Effect of Threats to Property Rights on Economic Performance of the Manufacturing Sector of Indian States

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Abstract

We examine the effect of threats to property rights on the economic performance of the manufacturing sector of Indian states. We construct indices of the threats from data on crime against property rights. Our estimation results show that not only threats to private property, but also threats to contracts adversely affect the performance of India's manufacturing sector.

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1. Introduction

This article investigates the effect of threats to property rights on the performance of the manufacturing sector of Indian states. We construct indices of threats to property rights from the data available on crime against property rights and, using these indices, we show that not only threats to private property, but also threats to contracts adversely affect the performance of the manufacturing sector in India.

Property rights in the broad sense include all rights having property value. In terms of its effects on economic performance, two specific types of property rights are important to consider. The first involves property right in the narrow sense, that is, the right to utilize and dispose of private property. The second is so-called “claim,” which is the right to claim a certain act from another as specified in a contract. Acemoglu and Johnson (2005) refer to institutions that protect property rights with respect to private property as “property right institutions,” and the institutions that protect property rights with respect to contracts as “contracting institutions.”

Citizens’ property rights are threatened by many, including monarchs (kings and emperors), lords, aristocrats, dictators, politicians, government officials, enterprises, organized crime cartels, and thieves. In order to protect property rights, not only the enactment of property right laws, but also the enforcement of such laws must be assured.

Since institutions that protect property rights are a kind of public good, a free rider problem may occur, and therefore governments typically supply such institutions. Thus, effective institutions such as the police and judicial system must be established by a government so that an individual who violates another's property right is brought to justice and damages are paid. Such institutions are also expected to prevent crimes against property rights.

In a society where private property and contracts are protected, entrepreneurs will, in all likelihood, acquire profits which they can duly expect to receive through corporate activities and use these profits for their own benefits. In such a society, entrepreneurs are expected to engage vigorously in corporate activities. Conversely, in a society where private property or contracts are not protected, even if entrepreneurs were to invest in physical assets, these might be destroyed by others, or even if pecuniary profits were acquired, they might be confiscated or stolen. Or, even if entrepreneurs entered into contracts with others, the contracts might not be fulfilled. Vibrant corporate activities cannot, therefore, be expected in such an economy.

Even though there exists a large body of literature in which the effects of property right protection are statistically analyzed, many previous studies have utilized indices based on assessments by experts or questionnaire responses from business people, or

some refined mixture of various indices from different organizations. Those indices may suffer several problems. First, they may reflect subjective perceptions of respondents with different personal characters, backgrounds and experiences. Second, there is also reasonable doubt about the selection bias of respondents since it is likely that samples excluded respondents from small enterprises in rural areas. The extent of property right protection may well be lower for small firms (World Bank 2005). Third, measures used to construct a property right protection index such as the rule of law may not accurately reflect what it is meant to capture because the contents of laws, and social and cultural contexts in which laws are implemented, vary from one country to another.

In this article, in order to address these problems, we avail ourselves of more objective data related to property right protection, that is, data on crime against property rights. Moreover, we focus on a comparison between Indian states, that is, different regions within one country, which enables us to obtain a sample that is under identical legislation.

Here, we extend Acemoglu and Johnson's (2005) study in which they examined the effects of property right institution and contracting institution on various economic performances. They showed that the property right institution, not the contracting institution, has significant impacts on economic performance; however, their study also

faces the same aforementioned problems concerning the objectivity of data. Since our data on crime is classified into various types of crime, we are able to more precisely separate the respective effects of property right institution and contracting institution in our examination.

We estimate the effects of two different indices related to threats to property rights on three economic performance variables of the state manufacturing sector for the period from 1980 to 2000. We obtain estimation results showing that not only threats to private property, but also threats to contracts adversely affect India's manufacturing sector. Our results confirm Acemoglu and Johnson's (2005) finding that the effects of property right institutions impact on economic performance, but, importantly, we also show that threats to contracts have deleterious effects on economic performance.

The rest of the article is organized as follows. We briefly review the relevant literature in section 2. We then explain our empirical formulation in section 3. Section 4 provides information about data sources and the method of variable construction. Our main estimation results are presented in section 5, and our conclusions are given in section 6.

2. Previous studies

There exist two strands of research related to this study. Detailed studies by economic historians on the effect of property right protection on economic development date back at least to North and Thomas (1973). Their pioneering work explains the difference in the historical paths that Western European nations traced from the 10th to the 17th centuries, using the analytical framework of transaction cost economics. They claim that during the period from 1500 to 1700, the Netherlands and Britain, where property right protection was secured to a greater degree, achieved economic development, while France and Spain, where the property right system was undeveloped, stagnated and fell behind. Landes (1998) considers a variety of historical factors that have divided rich and poor countries, and asserts that the assurance of property rights is one of the important determinants of economic prosperity. He insists that protection of private property rights and respect for contracts were critical factors that enabled Britain to grow in advance of other countries. Moreover, Engerman and Sokoloff (1997, 2002) compare the processes of economic development of South and North America since the Europeans colonized the regions. They assert that the difference in climate and resource distribution between the two regions initially gave rise to a bigger inequality of wealth, human resources, and statesmanship in South American nations than in North American nations. As a result,

political and economic systems that tend to preserve the privilege of the elite have been maintained, compared with more equal North America. The access of non-elites to critical resources including ownership of land, which is a most important property right, as well as education, finance, and political rights has been restricted, which retarded economic development in South America.

From the mid-1990s a new line of empirical research has examined the effect of property right protection on economic performance, mostly using cross-country data. The present article belongs to this latter line of research. Knack and Keefer (1995), using country risk indices provided by International Country Risk Guide and Business Environmental Risk Intelligence, show that the average value of various indices—including the index related to the level of property right protection (expropriation risk and rule of law)—have statistically significant influence on investments and growth rates. Hall and Jones (1999) show that the level of so-called social infrastructure significantly explains the difference in national income per capita. They constructed one of the two indices of social infrastructure, again from the International Country Risk Guide, and it partly reflects the degree of property right protection. Kaufmann, Kraay and Zoido-Lobaton (1999) aggregated indices from a variety of data that was collected and estimated by various organizations, and show that

the indices for the level of governance explain income per capita, mortality rate, and literacy rate. The indices include six measures, one of which, the rule of law, is closely related to the protection of property rights.

