Wooldridge, 2006b: 204-205). Hence, the coefficient of property rights protection represents the partial effect of property rights protection on labor productivity at the mean number of suppliers.

[19] The degree of property rights protection might directly affect the incentive for an enterprise to vertically integrate and hence its number of suppliers. We checked by regressing the number of suppliers on property rights protection and found no significant effect. In any case, to the extent that better property rights increases the number of suppliers, the inclusion of the number of suppliers in the productivity regression would *downward* bias the estimated effect of property rights (Angrist and Pischke 2009: page 67).

leading to less competition and lower productivity (McMillan and Woodruff 2002). With the same level of improvement in property rights protection, the reduction in entry costs would be proportionately lower for enterprises facing higher entry barriers than for those with lower entry barriers. Thus, it is expected that the enterprises facing lower entry barriers should exhibit relatively higher labor productivity in cities with stronger property rights protection.

Following Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002), we used the number of days to register a new business to measure, for each enterprise, the level of entry barriers. Accordingly, we estimated the following equation:

$$y_{eic} = \mu + \alpha R_{eic} + \beta \cdot EB_{eic} + \delta R_{eic} \cdot EB_{eic} + X_{eic}' \cdot \gamma + \eta_{eic}, \qquad (11)$$

where EB_{eic} measures the level of entry barriers at the enterprise level; X_{eic} is a vector of controls (CEO and enterprise characteristics, industry dummies, and city dummies); and η_{eic} is an independently and identically distributed error with a normal distribution and mean zero.

Table 6, column (ii), reports the OLS estimate of (11). The impact of property rights protection on labor productivity was larger for enterprises facing lower levels of entry barriers.[20] In terms of economic magnitude, the impact of a one standard deviation improvement in property rights protection on labor productivity was 0.034, or 0.8% of the mean labor productivity, at the mean level of entry barriers. [21]

Overall, the two-step GMM estimates and the heterogeneous response estimates reinforced the OLS estimates: stronger property rights protection led to higher enterprise productivity. Our result from the enterprise-level analysis is consistent with the general findings in the literature regarding the impacts of institutions on economic growth obtained from macro-level analysis (e.g., Acemoglu, Johnson, and Robinson, 2001, 2002;

[20] With the inclusion of the interaction term, the main effect of property rights protection ceased to be significant. There are two possible reasons for this reduction in significance. One is the reduction in sample size by almost 50%, which would cause the estimation to be imprecise. Another reason is that, in the this specification, including the interaction between property rights and entry barriers, the main effect of property rights protection represented the impact on enterprises facing no entry barriers. Intuitively, these were those with strong political connections, and which would not be affected by the degree of protection of property rights.

[21] In the interaction between property rights protection and the level of entry barriers, the level of entry barriers was specified as its difference from the sample mean (Wooldridge, 2006b: 204-205). Hence, the coefficient of the main effect of property rights protection represents the partial effect of property rights protection on labor productivity at the mean level of entry barriers.

Acemoglu and Johnson, 2005). In terms of specific mechanisms through which property rights protection affects enterprise productivity, two channels -- reliance on external environment and entry barriers —appear to be important. Another channel might be the positive impact of property rights protection on investment incentives (e.g., Johnson, McMillan, and Woodruff, 2002; Cull and Xu, 2005), R&D investment (Lin, Lin, and Song, 2009), and location choice (Du, Lu, and Tao, 2008), all of which subsequently lead to higher enterprise productivity.

3.4 Robustness Checks

We conducted four other sets of robustness checks of the impact of property rights protection on enterprise productivity. First, we addressed robustness to the measure of productivity. We estimated equation (3) using two alternative measures of enterprise productivity, viz., total factor productivity calculated using the panel fixed-effects method and the Levinsohn and Petrin (2003) methodology. Table 7, columns (i)-(ii), reports the results.[22] Clearly, our earlier finding regarding the impact of property rights protection on enterprise productivity was robust to these alternative measures of productivity.[23]

Next, we checked the robustness of the measure of property rights in several ways. One was to use an alternative measure of property rights protection, *Litigation*, specified as the perceived likelihood that the legal system would uphold contract and property rights in business disputes. Table 7, column (iii), reports OLS estimates using this alternative measure of property rights protection. Our earlier finding regarding the impact of property rights protection on enterprise productivity was robust to this alternative measure of property rights.

