

Does Greater Regulatory Burden Lead to More Corruption?

Evidence Using Firm-Level Survey Data
for Developing Countries

Mohammad Amin

Yew Chong Soh



WORLD BANK GROUP

Development Economics

Global Indicators Group

February 2020

Abstract

Regulation often creates opportunities for public officials to extract bribes. If this is true, deregulation offers a simple way to combat corruption. However, empirical evidence on the corruption and regulation nexus is limited. Further, the corruption indices used are based on experts' opinions, which may suffer from perception bias. The present paper attempts to address these shortcomings using firm-level survey data for 131 mostly developing countries on the

experiences of the firms with bribery and regulatory burden. Exploiting within-country and industry-level variation in regulatory burden, the analysis finds a large, positive effect of regulatory burden on corruption. For the baseline results, the bribery rate is higher by about 0.03 percentage point for each percentage point increase in the regulatory burden. The finding is robust to several endogeneity checks.

This paper is a product of the Global Indicators Group, Development Economics. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at <http://www.worldbank.org/prwp>. The authors may be contacted at mamin@worldbank.org.

The Policy Research Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about development issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

Does Greater Regulatory Burden Lead to More Corruption? Evidence Using Firm-Level Survey Data for Developing Countries

By: Mohammad Amin* and Yew Chong Soh**
(World Bank)

JEL Codes: D72, D73, H11, H77, L51

Keywords: Corruption, Regulation, Firm level, Bribery

We would like to thank Jorge Luis rodriguez Meza for very helpful comments. All remaining errors are our own.

* Corresponding Author. Senior Economist, Enterprise Analysis Unit, DECEA, World Bank Country office in Kuala Lumpur, Malaysia, World Bank. Email: mamin@worldbank.org

** Consultant, Enterprise Analysis Unit, DECEA, World Bank Country office in Kuala Lumpur, Malaysia, World Bank. Email: ysoh@worldbank.org

1. Introduction

Business regulations often create opportunities for public officials to collect bribes (De Soto 1989; Shleifer and Vishny 1993; Djankov et al. 2002; Svensson 2005). If true, this simple insight provides a practical and powerful way for deregulation to combat corruption and its many harmful effects on the economy.¹ However, empirical evidence on how regulation affects corruption is limited in several ways. For one, the existing studies use macro-level corruption indices based on subjective opinions of experts and, therefore, are prone to perception bias (Svensson 2003; Fan et al. 2009). Regulation is often measured by laws on the books rather than the actual regulatory burden on the firms even though it is the latter that is the primary determinant of corruption (Kaufmann and Wei 2000; Duvanova 2014). The present paper attempts to fill this gap in the literature by using firm-level survey data on the actual corruption and regulatory burden experienced by the firms. We find a large positive impact of regulation on the level of corruption. The result is robust to alternative corruption indicators, estimation methods and various endogeneity checks.

Theoretical models posit two views of regulation. The first view, the public interest view, goes back to Pigou (1938) who argued that markets are prone to frequent failures and regulation is intended to correct for these market failures. Corruption may still arise as implementing rules requires bureaucrats who may be corrupt (Acemoglu and Verdier 2000). The second view, the public choice theory, stresses that regulation is intended to create rents to be distributed between the industry incumbents and the corrupt public officials. In some cases, the main beneficiary of

¹ Corruption is found to slow down economic growth (Mauro 1997; Fisman and Svensson 2007), lower productivity and investment (Mauro 1995; 1997; Keefer and Knack 1995) and discourage foreign investment (Alesina and Weder 1999; Wei 2000).

regulation is the industry (regulatory capture view) while in others, it is the politicians and public officials (tollbooth view).

The opportunities created by regulation mentioned above increase the marginal benefit from corruption. This raises corruption when corrupt public officials equate the marginal benefit and marginal cost of corruption (crime and punishment model of corruption due to Becker 1968, and Becker and Stigler 1974). Corruption may also arise because principals (citizens) can only imperfectly monitor the corrupt behavior of their elected agents (politicians and public officials) (the principal-agent model due to Rose-Ackerman 1978 and Klitgaard 1988). More regulation creates greater opportunities for agents to use their discretionary powers to hide their corruption activities behind the labyrinth of rules and regulations.