However, Acemoglu, Johnson, and Robinson (2001) were critical of previous studies, asserting that they had not properly addressed the endogeneity problem. Accordingly, they adopted an innovative method in which they used malaria mortality rate as an instrumental variable for the protection of property rights. They show that the nations where Europeans settled due to low mortality rates had established property right systems and achieved economic development even after the regions became independent states. Moreover, using urbanization rates in 1500 as an instrumental variable for the low level of property right protection, they show in a later work (2002) that nations with low protection of property rights have lower economic growth. Rodrik and Subramanian and Trebbi (2002) also obtained estimation results that the presence of institutions covering property right protection was the most important determinant of economic development, relative to two other important candidate determinants, namely, trade and geography.[i]

Along this line of research, Acemoglu and Johnson (2005) investigated the separate effects of property right institution and contracting institution on economic performance.

They captured the former using “constraints on executives (from Polity IV),” “average protection against risk of expropriation (from Political Risk Service),” and “private property index (from Heritage Foundation 1997),” and the latter using “legal formalism (from Djankov et al. 2003),” “procedural complexity (from World Bank 2004),” and “number of procedures (World Bank 2004).” They show that it is only property right institutions, not contracting institutions, that have a positive and significant effect on economic performance.[ii]

In the Indian context, to our best knowledge, there exist only two studies along this line. Veeramani and Goldar (2005) made use of the Firm Analysis and Competitiveness Survey (FACS) data constructed by the World Bank, which examines the effects of the business climate of each state, and show that productivity level is higher in those states with good indicators of business climate. Although FACS does not directly inquire into property right protection, we suppose that the index of business climate in their study at least partially reflects the respondents’ perception of property right protection. Chemin (2004) focused on the effects of the quality of the judiciary on various economic phenomena related to small-scale firms. He shows that as judicial processes take longer to complete, there are more breaches of trust, fewer relation-specific investments, and worse growth performance of firms. He focused, however, only on threats to contracts,

not on threats to private property. We pay attention to both threats in this study.

As mentioned in section 1, many previous studies utilized indices based on questionnaire responses from business people or assessments by experts (e.g., International Country Risk Guide, Business Environmental Risk Intelligence, Business Environment and Enterprise Performance Survey). These indices suffer at least three problems. First, the perception by respondents may vary from one person to another due to differences in personal characters, backgrounds and experiences. In this article, we attempt to address this problem by directly using the data on crime against property rights with the expectation that our indices will be more objective than the subjective perception of respondents used in previous studies. Second, while many studies have used the rule of law index as an indicator for property right protection in cross-country analysis, we believe the index may be less than accurate in cross-country comparisons since the content of law and the culture in which the law is enforced differs between countries. By focusing on one nation, India, we can base our statistical analysis on a sample which is under an identical system of laws. And third, as is reported by the World Bank (2005), the extent of property right protection differs depending on categories of firms, for instance, the size of firms. Questionnaire-based data might not precisely capture the business environments faced by small firms. By using crime data,

we can capture more general threats to property rights faced by people in a region.

Furthermore, there is some vagueness associated with the interpretations of the variables in Acemoglu and Johnson (2005). For instance, while they use “constraints on executives (from Polity IV)” as the index for property right institution, other agents such as organized crime cartels or thieves (dacoits) and other criminal elements also threaten property rights. They use “legal formalism (from Djankov et al. 2003)” as the index for contracting institutions, but the inefficient legal system may make compensation for damage to private property difficult to obtain, thus becoming a threat to private property. Fully availing ourselves of a more finely classified crime data would enable us more directly to separate out the threats to property rights into threats to private property and those to contracts. We propose that our indices will provide clearer measures of property right institution and contracting institution than those used by Acemoglu and Johnson (2005).

3. Empirical formulation

The level of materialistic well-being of a nation can be roughly captured by per capita GDP, which has also been shown to be closely correlated with social development

indicators. In this study, we pay attention to the effect of threats to property rights on value added per worker (in log terms) as our primary focus. It is known that a constant returns to scale Cobb-Douglass production function

$$Y = AK^{\alpha} L^{1-\alpha}$$

can be transformed under certain conditions into

$$\ln \frac{Y}{L} = \ln A + \alpha \ln \frac{K}{L},$$

where Y is value added, K is capital, L is labor and A is total factor productivity. Thus, we also examine the decomposed effects of threats to property rights on log capital labor ratio, and log total factor productivity.

Our basic estimation model is as follows.

$$Z_{it} = \alpha + \theta_t + \theta_i + \beta X_{it} + Y_{it}{}' \gamma + \varepsilon_{it}$$

Here, Z_{it} is the natural log of economic performance variables of the manufacturing

sector of state i in year t, X is the variable indicating the extent of threats to property right, and Y is the vector of control variables which may influence the economic performance of the manufacturing sector of each state. All these independent variables in X and Y are expressed in natural log terms. State dummy θ_i and year dummy θ_t are included in the estimation.

We construct two types of variables that capture threats to property rights in each state. The first is expected to reflect threats to private property and is constructed from the value of property stolen, normalized by gross state domestic product (GSDP) of each state. The second is expected to reflect the threats to contracts and is constructed from the incidence of cheating, normalized by the population of each state. Since citizens' perception of the threats to property rights is supposed to change only slowly, we use, as explanatory variables, the average of these two variables over the last three years, including the current year. The former variable is denoted as *vpstolen* and the latter as *cheat* hereafter.

Based on earlier studies, we adopt three types of controls: physical infrastructure, human capital, and financial resources. Since variables which reflect each category tend to be correlated, we choose one or two variables from each category. In this study, we use electricity sales per person (*electricity*) and road length per person (*road*) to

represent physical infrastructure, primary school enrollment rates (*pschool*) and the incidence of labor disputes per worker (*disp*) to represent human resources, and the number of bank branches per person (*bank*) to represent financial resources.

First, we conduct the estimation using the panel data estimation method, with both a fixed effects model and a random effects model. We then apply instrumental variable estimation to address the endogeneity problem.

4. Data and variable construction

We will examine the effects of threats to property rights on three economic performance measures. First, value added per worker is obtained by dividing deflated value added by the number of workers. Second, capital labor ratio is calculated by dividing real capital stock by the number of workers.

Third, in order to obtain total factor productivity (TFP, hereafter), we first estimate a Cobb-Douglas production function having log real value added as a dependent variable and log real capital stock and log number of workers as independent variables, using fixed effects panel data estimation. We then insert the estimated coefficients back into the production function and subtract the coefficients times the independent

variables from the log dependent variable so as to obtain log TFP.

We also control for other variables that may affect performance of the manufacturing sector of each state. The data sources and the construction of these control variables are explained in the Appendix. Since these variables are not expected to affect economic performance immediately, we take into account a one year lag of these variables in the estimation.