Table 7, column (iv), reports OLS estimates using both our principal measure of property rights protection (the perceived effectiveness of getting help from government officials) and the alternative measure, *Litigation*. Property Rights Protection was statistically significant while *Litigation* was not. This finding is consistent with the

[22] In GMM estimations with the instruments presented in Section 3.2 (unreported, for brevity), we obtained similar results: TFP was positively and significantly associated with the degree of property rights protection.

[23] Further, in an unreported estimate, we estimated equation (3) with labor productivity as the dependent variable but excluding observations with negative labor productivity. Our findings were robust to this restriction on the sample.

previous academic literature in general and commentary specific to China that protection of private property hinged upon the state rather than the legal system.

Some might be concerned that our measure of *Property Rights Protection* actually measures the degree to which government officials assist business with official services. The Survey of Chinese Enterprises questionnaire, from which we draw the data, suggests otherwise. Section H includes questions that directly ask about government services – whether the enterprise had received assistance with various issues (such as obtaining bank financing, identifying foreign investors, locating foreign technology to license, identifying potential foreign clients, identifying potential foreign suppliers and identifying potential domestic clients), and the share of government officials that deliver efficient services. The question that we rely upon is presented four positions later in the questionnaire. In any case, we estimated equation (3) including both Property Rights Protection and the indicators of assistance with various issues. As Table 7, column (v) reports, our findings were robust to the inclusion of official assistance. We also estimated equation (3) including both *Property Rights Protection* and the share of government officials that deliver efficient services. As Table 7, column (vi) reports, our findings were robust to the inclusion of official efficiency.[24]

Third, we addressed concern that our results were driven by particular outliers. In this robustness check, we used quantile regression to estimate specification (3). Table 7, column (vii), reports the results. Our earlier finding regarding the impact of property rights protection on labor productivity was robust to outliers.

Finally, we addressed concern that our results could be biased due to the inclusion of state-owned enterprises. This is because state-owned enterprises conduct business under the auspices of national and regional governments (thus enjoying better de facto property rights protection), and they have lower productivity due to the multiple responsibilities that they are charged with (Bai, Li, Tao, and Wang, 2000). To rule out this concern, we restricted our sample to private enterprises, which were defined as those enterprises with more than 50% percentage of private ownership. Table 7, column (viii), reports the results. Clearly, our earlier finding regarding the impact of property rights protection on labor productivity was robust to this subsample. In terms of economic

[24] Besides providing a helping hand, local government may also act as a grabbing hand. In an unreported estimate, we estimated equation (3) including both *Property Rights Protection* and a measure of local government expropriation – the cost of travel and entertainment (Cai, Fang, and Xu, 2010). Our findings were robust to the inclusion of the cost of travel and entertainment.

magnitude, the impact of a one standard deviation improvement in property rights protection on labor productivity was 0.097, or 2.2% of the mean labor productivity. Consistent with intuition, this value was higher than that obtained from the whole sample (see Table 3, column (vi)).

4. Conclusion

It is widely believed that China's spectacular growth in the last thirty years contradicts the prevailing view of the importance of institutions to economic performance (Blanchard and Kremer 1997; Rodrik 2004a and 2004b; Allen, Qian, and Qian 2005; *Economist*, March 15, 2008). Indeed, protection of private property was not formally written into China's constitution until 2004, and its legal institutions have been rather weak.

Using data from a World Bank survey of 1,566 manufacturing enterprises in 18 Chinese cities, we found that property rights protection had a positive and statistically significant impact on enterprise productivity. These results were robust to the inclusion of a comprehensive list of controls related to CEO and enterprise characteristics, as well as industry and city dummies.