Motivated by the above arguments, several studies analyze the possible effects of regulation on corruption. Using macro-level data for a cross-section of 85 countries in 1999, Djankov et al. (2002) look at the relationship between entry regulations and the level of corruption. The corruption measure they use is Transparency International's Corruption Perception Index (CPI). Entry regulation is measured by the number of procedures required to start a business, the time it takes to clear all the procedures, and the official cost of doing so (Doing Business, World Bank). Consistent with the tollbooth view, the study finds strong evidence of higher corruption associated with heavier regulation of businesses. Using data from three worldwide firm surveys, Kaufmann and Wei (2000) confirm that when bribe-extracting bureaucrats can endogenously choose regulatory burden and delay, the effective (not just nominal) red tape and bribery can be positively correlated across firms. Duvanova (2014) employs firm-level survey data for 25 post-communist economies between 1999 and 2005 and finds that the mechanisms of regulatory implementation, rather than heavy-handed regulatory policy, are responsible for bribery. Also see

for example, Ades and Di Tella (1997), Svensson (2003), and Holcombe and Boudreaux (2015) and Fisman and Golden (2017).

The present paper contributes to the above literature in several ways. First, as Fan et al. (2009) and Svensson (2003) note, most previous studies have used perceived corruption indices that rely on the aggregated perceptions of businesspersons or country experts, many of whom may have formed impressions—perhaps subconsciously—based on common press depictions of countries or conventional notions about what institutions or cultures are conducive to corruption. Thus, the use of these indices raises concerns about perception biases. The *Manual on Corruption Surveys* prepared by the UN (UNDOC, UNDP and UNODC-INEGI 2018) argues that corruption measures based on the actual experience of individuals with corruption (obtained from survey data) are far superior than the corruption measures based on opinions and perceptions of the experts. Thus, we depart from the literature by using firms' experience with corruption instead. We do so for the overall corruption and petty corruption that arises in conducting a specified list of public transactions.

Second, for regulation, we use the actual regulatory burden experienced by the firms rather than rules on the books. This is an important departure from the literature which is almost exclusively focused on regulations on the books. The only exception we found is Duvanova (2014). While our study uses the same measures of regulation and corruption as Duvanova (2014), ours differs in several ways. For instance, Duvanova (2014) employs an older data set (1999 to 2005) and is confined to 25 post-communist economies. In contrast, our sample includes 131 countries (baseline sample) surveyed over 2006 to 2018. Further, we explore the corruption and regulation relationship for the overall corruption and petty corruption. The study by Duvanova

(2014) analyzes only the overall corruption. We also include several endogeneity checks (discussed in the next paragraph) that are not included in the Duvanova (2014) study.

Third, we pay due attention to endogeneity concerns. Unlike Duvanova (2014) who regresses corruption experienced by a firm on its own level of regulatory burden, we proxy the latter by the average level of regulatory burden experienced by all other firms (that is, excluding own firm) in the country-industry cell to reduce endogeneity concerns. We control for all time invariant country-specific factors (country fixed effects) and so our results are immune from endogeneity problems that plague much of the cross-country evidence on corruption issues. We go beyond and show that our results are not spuriously affected by country-industry-specific factors. To do so, we take advantage of the fact that for several country-industry pairs, multiple rounds of ES are available. Thus, we use change in the level of regulation (at the country-industry level) over time to identify its effect on (change in) corruption. Results here are robust to controls for country features such as GDP per capita (level and growth), government size, trade openness, education attainment, etc., that may change over time and impact corruption.

Fourth, most of the existing studies use macro-level data which cannot capture within-country variations in the level of corruption and the regulatory burden. As Svensson (2003) notes, firms facing similar institutions and policies may still end up paying different amounts in bribes for the same amount of services received. This is particularly important when considering the actual regulatory burden on the firms, since the enforcement of rules can vary significantly within the country.