Descriptive statistics of the variables used are provided in Table 1. It can be seen that there are wide variations in the variables among the Indian states. Pairwise correlations among the variables are shown in Table 2. The correlations between *bank* and *electricity* and between *bank* and *road* are somewhat high, but there are no other notable correlations.

INSERT Table 1 Here

INSERT Table 2 Here

Table 3 presents data on the time trends of variables. From this table it is seen that *electricity*, *road*, *pschool*, *bank*, and *cheat* all have more or less steadily increased and *disp* decreased throughout the period, while *vpstolen* has not necessarily shown stable trend. The changes in *vpstolen* and *cheat* are traced in Figures 1 and 2. From Figure 1 it can be seen that the trend in *vpstolen* was rather volatile; after a steep hike in 1980,

there was a downward trend in the 1980s, followed in the earlier part of the 1990s by upward movement, which was maintained steadily at a lower level thereafter. Figure 3 is a scatter diagram with *cheat* averaged over the sample period on the horizontal axis and *vpstolen* averaged over the sample period on the vertical axis, where each point in the diagram corresponds to a state. This figure shows no clear correlation between *cheat* and *vpstolen*.

INSERT Table 3 Here

INSERT Figure 1 Here

INSERT Figure 2 Here

INSERT Figure 3 Here

Table 4 shows statewise values of the independent variables averaged over the sample period. The results reconfirm the large variations between the Indian states. People in the state with the highest value of *cheat* may face threats of cheating about seven times more often than those in the state with the lowest count. Similarly, the highest value of *vpstolen* is about four times as high as the lowest value. We see that in terms of *vpstolen*, Maharashtra, Uttar Pradesh and Gujarat face comparatively more threats, while Andhra Pradesh, West Bengal and Bihar have relatively more secure protection of property rights with respect to private property. In terms of *cheat,* in Orissa,

West Bengal and Bihar the incidence of cheating is low, while it is high in Rajasthan, Kerala, and Gujarat.

INSERT Table 4 Here

5. Estimation results

Panel Estimation Results

Tables 5 and 6 show the results of our panel data estimation regarding *vpstolen* and *cheat* for three economic performance variables. The results of the fixed effects model estimation are given in Panel A and those of the random effects model in Panel B. The hypotheses that all the coefficients are zero are rejected in both models. Standard errors are obtained with heteroscedasticity robust estimation, unless otherwise noted at the bottom of each table.

First, we discuss the effects of *vpstolen*, given in Table 5. The results of the Hausman test at the bottom of Table 5 indicate that for all the formulations the random effects model is preferred. In any case, the main estimation results are the same for both the random and fixed effects models. The coefficients of *vpstolen* are negative and highly significant in columns (1) and (2), though it is not significant in (3); in other words, the higher the threats to private property, the lower the gross value added per

worker and capital labor ratio. A 1 percent increase in the threats reduces gross value added per worker by 0.07%, and capital labor ratio by 0.05%.

INSERT Table 5 Here

Regarding other independent variables, the incidence of labor disputes per worker has highly significant negative coefficients in columns (1) and (3), and a positive coefficient in column (2). The coefficient of road per person is positive and significant in columns (1) and (3). Primary school enrolment rates are shown to have highly significant positive effects in column (2), implying that the higher the primary school enrolment rate, the more firms are likely to adopt capital intensive technology. This may reflect the fact that as the labor becomes more educated, firms are able to use more sophisticated, but more expensive, technology.

Somewhat unexpected results are obtained for electricity consumption per person and bank branches per person. Electricity per person has negative coefficients in columns (1) and (2), and they are significant depending on the model. The results indicate that the higher the electricity consumption per person, the lower the gross value added per worker and capital labor ratio. The coefficients on bank per person are negative in columns (1), (2) and (3), and are mostly significant. We suspect these results are attributable to intervention by both the central and state governments in the financial

and power sectors. The Government of India has taken special measures to promote agriculture and small-scale industries. For instance, since 1980, banks have been requested to lend 40% of bank credit to priority sectors, out of which 40% should be directed to agriculture. The Government of India has traditionally given priority to rural electrification in efforts to promote agriculture. These policy measures may have produced the counterintuitive estimation results here.

Next, we discuss the effects of *cheat* on economic performance. Table 6 presents our estimation results. *Cheat* shows no significant effects. If *cheat* can be considered a threat to contracts, this result is in accordance with Acemoglu and Johnson's (2005) results that show contracting institutions have no significant negative effects except for market capitalization to GDP ratio.[iii]

As regards the other variables, the estimation results are more or less the same, so explanations are not necessary. The one notable finding is that primary school enrolment rate in Table 6 has a significant positive coefficient in column (3) in Panel B; this result is as expected since higher education is supposed to bring about higher productivity.

INSERT Table 6 Here

In summary, the panel data estimation shows that threats to private property have

adverse effects on gross value added per worker, capital labor ratio and total factor productivity, while threats to contracts do not.

Instrumental Variable Estimation Results

There is reasonable doubt about the endogeneity between economic performance and incidence of crime. One possible relationship is that when the income level of people is so low, the poor may steal others' property simply for survival, or they are inclined to be engaged in contract crime for money. Another possibility is that, as the income of people increases on average, the expected return to crime may be higher because there are greater numbers of affluent people in society; people tend to commit more crime in a rich society.[iv]

In order to address this problem, we conduct instrumental variable (IV, hereafter) estimation using the number of policemen per person in each state as the IV. The number of policemen per person may have some correlation with the incidence of crimes, while the variable may not impact economic performance, except through its effect on the incidence of crime.

Value of property stolen. Table 7 presents the estimation results for *vpstolen*. Panel A

shows the results of the first stage estimation of *vpstolen* instrumented by the total number of policemen per person. R-squared is 0.1005 and the F-test rejects the hypothesis that all coefficients are zero. It is shown that the coefficient on the instrument is positive and highly significant. The positive sign indicates that as the number of policemen per person increases, the greater the number of crimes are detected or reported.

INSERT Table 7 Here

Panel B of Table 7 reports the results of the second stage estimation. In column (1) where the dependent variable is gross value added per worker, the coefficient of *vpstolen* is negative and significant at the 1% level. The value of the coefficient is -0.612, which implies that if *vpstolen* increases by 1%, gross value added per worker declines by 0.61%. This is a surprisingly large effect.