To further establish the causal impacts of property rights protection on enterprise productivity, we applied two-step GMM estimation with two alternative instruments, viz, the average perception of property rights protection among other enterprises belonging to other industries located in the same city, and the logarithm of population in the respective city around 1918-19. The two-step GMM estimates reinforced our findings that property rights protection had a positive and significant causal impact on productivity.

In addition, we applied heterogeneous response estimation (Rajan and Zingales, 1998) to further establish causality by focusing on the theoretical mechanisms through which property rights protection might affect enterprise performance. We found that enterprises which were more reliant on the external environment exhibited relatively higher productivity in cities with stronger property rights protection. We also found that enterprises which faced lower levels of entry barriers exhibited relatively higher productivity in cities with stronger property rights protection.

In further robustness checks, we explored alternative measures of productivity and property rights protection, used the quantile regression to deal with possible impact

of outlying observations, and investigated whether the results were biased due to the inclusion of state-owned enterprises.

Finally, we did find evidence that property rights protection was, to some extent, correlated with geography. This would be consistent with the explanation of China's growth as being concentrated in the coastal areas, where institutional quality is relatively higher.

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Table 1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Labor productivity	1557	4.322	1.562	-3.989	11.893
Total factor productivity (fixed effect)	1356	4.151	1.077	-0.983	11.069
Total factor productivity (LP)	1356	3.042	0.953	-2.363	10.123
Property rights protection	1462	0.355	0.320	0.000	1.000
Court litigation	1361	0.634	0.389	0.000	1.000C
Average perceived property rights protection among other industries in same city	1566	0.349	0.106	0.175	0.623
Logarithm of population in 1918-19	1437	11.926	0.836	10.463	13.385
Enterprise size	1563	5.040	1.454	0.000	9.899
Enterprise age	1566	2.494	0.777	1.099	3.970
Private ownership percentage	1566	0.813	0.376	0.000	1.000
Skilled labor ratio	1542	0.026	0.060	0.000	1.000
CEO education	1553	15.359	2.511	0.000	19.000
CEO 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 member	1524	0.648	0.478	0.000	1.000
Government appointed CEO	1544	0.243	0.429	0.000	1.000
Number of suppliers (in thousands)	1509	0.042	0.199	0.000	7.100
Entry barriers	778	8.817	11.811	0.000	100.000
Property rights protection x suppliers[1]	1423	0.000	0.044	-0.041	0.825
Property rights protection x entry barriers[2]	733	-0.380	4.284	-8.817	28.414

Notes:

1. Number of suppliers was specified as its difference from the sample mean.
2. Entry barriers were specified as their difference from the sample mean.

Table 2. Correlations

	Labor productivity	Total factor productivity (fixed effect)	Total factor productivity (LP)	Property rights protection	Court litigation	Average perceived property rights protection among other industries in same city	Logarithm of population in 1918-19
Labor productivity	1.000						
Total factor productivity (fixed effect)	0.821	1.000					
Total factor productivity (LP)	0.820	0.968	1.000				
Property rights protection	0.109	0.097	0.082	1.000			
Court litigation	0.095	0.074	0.053	0.258	1.000		
Average perceived property rights protection among other industries in same city	0.113	0.116	0.088	0.257	0.155	1.000	
Logarithm of population in 1918-19	0.132	0.157	0.125	0.090	0.064	0.299	1.000