Our results show a large positive impact of the regulatory burden on the level of overall corruption as well as petty corruption. For the baseline specification, the overall bribery rate (bribes as percentage of firms' annual sales) rises by about 0.03 percentage point for each

percentage point increase in the regulatory burden. Figure 1 illustrates the point graphically. The finding is robust to various controls, specifications, and estimation methods including OLS (cross-section and repeated cross-section estimation), logit, and Poisson.

2. Data and Main Variables

2.1 Data description

Our main data source is firm-level survey data collected by the World Bank's Enterprise Surveys (ES). Our baseline regression results are based only on the ES data. For the repeated cross-section regressions, we compliment the ES with other data sources such as World Development Indicators, World Bank.

The ES are nationally representative surveys of the non-agricultural and non-financial private economy. A common sampling methodology – stratified random sampling – is followed in all the surveys along with a common questionnaire.² The sample for each country is stratified by industry, firm-size, and location within the country. Weights are provided in the survey and used in all our regressions so that the sample is representative of the target population.

Throughout, we focus on firms in the manufacturing sector and all the countries for which ES data are available. The firms were surveyed between 2006 and 2018. For our main or baseline results, the sample used is a pure cross-section in that each country (and firm) is included only once. The most recent round of ES available for the country is used. The sample consists of 25,388 firms for our main overall corruption measure and 20,142 firms for the petty corruption measures. Both these samples are spread over 131 countries and 29 industries (3-digit ISIC Rev. 3.1). The number of country-industry cells equals 1,095 for the overall corruption sample and 1,091 for the

² Details of the sampling methodology and other related information are available at www.enterprisesurveys.org.

petty corruption sample. Later, we refer to these samples as the baseline or pure cross-section samples.

For several countries and industries, multiple rounds of ES are available. We take advantage of this feature of the data to consider changes over time in the level of regulation (at the country-industry level) and how these changes correlate with changes in the level of corruption. This constitutes our repeated cross-section estimation. The two most recent rounds of ES in a country are used. The repeated cross-section sample consists of a maximum of 22,928 firms for overall corruption and 20,477 firms for petty corruption. These firms are spread across 79 countries (or 158 country-years) and 20 industries. The number of country-year-industry cells here equals 1,116 for overall corruption and 1,118 for petty corruption. The repeated cross-section samples become somewhat smaller when we include some country-level controls, such as education attainment, government size, etc. This happens due to missing data on the country-level controls.

2.2 Estimation methodology

The baseline regression exercise involves estimating the following equation:

$$Y_{ijk} = \alpha + \beta_1 \text{Regulatory Burden}_{ijk} + CFE_j + IFE_k + \text{Firm Controls}_{ijk} + u_{ijk} \quad (1)$$

where subscript i denotes the firm, j the country and k the industry (3-digit ISIC rev. 3.1) to which the firm belongs. Y is the measure of corruption experienced by the firm; *Regulatory Burden* denotes the burden on the firms of complying with various government regulations; *CFE* denotes dummy variables for the various countries (country fixed effects) and *IFE* denotes dummy

variables for the industry (industry fixed effects). *Firm Controls* includes various firm-level controls that are discussed in detail below, and u is the error term.

The corruption measures we use include both a continuous measure of the level of corruption and the incidence of corruption (dummy variable). Since a large proportion of firms (about 80 percent) report zero corruption, we use Ordinary Least Squares and Poisson estimation methods when the dependent variable is the level of corruption. For the incidence of corruption as the dependent variable, we use the logit estimation method. All the regressions use robust standard errors and clustered at the country times industry level. We pay due attention to endogeneity concerns. This is discussed in detail below.

2.3 *Dependent variable*

2.3.1 *Overall corruption*

The ES asked firms the amount of bribe firms like itself typically pay to public officials to “get things done”. Our first measure of corruption is this bribe amount reported by the firms and expressed as a percentage of the firms’ annual sales (*Overall Corruption*). The motivation for the question is that firms are most likely to report their own experience with paying bribes. The advantage of using this variable is that it is based on the actual experiences of firms rather than the subjective opinions of experts. The variable is used in other studies including Fan et al. (2009) and Duvanova (2014). For our baseline sample, the mean value of *Overall Corruption* equals 1.09 percent and the standard deviation is 4.94.