The coefficient on *vpstolen* is also negative and significant at the 1% level in column (2) where the dependent variable is log capital labor ratio. As *vpstolen* increases, less capital intensive technology is adopted. This result is interpreted as indicating that as the threats to private property increase, the less incentive there is for firms to invest in physical assets. The coefficient of *vpstolen* is also negative and significant at the 1% level in column (3) where the dependent variable is log total factor productivity. It is

interesting to note that threats to private property adversely affect total factor productivity.

As regards the other explanatory variables, labor disputes per worker have a positive effect on capital labor ratio in column (2), which may reflect that, in a state with poor industrial relations, firms tend to adopt more capital intensive technology to save labor. Labor disputes per worker also have a negative effect on total factor productivity, as seen in column (3). Since high productivity can be realized on the basis of cooperation between management and labor, the sign of the coefficient is as expected. Of note, primary school enrolment rate has a positive coefficient in column (2), indicating that as primary school enrolment increases, firms tend to adopt more capital intensive technology. This may be due to higher wages or vibrant labor movement in highly educated states. Alternatively, it may reflect the fact that as the education level of workers increases, firms can use more sophisticated, albeit more expensive, technology since higher educated workers can operate them efficiently.

Electricity per population has negative coefficients in column (2), which is an unexpected finding. The number of bank branches per person has negative and highly significant coefficients in columns (1), (2) and (3). As discussed in subsection 5-1, we suspect that these counterintuitive estimation results are due to government intervention

in the financial and power sectors.

Cheating. We now discuss the estimation results for cheating per person (*cheat*), which is proxied for threats to contracts. First stage estimation results are shown in Panel A of Table 8. As in the case of *vpstolen*, the total number of policemen per person is positive and highly significant. R-squared is lower than in the case of *vpstolen,* which seems to imply that policemen per person is not a good instrument for threats to contracts.[v] However, since we do not have better instrument for now, and the coefficient of the instrument is significant, we continue to use it.

INSERT Table 8 Here

Panel B of Table 8 reports the second stage estimation results. The coefficient of *cheat* is negative and significant in columns (1), (2) and (3). Unlike Acemoglu and Johnson (2005), we obtained significant negative effects of threats to contracts on important economic performance variables. Furthermore, note that its effects are rather large. If the incidence of cheating per person rises by 1 percent, then gross value added per worker decreases by 1.4%, capital labor ratio declines by 0.97%, and total factor productivity falls by 0.77%.

Not obtaining any significant estimation results, Acemoglu and Johnson (2005)

argue that “individuals can avoid most of the adverse effects of bad legal rules by changing the terms of their contracts or by developing informal arrangements” (Acemoglu and Johnson 2005, p. 984). Their argument is plausible and persuasive. It is true that individuals can devise some means to avoid nonfulfillment of contracts or hedge the risks associated with them. Nonetheless, it is also true that those individuals making a contract under the condition of less certain fulfillment must incur additional transaction costs to avoid risk. These additional transaction costs may deter some people from making the deal or force others to change the content of the contract to a less optimal one. Thus, threats to contracts could plausibly deteriorate economic performance.

Chemin (2004), as mentioned in section 2, finds that as the judiciary process slows, the incidence of breach of trust, which should be related to threats to contracts, increases, the less relation-specific investment occurs, and economic performance worsens for small-scale firms. Our findings are in accordance with Chemin (2004) in the sense that contracting institutions are important for economic performance.

Note also that Acemoglu and Johnson (2005) obtained negative coefficients for variables capturing contracting institution, such as legal formalism, procedural complexity, and number of procedures, in their Table 2, though they were not

significant.

As regards the other independent variables, labor disputes per worker have negative coefficients in columns (1) and (3), but not (2). Primary school enrolment rate again has a positive coefficient in column (2). Bank branches per person continue to have negative coefficients in columns (1), (2) and (3). Since these findings are similar to the ones in Table 7, the same explanations apply.

In summary, IV estimation revealed that both threats to private property and threats to contracts would have significant adverse effects on gross value added per worker, capital labor ratio and total factor productivity of the manufacturing sector of Indian states.

6. Conclusion

In this article, we estimated the effects of threats to property rights on the performance of the manufacturing sector of Indian states. The novelty of our study is the application of crime data to capture the extent of threats to property rights in each state. We used data on the value of property stolen as the variable related to threats to private property, and data on cheating as the variable related to threats to contracts. We conducted panel

data estimation, as well as instrumental variable estimation using total number of policemen as an instrumental variable for the variables related to property right protection. Our IV estimation results indicate that not only threats to private property, but also threats to contracts would have significant adverse effects on the economic performance of the manufacturing sector of Indian states.

While our conclusion is generally consistent with the results obtained by Acemoglu and Johnson (2005), we also show the importance of protection of property rights with respect to contracts. We argue that while Acemoglu and Johnson's (2005) claim that individuals themselves can avoid threats to contracts is plausible, the additional transaction costs required to fend off threats to contracts could deteriorate the outcome of the transaction or even hamper completion of the transaction itself. Thus, aggregate economic performance may be worse.

Appendix: Data sources and construction of variables

We use data on the manufacturing industries from EPW Research Foundation's *Annual Survey of Industries 1973-74 to 1997-98* in India's 15 main states for the period

from 1979 to 1997. We exclude "gas, water, and electricity" from the category of the manufacturing industries in order to combine with new data from the *Annual Survey of Industries* for the period from 1998 to 2000 that is available on the Central Statistical Organisation's (CSO) website. Definitions of the main variables are as follows.

Real Gross Value Added (GVA): We obtain GVA by the double-deflation method as follows: GVA= (gross value of output)/(wholesale price index)-(total input)/(input price index). The depreciation stated in the *Annual Survey of Industries* is not necessarily the real value since it is linked to a firm's tax obligation and accounting practices. Thus, the gross term including depreciation as the measure of output is better than the net term excluding depreciation. Gross value of output is deflated by its wholesale price in order to obtain the real value. We construct the input price series. Input price is the weighted average of fuel price, material price, and other input prices, and its weights are drawn from fuel consumed, material consumed, and other input as stated in the *Annual Survey of Industries*. Fuel price, material price and other input prices are also constructed using wholesale prices, the implicit deflator of national account statistics, and weight from the input-out table. The data sources we use for constructing the input price index are as follows: Reserve Bank of India, *Database on Indian Economy*, and *Handbook of Statistics on Indian Economy*; CSO, *Input-Output Transaction Table 1989* and *National*

Account Statistics.