Table 3. OLS estimates

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Dependent variable	Labor productivity					
Property rights protection	0.511***	0.448***	0.426***	0.321**	0.309**	0.245**
	[0.142]	[0.142]	[0.138]	[0.130]	[0.118]	[0.104]
CEO characteristics						
Human capital						
CEO education		0.152***	0.154***	0.101***	0.077***	0.068***
		[0.019]	[0.019]	[0.020]	[0.021]	[0.020]
CEO tenure		-0.020**	-0.009	0.008	0.016*	0.001
		[0.009]	[0.010]	[0.009]	[0.008]	[0.008]
Deputy CEO previously		-0.183**	-0.022	0.075	0.038	0.026
		[0.078]	[0.082]	[0.077]	[0.077]	[0.071]
Political capital						
Government cadre previously			0.036	0.044	0.075	0.133
			[0.213]	[0.188]	[0.170]	[0.176]
Party member			-0.250***	-0.175**	-0.177**	-0.051
			[0.093]	[0.087]	[0.078]	[0.073]
CEO government appointed			-0.635***	-0.308***	-0.309***	-0.260**
			[0.099]	[0.110]	[0.104]	[0.111]
Enterprise characteristics						
Enterprise size				0.249***	0.237***	0.139***
				[0.039]	[0.040]	[0.038]
Enterprise age				-0.555***	-0.528***	-0.455***
				[0.071]	[0.069]	[0.065]
Private ownership percentage				0.146	0.156	0.170
				[0.139]	[0.141]	[0.137]
Skilled labor ratio				2.756***	2.110**	2.023***
				[0.751]	[0.853]	[0.763]
Industry characteristics						
Industry dummies					Yes	Yes
City characteristics						
City dummies						Yes
Constant	4.139***	2.004***	2.172***	2.695***	2.968***	2.621***
	[0.110]	[0.333]	[0.324]	[0.386]	[0.459]	[0.527]
No. of observations	1453	1424	1385	1369	1369	1369
R^2	0.0111	0.0828	0.1221	0.2106	0.2587	0.334
p-value for F-test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Impact of property rights protection[2]	0.164	0.143	0.136	0.103	0.099	0.078

Notes:

1. Robust standard errors clustered by industry and city in brackets; (*** p < 0.01, ** p < 0.05, * p < 0.1).
2. Impact as measured by a one standard deviation increase in *Property Rights Protection*.

Table 4. GMM estimates: Property rights protection as perceived by others

Estimation specification	(i)	(ii)	(iii)	(iv)
	GMM		OLS	
Dependent variable	First stage Property rights protection	Second stage Labor productivity	Labor productivity	
Property rights protection		1.331*		0.201*
		[0.766]		[0.108]
Average perceived property rights protection among other industries in same city	-3.063***		-4.077*	-3.462
	[0.239]		[2.386]	[2.468]
CEO characteristics				
Human capital				
CEO education	0.004	0.063***	0.068***	0.067***
	[0.004]	[0.021]	[0.020]	[0.020]
CEO tenure	0.000	0.000	0.001	0.001
	[0.002]	[0.008]	[0.008]	[0.008]
Deputy CEO previously	-0.022	0.046	0.017	0.021
	[0.016]	[0.069]	[0.072]	[0.072]
Political capital				
Government cadre previously	-0.065	0.189	0.103	0.116
	[0.055]	[0.182]	[0.178]	[0.177]
Party member	-0.018	-0.032	-0.055	-0.052
	[0.019]	[0.070]	[0.073]	[0.073]
Government appointed CEO	0.006	-0.253**	-0.245**	-0.246**
	[0.022]	[0.103]	[0.113]	[0.112]
Enterprise characteristics				
Enterprise size	0.012	0.128***	0.144***	0.141***
	[0.008]	[0.041]	[0.038]	[0.038]
Enterprise age	-0.008	-0.444***	-0.455***	-0.454***
	[0.013]	[0.064]	[0.067]	[0.066]
Private ownership percentage	0.007	0.175	0.185	0.183
	[0.033]	[0.127]	[0.138]	[0.136]
Skilled labor ratio	0.023	1.947***	1.977**	1.973**
	[0.148]	[0.697]	[0.781]	[0.767]
Industry characteristics				
Industry dummies	Yes	Yes	Yes	Yes
City characteristics				
City dummies	Yes	Yes	Yes	Yes
Constant	1.493***	3.190***	6.472***	3.779***
	[0.107]	[0.508]	[1.048]	[0.975]
Tests				
Relevance tests				
Anderson canonical correlations LR statistic	[44.08]***	-	-	-
Cragg-Donald Wald statistic	[55.30]***	-	-	-
Weak instrument tests				
Shea partial R^2	0.0392	-	-	-

Cragg-Donald F-statistic	[53.29]	-	-	-
No. of observations	1369	1369	1369	1369
Impact of property rights protection[2]	-	0.426	-	-

Notes:

1. Robust standard errors clustered by industry and city in brackets; (*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$).
2. Impact as measured by a one standard deviation increase in *Property Rights Protection*.