It is worth noting that there are several firms that report very small levels of bribe payments. We check that our results continue to hold even if we set very small levels of bribes (less than or equal to 0.1 percent) to zero (*Overall Corruption (adjusted)*). Since a majority firms (about 80

percent) report zero bribe payments, we check our main results using as dependent variable a dummy equal to 1 if the firm reports positive bribe payments and 0 otherwise (*Incidence of Overall Corruption*).

2.3.2 Petty corruption

The ES also contains information on instances of corruption that firms experience in soliciting the following: obtaining electricity connection, obtaining water connection, obtaining construction permit, obtaining import license, obtaining operating license, and inspections or meetings with tax officials. Based on this information, the ES compiles two separate measures of petty corruption that we use as dependent variables. The first measure is the incidence of petty corruption defined as a dummy variable equal to 1 if a firm experienced a bribe payment or request in one or more of the six transactions listed above and 0 otherwise (*Petty Corruption Incidence*). The second measure is the depth of petty corruption defined as the percentage of the six transactions for which the firm experienced a bribe payment or request for one (*Petty Corruption Depth*).³ In the baseline sample, the mean value of the incidence of petty corruption equals 0.17 and the standard deviation equals 0.38. The corresponding figures for the depth of petty corruption equal 13.47 and 31.70 percent.

2.3.3 Correlation between overall and petty corruption

The overall corruption measure described above aims to capture all types of corruption that the private firms experience in running their business. Thus, it is ideally suited for our purpose since

³ The two measures of petty corruption are available for only those firms that solicited the public services listed above or were inspected by tax officials. For the bribery depth measure and following the ES methodology, a refusal to answer a question on whether bribes were requested or expected is considered as an affirmative answer.

the regulation measure that we use captures the overall regulatory burden on the firms. However, the overall corruption measure is based on an open question on how much bribes firms pay to “get things done”. While the measure has been used in the literature, there may be some concern since it is not clear exactly what types of corruption experiences firms have in mind in responding to the question. One way to address such concerns, at least to some extent, is see how well the overall corruption measure correlates with the petty corruption indicators. Since petty corruption is part of overall corruption, we should find that the two are positively correlated. Of course, the correlation is unlikely to be perfect, since countries may be more corrupt in certain types of petty corruption and less so in the others.

For our baseline sample, we find that there is a high correlation between the overall corruption and the two petty corruption measures, significant at the 1 percent level. This holds for both Spearman’s rank correlation and Pearson’s correlation, although the latter correlations are smaller in magnitude than the former in some cases. Table A1 in Appendix A shows the details. Focusing on the Spearman’s rank correlation, at the country-level, the correlation between overall corruption and the petty corruption (incidence and depth) equals about 0.6; the correlation between the incidence of overall corruption and petty corruption is even higher at about 0.72. We also looked at the correlations at the country-industry level since the regulation measure that we use varies at the country-industry level. The correlations here are slightly lower but still high equaling 0.50 for overall corruption and the petty corruption indicators, and about 0.52 for the incidence of overall corruption and the petty corruption measures (Table A1 in Appendix A).

2.3.4 How ES corruption measures correlate with others

Another validity check for our corruption measures is how well they correlate with the macro-level corruption measures typically used in the literature. Thus, we check for the correlation between our overall and petty corruption measures and other corruption measures including the Corruption Perception Index (Transparency International), Control of Corruption (Worldwide Governance Indicators, World Bank) and the one from ICRG. All these external corruption measures are re-scaled so that higher values imply higher corruption. Of course, this does not affect the analysis that follows.