Capital Stock (K): The fixed capital given in the *Annual Survey of Industries* is evaluated at the end of the reference year and does not contain the value of the accumulated depreciation. We employ the perpetual inventory accumulation method for making the figure of capital stock. Real gross fixed capital formation I is defined as $I(t)=(B(t)-B(t-1)+D(t))/P(t)^I$, where D is depreciation, B is fixed capital, and $P(t)^I$ is the implicit deflator of gross fixed capital formation. Then, we construct a time-series of real gross capital stock (K^G) as $K(t)^G = K(t-1)^G + I(t)=K(0)^G+\sum_{i=1}^{t}I(t)$, where $K(0)^G$ is the base year capital stock and is regarded as $B(0)+D(0)$. Finally, assuming that the depreciation ratio per year is 5 percent, real net capital stock K is set as $K(t)=0.95\ K(t)^G$.

Labor Input (L): We use the number of workers as labor input.

Crime data: The data on value of property stolen and criminal breach of trust in each state is derived from *Crime in India*, published annually by the Ministry of Home Affairs, the Government of India.

Electricity: Electricity Sales to Ultimate Consumers is obtained from the CMIE publication, *Infrastructure*. This number is divided by population.

Road: Data on total road length is available from *Basic Road Statistics of India*, the Ministry of Shipping, Road Transport & Highways, the Government of India. This

number is divided by population.

School enrolment rates: Both primary school and secondary school enrolment rates are available from *Selected Educational Statistics*, the Ministry of Human Resource Development, the Government of India. We use Enrolment Ratio for Classes I-V as primary school data.

Bank branches: The data on the number of branches of scheduled commercial banks is obtained from *Statistical Tables Relating Banks in India*, published by the Reserve Bank of India. The number of offices is divided by population.

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Notes

[i] However, there have also been strong rebuttals against the claims that institutions are an ultimate determinant of economic development. Among others, Glaeser, La Porta, Lopez-de-Silanes and Shleifer (2004) were harshly critical of the fact that the institution indices used in previous studies are inappropriate in the sense that they are so volatile and the instrumental estimation methods are also flawed. Then, they provided the estimation result that human capital is more important than the institutions.

[ii] They show that contracting institutions have a favorable effect on stock market capitalization as a percent of GDP.

[iii] We do not test the effect on any variable similar to market capitalization to GDP in this article.

[iv] Another important issue is that the number of crimes may be underreported, possibly because victims could not expect a fair and efficient judiciary process, or would fear revenge from the perpetrators of the crime. However, we do not know how to deal with this problem at present.

[v] It is reasonable to suppose that some measures of the effectiveness of the judiciary

process could be a better instrument, but we could not obtain appropriate panel data on it.

Table 1. Descriptive statistics

Variable	No. of Observations	Mean	S.D.	Min	Max
electricity	357	0.244	0.163	0.031	0.907
road	357	2.723	1.357	0.262	7.541
disp	344	0.000277	0.000195	0.000009	0.001218
pschool	352	98.9	18.2	58.4	152.6
bank	357	0.074	0.022	0.025	0.141
cheat	357	0.03192	0.02050	0.00954	0.12489
vpstolen	344	0.00088	0.00061	0.00003	0.00578

Notes.
electricity: electricity sales to ultimate consumers (million KwH) per person.
road: total road length (km) per person.
disp: the number of labor disputes per worker
pschool: primary school enrollment rate.
bank: the number of bank branches per person.
cheat: the incidence of cheating per person.
vpstolen: the value of property stolen divided by gross state domestic product.
Primary school enrolment rates for Jammu& Kashmir, Bihar, Madhya Pradesh, Punjab and West Bengal in 1989 are missing.

Table 2. Unconditional Correlations

	electricity	road	disp	pschool	bank	cheat	vpstolen
electricity	1						
road	−0.0171	1					
disp	−0.3507	0.0931	1				
pschool	0.23	0.2224	−0.1096	1			
bank	0.4556	0.4017	−0.1987	0.3034	1		
cheat	0.3195	−0.0202	−0.1098	−0.0229	0.1401	1	
vpstolen	0.1471	0.0865	−0.1004	−0.0034	0.0063	0.0724	1

Notes.
electricity: electricity sales to ultimate consumers (million KwH) per person.
road: total road length (km) per person.
disp: the number of labor disputes per worker
pschool: primary school enrollment rate.
bank: the number of bank branches per person.
cheat: the incidence of cheating per person.
vpstolen: the value of property stolen divided by gross state domestic product.

Table 3. Time Trends of Variables

year	electricity	road	disp	pschool	bank	cheat	vpstolen
1980	0.1295	2.5692	0.000566	87.8706	0.0578	0.0248021	0.0013617
1981	0.1380	2.5823	0.000460	88.6412	0.0623	0.0252457	0.0009744
1982	0.1425	2.5590	0.000390	92.4118	0.0650	0.0241056	0.0009207
1983	0.1495	2.5660	0.000391	95.1588	0.0692	0.0264887	0.0007802
1984	0.1605	2.6340	0.000359	98.7647	0.0718	0.0248097	0.0008928
1985	0.1712	2.6368	0.000302	96.2059	0.0772	0.0269989	0.0008547
1986	0.1871	2.6663	0.000342	98.2012	0.0765	0.0286701	0.0007686
1987	0.1994	2.5763	0.000301	101.0988	0.0770	0.028068	0.0009809
1988	0.2149	2.7481	0.000279	102.6465	0.0762	0.0279448	0.0008398
1989	0.2321	2.7902	0.000276	105.1500	0.0772	0.0289403	0.0006719
1990	0.2469	2.7354	0.000288	103.7453	0.0788	0.0279468	0.0008679
1991	0.2616	2.7389	0.000261	105.1159	0.0788	0.0321375	0.0009758
1992	0.2726	2.7477	0.000237	107.6118	0.0778	0.0329753	0.0010607
1993	0.2876	2.7356	0.000220	107.4706	0.0772	0.0342911	0.0008342
1994	0.3055	2.7216	0.000157	105.9118	0.0767	0.0357991	0.000979
1995	0.3222	2.8586	0.000146	106.7118	0.0759	0.0342544	0.0009732
1996	0.3237	2.9206	0.000160	92.4529	0.0754	0.0373933	0.000777
1997	0.3339	2.9020	0.000168	92.5353	0.0738	0.0392822	0.0008146
1998	0.3478	2.9360	0.000164	94.9094	0.0735	0.0415272	0.0007499
1999	0.3525	2.7946	0.000165	96.9741	0.0734	0.044694	0.0007822
2000	0.3512	2.7689	0.000144	98.8800	0.0728	0.0439009	0.0006936

Notes.
electricity: electricity sales to ultimate consumers (million KwH) per person.
road: total road length (km) per person.
disp: the number of labor disputes per worker
pschool: primary school enrollment rate.
bank: the number of bank branches per person.
cheat: the incidence of cheating per person.
vpstolen: the value of property stolen divided by gross state domestic product.