Table 5. GMM estimates: Historical population

	(i)	(ii)	(iii)	(iv)
Second Stage: Dependent Variable: Labor productivity				
Property rights protection	4.787***	4.193***	4.105***	3.590***
	[1.487]	[1.265]	[1.407]	[1.107]
Losses due to theft		19.958	20.284	21.856
		[16.591]	[16.982]	[16.103]
Clustering of suppliers			-0.509	-0.804
			[1.265]	[1.164]
Local protectionism				0.820
				[0.674]
Controls				
Enterprise characteristics	Yes	Yes	Yes	Yes
CEO characteristics	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Logarithm of GDP per capita	Yes	Yes	Yes	Yes
Impact of property rights protection[2]	1.532	1.342	1.314	1.149
First Stage: Dependent Variable: Property rights protection				
Logarithm of population in 1918-19	0.044***	0.050***	0.046***	0.063***
	[0.015]	[0.015]	[0.014]	[0.012]
Losses due to theft		-4.304	-3.840	-6.263*
		[3.287]	[3.229]	[3.268]
Clustering of suppliers			-0.388**	-0.322*
			[0.161]	[0.172]
Local protectionism				-0.560***
				[0.155]
Controls				
Enterprise characteristics	Yes	Yes	Yes	Yes
CEO characteristics	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Logarithm of GDP per capita	Yes	Yes	Yes	Yes
Tests				
Relevance tests				
Anderson canonical correlations LR statistic	[14.61]***	[18.52]***	[15.85]***	[24.78]***
Cragg-Donald Wald statistic	[14.87]***	[19.10]***	[16.29]***	[27.49]***
Weak instrument tests				
Shea partial R^2	0.0114	0.0148	0.0127	0.0215
Cragg-Donald F-statistic	[14.46]	[18.56]	[15.81]	[26.67]
No. of observations	1268	1247	1234	1234

Notes:

1. Robust standard errors clustered by industry and city in brackets; (*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$).
2. Impact as measured by a one standard deviation increase in *Property Rights Protection*.

Table 6. Heterogeneous response

Dependent variable	(i) Labor productivity	(ii) Labor productivity
Property rights protection	0.253**	0.106
	[0.105]	[0.158]
Number of suppliers (in thousands)	0.094	
	[0.141]	
Property rights protection × Supplier[2]	3.476***	
	[0.845]	
Entry barriers		0.006
		[0.006]
Property rights protection × Entry barriers[3]		-0.036*
		[0.018]
Controls		
Industry dummies	Yes	Yes
City dummies	Yes	Yes
Enterprise characteristics	Yes	Yes
CEO characteristics	Yes	Yes
No. of observations	1337	689
R^2	0.3430	0.3495
p-value for F-test	0.0000	0.0000
Impact of property rights protection[4]	0.080	0.034

Notes:

1. Robust standard errors clustered by industry and city in brackets; (*** p < 0.01, ** p < 0.05, * p < 0.1).
2. Number of suppliers was specified as its difference from the sample mean.
3. Entry barriers was specified as its difference from the sample mean.
4. Impact as measured by a one standard deviation increase in *Property Rights Protection* at the mean value of *Suppliers/Entry barriers*.

Table 7. Robustness checks

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Estimation method	OLS	OLS	OLS	OLS	OLS	OLS	Quantile	OLS
Sample	Whole	Whole	Whole	Whole	Whole	Whole	Whole	Whole
Dependent variable	TFP (fixed effect)	TFP (Levinsohn-Pakes)	Labor productivity	Labor productivity	Labor productivity	Labor productivity	Labor productivity	Labor productivity
Property rights protection	0.178**	0.153*		0.199*	0.189*	0.201*	0.263*	0.302**
	[0.085]	[0.083]		[0.116]	[0.102]	[0.120]	[0.141]	[0.130]
Litigation			0.178*	0.143				
			[0.103]	[0.108]				
Assistance with issues					Yes			
Efficiency with government services						0.245*		
						[0.124]		
Controls								
Enterprise characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CEO characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	1205	1205	1274	1246	1341	1298	1369	1120
R^2/Pseudo R^2	0.442	0.3211	0.3206	0.3235	0.3382	0.3359	0.2020	0.3353
p-value for F-test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-	0.0000
Impact of property rights protection /litigation[2]	0.057	0.049	0.069	0.064	0.061	0.065	0.084	0.097

Notes:

1. Robust standard errors clustered by industry and city in brackets; (*** p < 0.01, ** p < 0.05, * p < 0.1).
2. Impact as measured by a one standard deviation increase in *Property Rights Protection* or *Litigation*.

Appendix A. Geographic differences in property rights protection

	(i) Dependent Variable: Property rights protection
F-tests	
Industry dummies=0	[1.28]
City dummies=0	[15.03]***
Controls	
Enterprise characteristics	Yes
CEO characteristics	Yes
No. of observations	1377
R^2	0.1114

Note:
Robust standard errors clustered by industry and city in brackets; (*** p < 0.01, ** p < 0.05, * p < 0.1).

Appendix B. Population as a proxy for property rights protection

During the late Qing Dynasty (1840-1911), China was defeated in a series of wars against foreign colonial powers, including two Opium wars with 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, conceding huge amounts of reparations as well as territorial and other concessions. For example, following the Boxer Rebellion, eight colonial powers attacked Beijing and forced the Qing government to sign the Peace Treaty of 1901, which stipulated reparations of 450 million taels of silver (Fan, 1955).

The total amount of reparations over 1840-1911 amounted to 30 times the annual treasury income in 1840 or 15 times the annual treasury income in 1890 (Li, Li, Li, Yang, and Gong, 1994). In order to finance the war reparations, the Qing government imposed levies and taxes on the population, while delegating responsibility for collection to regional governors. Given the right to collect revenues, however, the regional governors seized the opportunity to determine the size of levies and taxes, leading to variations in taxation across China's regions.

In 1911, the Qing Dynasty was overthrown and a republican government was established in Nanjing. The new government enacted statutes providing for the protection of private property (Dong, Zhang, and Jiao, 2000). However, the republican government failed to secure national unity. Following the death of President Yuan Shih Kai in 1916, China split into north and south, with each part further divided into various regions.

The regional authorities were called "warlords" as they maintained their own armies and fought against rivals and one another. Regional wars caused widespread depredation of agricultural and other land. The warlords further increased taxes and levies to finance their expenditures. In some regions, after 1911, land taxes increased by over 50% (Li, Li, Li, Yang, and Gong, 1994). The incessant fighting and the increasing burden of taxes and levies prompted internal migration of people away from war-ridden regions. This led to the concentration of population and wealth in areas that offered better security of person and property (Wu, 1955).[25]

Accordingly, the population of a city in 1918-19 could reasonably reflect the state of property rights at that time, with a larger population indicating better protection of property rights.[26]

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[25] See Rawski (1989) for the overall economic history of China during the Republican period.

[26] Superficially, our argument may appear to differ from that of Acemoglu, Johnson, and Robinson (2002), who argued that high population density in 1500 was correlated with weak property rights institutions.

However, the underlying theory is the same. In Acemoglu, Johnson, and Robinson (2002), high population density was a precondition for expropriation. By contrast, we use population to reflect the equilibrium state of property rights.