Table 4. Statewise Average Values of Variables

state	electricity	road	disp	pschool	bank	cheat	vpstolen
Orissa	0.147	6.061	0.000477	95.870	0.058	0.0125	0.000944
West Bengal	0.145	0.990	0.000274	108.540	0.055	0.0161	0.000488
Bihar	0.089	1.012	0.000279	78.709	0.050	0.0177	0.000512
Himachal Pradesh	0.200	4.861	0.000329	110.854	0.122	0.0232	0.000729
Assam	0.057	2.909	0.000220	100.689	0.044	0.0235	0.000858
Madhya Pradesh	0.212	2.342	0.000230	95.275	0.058	0.0248	0.000846
Uttar Pradesh	0.131	1.470	0.000147	76.677	0.055	0.0252	0.001304
Tamil Nadu	0.320	2.836	0.000283	126.552	0.074	0.0262	0.000546
Punjab	0.595	2.735	0.000174	94.444	0.105	0.0279	0.000993
Jammu & Kashmir	0.182	2.013	0.000135	82.133	0.096	0.0283	0.001074
Andhra Pradesh	0.242	2.352	0.000482	98.884	0.066	0.0311	0.000453
Haryana	0.361	1.638	0.000268	85.246	0.074	0.0366	0.000734
Maharashtra	0.401	3.107	0.000181	119.984	0.068	0.0374	0.001786
Karnataka	0.252	3.010	0.000120	104.407	0.090	0.0376	0.001065
Gujarat	0.437	2.040	0.000310	116.991	0.078	0.0434	0.001124
Kerala	0.185	4.458	0.000292	98.512	0.097	0.0466	0.000870
Rajasthan	0.198	2.459	0.000451	85.630	0.063	0.0846	0.000791
Averages	0.244	2.723	0.000277	98.887	0.074	0.0319	0.000882

Notes.
electricity: electricity sales to ultimate consumers (million KwH) per person.
road: total road length (km) per person.
disp: the number of labor disputes per worker
pschool: primary school enrollment rate.
bank: the number of bank branches per person.
cheat: the incidence of cheating per person.
vpstolen: the value of property stolen divided by gross state domestic product.

Table 5. Panel Data Estimation (vpstolen)

	(1)			(2)			(3)		
	All dependent Variables are in natural log terms								
	gross value added per worker			capital labor ratio			total factor productivity		
Panel A: Fixed Effects Model									
ln vpstolen	−0.08593	(−2.32)	**	−0.05726	(−2.31)	**	−0.0479993	(−1.38)	
ln disp (−1)	−0.04786	(−1.7)	*	0.043569	(3.04)	***	−0.0625323	(−2.47)	**
ln electricity (−1)	−0.26884	(−1.92)	*	−0.3841	(−4.57)	***	0.0169862	(0.13)	
ln road (−1)	0.110894	(1.96)	*	0.058956	(1.05)		0.0859404	(1.87)	*
ln pschool (−1)	0.285734	(2.04)	**	0.367928	(4.5)	***	0.1276569	(0.95)	
ln bank (−1)	−0.85371	(−3.34)	***	−0.49759	(−2.88)	***	−0.6562009	(−2.76)	***
R^2	0.0243			0.3167			0.0702		
F	13.19 (0)			167.84 (0)			6.24 (0)		
Panel B: Random Effects Model									
ln vpstolen	−0.07391	(−2.01)	**	−0.05072	(−1.89)	*	−0.0478396	(−1.39)	
ln disp (−1)	−0.05537	(−2.04)	**	0.040654	(2.6)	***	−0.0681409	(−2.82)	***
ln electricity (−1)	−0.05836	(0.5)		−0.27439	(−3.41)	***	0.2450019	(2.34)	**
ln road (−1)	0.117805	(1.93)	**	0.06185	(1.05)		0.0460737	(1.13)	
ln pschool (−1)	0.257948	(1.79)	*	0.327229	(3.77)	***	0.2513291	(1.78)	*
ln bank (−1)	−0.53919	(−2.72)	***	−0.31163	(−1.97)	**	−0.737098	(−3.24)	***
R^2	0.0887			0.3889			0.3756		
Wald Chi^2	318.59 (0)			3202.49 (0)			146.76 (0)		
Hausmann Chi^2	1.47 (1)			2.83 (1)			1.91 (1)		
No. of obs.	282			282			282		

Note:
*** indicates 1% significance level, ** 5%, and * 10%.
Numbers in parentheses are t values for fixed effects model and z values for random effects model.
electricity: electricity sales to ultimate consumers (million KwH) per person.
road: total road length (km) per person.
disp: the number of labor disputes per worker
pschool: primary school enrollment rate.
bank: the number of bank branches per person.
cheat: the incidence of cheating per person.
vpstolen: the value of property stolen divided by gross state domestic product.

Table 6. Panel Data Estimation (cheat)

	(1)			(2)			(3)		
	All dependent Variables are in natural log terms								
	gross value added per worker			capital labor ratio			total factor productivity		
Panel A									
Fixed Effects Model									
ln cheat	0.033042	(0.66)		−0.01068	(−0.27)		0.0702587	(1.59)	
ln disp (−1)	−0.06021	(−2.48)	**	0.044522	(3.00)	***	−0.0782265	(−3.62)	***
ln electricity (−1)	−0.2798	(−2.51)	**	−0.36997	(−3.80)	***	−0.0088861	(−0.09)	
ln road (−1)	0.134464	(2.00)	**	0.069536	(1.14)		0.1196793	(2.00)	**
ln pschool (−1)	0.327729	(2.71)	***	0.430417	(4.87)	***	0.1092852	(1.02)	
ln bank (−1)	−0.46669	(−2.18)	**	−0.48277	(−2.76)	***	−0.1318144	(−0.69)	
R^2	0.0966			0.3992			0.0603		
F	13.17 (0)			165.92 (0)			5.47 (0)		
Panel B									
Random Effects Model									
ln cheat	0.031545	(0.65)		−0.01315	(−0.34)		0.0567041	(1.27)	
ln disp (−1)	−0.06058	(−2.51)	**	0.043798	(2.78)	***	−0.0740606	(−3.32)	***
ln electricity (−1)	−0.13347	(−1.48)		−0.28836	(−3.11)	***	0.1518939	(1.92)	*
ln road (−1)	0.130094	(2.06)	**	0.069947	(1.12)		0.0746495	(1.31)	
ln pschool (−1)	0.313529	(2.70)	***	0.393705	(4.36)	***	0.2495355	(2.34)	**
ln bank (−1)	−0.34335	(−1.96)	*	−0.35015	(−2.20)	**	−0.4487972	(−2.89)	***
R^2	0.1761			0.4508			0.3873		
Wald Chi^2	309.71 (0)			3616.37 (0)			127.71 (0)		
Hausmann Chi^2	10.39 (0.9927)			14.06 (0.9453)			25.81 (0.3628)		
No. of obs.	307			307			307		

Note: The results for gross value added per worker and TFP are without robust option because robust option makes Hausman test unfeasbile.
*** indicates 1% significance level, ** 5%, and * 10%.
Numbers in parentheses are t values for fixed effects model and z values for random effects model.
electricity: electricity sales to ultimate consumers (million KwH) per person.
road: total road length (km) per person.
disp: the number of labor disputes per worker
pschool: primary school enrollment rate.
bank: the number of bank branches per person.
cheat: the incidence of cheating per person.
vpstolen: the value of property stolen divided by gross state domestic product.

Table 7. Two stage least squares estimation (vpstolen)

Panel A: First Stage

Dependent Variable: ln vpstolen				
tpolice(−3)	0.460177	(0.104033)	***	
ln disp (−1)	−0.0071	(0.040254)		
ln electricity (−1)	0.033783	(0.197051)		
ln road (−1)	−0.02543	(0.109682)		
ln pschool (−1)	0.047103	(0.209193)		
ln bank (−1)	−0.3233	(0.398469)		
R^2	0.1005			
F(23,241)	2.01	(0.0052)		

Panel B: Second Stage

	(1)			(2)			(3)		
	All dependent variables are in natural log terms								
	gross value added per worker			capital labor ratio			total factor productivity		
ln vpstolen	−0.61164	(0.183366)	***	−0.42184	(0.124402)	***	−0.372504	(0.144306)	***
ln disp (−1)	−0.05166	(0.032675)		0.041056	(0.022168)	*	−0.06495	(0.025714)	**
ln electricity (−1)	−0.1959	(0.160699)		−0.33307	(0.109024)	***	0.0617364	(0.126467)	
ln road (−1)	0.07222	(0.089551)		0.031906	(0.060755)		0.0622108	(0.070475)	
ln pschool (−1)	0.241396	(0.168648)		0.336446	(0.114417)	***	0.1007429	(0.132723)	
ln bank (−1)	−0.96157	(0.324512)	***	−0.57067	(0.22016)	***	−0.723838	(0.255384)	***
R^2	0.0001			0.2185			0.0122		
Wald Chi^2	338.6	(0.0000)		43559.47	(0.0000)		103717.1	(0.0000)	
No. of obs.	281			281			281		

Notes: *** indicates 1% significance level, ** 5%, and * 10%.
Numbers in parentheses are standard errors.
electricity: electricity sales to ultimate consumers (million KwH) per person.
road: total road length (km) per person.
disp: number of labor disputes per worker.
pschool: primary school enrollment rate.
bank: number of bank branches per person.
cheat: incidence of cheating per person.
vpstolen: the value of property stolen divided by gross state domestic product.
tpolice: total number of policemen per person.

Table 8. Two stage least squares estimation (cheat)

Panel A: First Stage

Dependent Variable: ln cheat			
tpolice(−3)	0.205894	(0.076)	***
ln disp (−1)	−0.02596	(0.03)	
ln electricity (−1)	0.457853	(0.148)	***
ln road (−1)	0.022638	(0.082)	
ln pschool (−1)	0.077558	(0.158)	
ln bank (−1)	−0.4495	(0.286)	
R^2	0.086		
F(23,249)	4.99 (0.0000)		

Panel B: Second Stage

	(1)			(2)			(3)		
	All dependent variables are in natural log terms								
	gross value added per worker			capital labor ratio			total factor productivity		
ln cheat	−1.38552	(0.609)	**	−0.97246	(0.413)	**	−0.7699527	(0.415)	*
ln disp (−1)	−0.09199	(0.052)	*	0.017458	(0.035)		−0.095737	(0.035)	***
ln electricity (−1)	0.454605	(0.391)		0.120428	(0.265)		0.4339128	(0.267)	
ln road (−1)	0.111424	(0.136)		0.053711	(0.092)		0.1015756	(0.092)	
ln pschool (−1)	0.3169	(0.259)		0.394304	(0.176)	**	0.1231771	(0.177)	
ln bank (−1)	−1.31744	(0.532)	**	−0.94172	(0.361)	***	−0.7004058	(0.363)	*
R^2	0.0156			0.272			0.0438		
Wald Chi^2	130.87 (0.0000)			18444.57 (0.0000)			57954.92 (0.0000)		
No. observations	289			289			289		

Notes. *** indicates 1% significance level, ** 5%, and * 10%.
Numbers in parentheses are standard errors.
electricity: electricity sales to ultimate consumers (million KwH) per person.
road: total road length (km) per person.
disp: number of labor disputes per worker.
pschool: primary school enrollment rate.
bank: number of bank branches per person.
cheat: incidence of cheating per person.
vpstolen: the value of property stolen divided by gross state domestic product.
tpolice: total number of policemen per person.

Figure 1. Trend in vpstolen

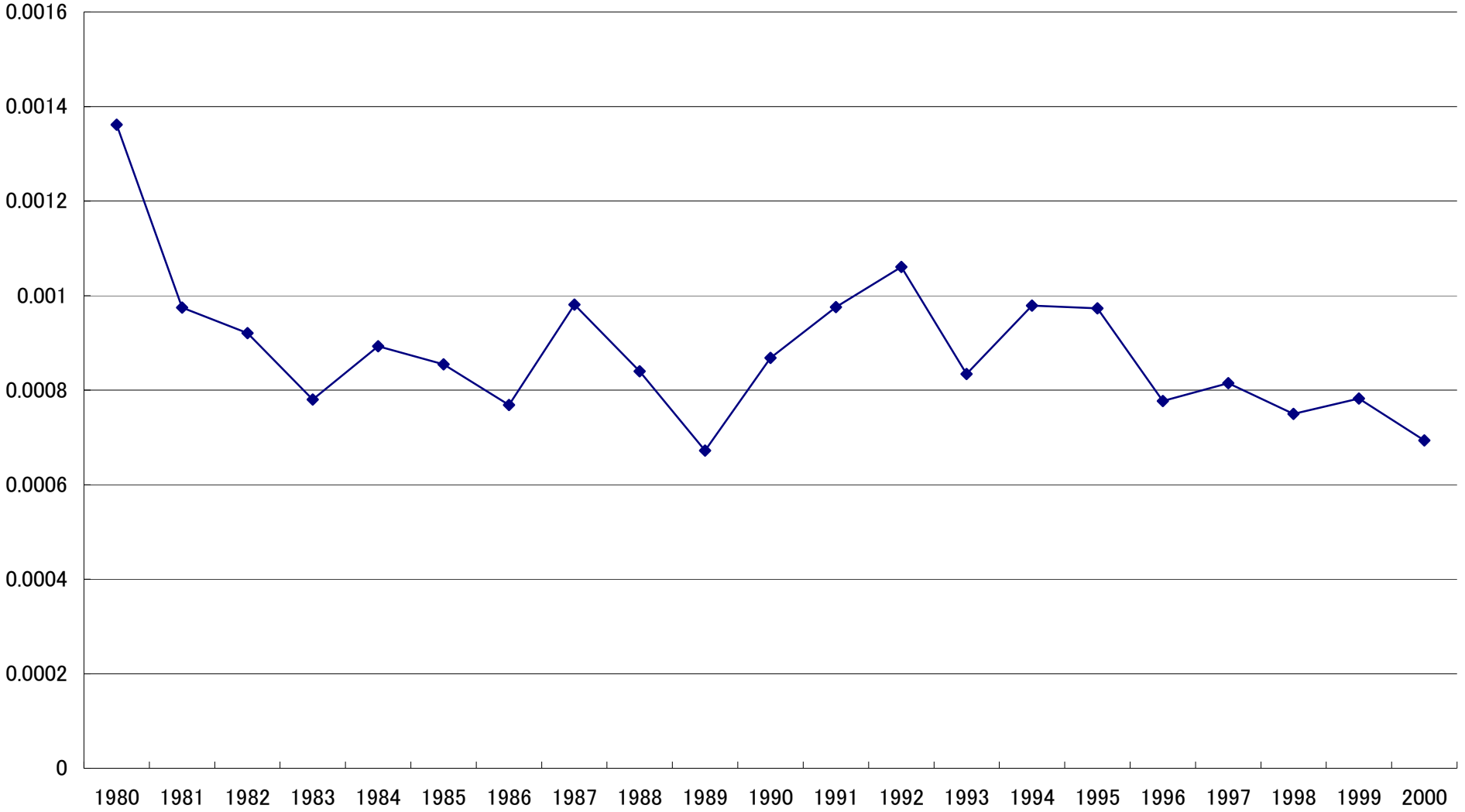

Figure 2. Trend in cheat

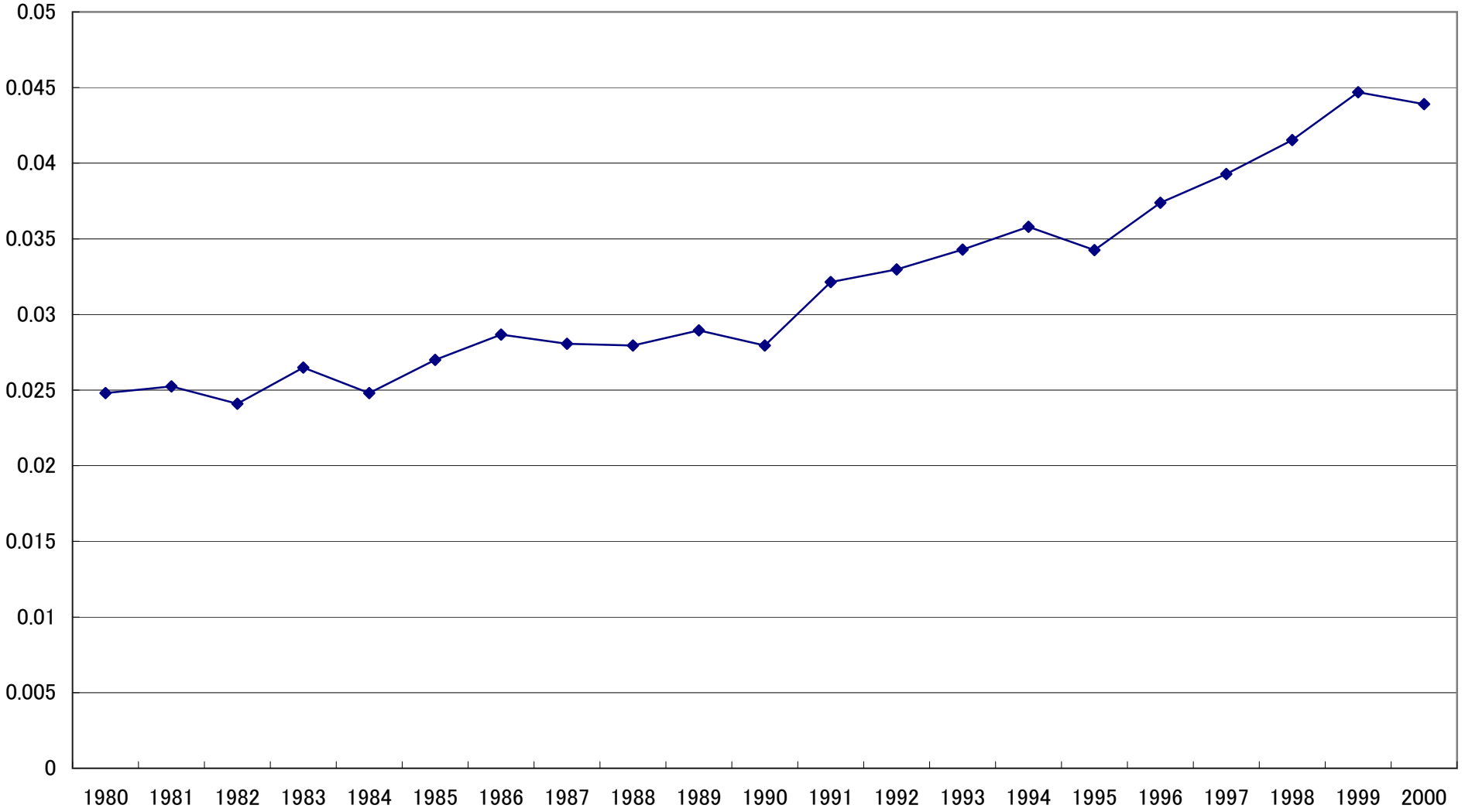

Figure 3. Scatter Diagram of cheat and vpstolen