Table A2 in Appendix A shows the correlations. By and large, there is a high correlation between our corruption measures (overall and petty corruption) defined at the country-level and the rest, significant at the 1 percent or 5 percent level. For instance, the Spearman's rank correlation between our overall corruption measure and the Control of Corruption measure equals 0.51. The corresponding figure for the incidence of petty corruption equals 0.65 and 0.62 for the depth of petty corruption. There is one exception, however. The Pearson's correlation between our overall corruption measure and the ICRG corruption measure is somewhat weak equaling 0.196, significant at the 10 percent level. Note that the ICRG corruption measure has a poor coverage and is available for only 88 (out of 131) countries in our sample. Control of Corruption and Corruption Perception Index are available for 131 and 120 countries, respectively.

2.4 Main explanatory variable

Our main explanatory variable is a measure of the level of regulation experienced by the private firms. The ES asked firms the percentage of their senior management's time that is spent in dealing with business regulations. It is not possible to use this measure directly in the regressions as it is likely to be endogenous to various firm characteristics. Further, firms' experience with corruption

may have a direct effect on the time spent in dealing with business regulations (reverse causality problem). One solution suggested in the literature is to proxy the regulatory burden on the firm by the average level of regulatory burden experienced by all other firms (that is, other than the firm in question) in the country-industry cell.⁴ Using country-industry cell average also helps to control for potential measurement error if some firms choose not to respond or misreport the regulatory burden (Pounov 2016). Thus, we define our main explanatory variable, *Time Tax*, as the average of the percentage of senior management's time spent in dealing with business regulations where the average is taken over all firms at the country-industry level (cell) excluding the firm in question. To ensure adequate thickness within the cells, all cells with fewer than 5 firms are excluded from the sample. As mentioned above, there are 1,095 country-industry cells in our baseline sample for overall corruption.

2.5 Controls

Our estimate of the relationship between corruption and regulation (henceforth, main results) could suffer from omitted variable bias problem if the drivers of corruption happen to be correlated with regulation. At a broad level, bribe paid depends on the firms' ability to pay bribes, outside options available to the firm if it chooses not to pay bribes, firms' bargaining power against public officials, and the degree of interaction between the firm and the public officials. Thus, motivated by the existing studies, we control for several determinants of corruption. These determinants can be grouped into micro- or firm-level and macro- or country-level determinants.

⁴ Reverse causality from firm's own experience with corruption to the regulatory burden experienced by the other firms in the country is highly unlikely, although it cannot be ruled out completely (see for example, Aterido et al. 2011).

At the macro-level, the literature has identified several potential drivers of corruption (for an overview, see Svensson 2005; Fan et al. 2009; Dimant and Tosato 2018). Some of the drivers include GDP per capita, country size, size of the government, education level, trade openness, inflation, ethnic fractionalization and legal origin. However, except for GDP per capita, empirical evidence for most of the other determinants is somewhat mixed and inconclusive. In our baseline specification, we exploit variation in regulation at the country-industry level controlling for industry and country dummies (fixed effects). Thus, all country-specific features, such as income level (GDP per capita), ethnic fractionalization, etc., are controlled for (absorbed by the country fixed effects). In the repeated cross-section estimation, however, we exploit the variation over time in regulation defined at the country-industry level. We include dummies for country-industry pair (Country-Industry fixed effects) which control for all time invariant country-industry and therefore country characteristics that may impact corruption. However, the results here could still suffer from spurious correlation if there is a change in country characteristics over time that is correlated with the change in regulation and corruption. To guard against this possibility, we follow the literature mentioned above and include several country-level controls. The data source for all these controls is WDI unless stated otherwise. The controls include (log of) GDP per capita (PPP adjusted and at constant 2011 international dollars) as well as its annual growth rate; government size proxied by the “Freedom from Government Size” indicator from Fraser Institute’s Economic Freedom of the World database; gross enrollment rate in primary education (*Primary Education*); trade openness defined as the ratio of exports plus imports to GDP; quality of bureaucracy using

the “Government Effectiveness” measure from the Worldwide Governance Indicators; and the annual rate of inflation (Consumer Price Index).⁵

Given the dearth of literature on which firm characteristics best capture the broader determinants of bribery mentioned above, we use several proxy measures. We begin with control for industry choice, as this can significantly affect firms’ profitability and growth (Rand and Tarp 2012). We do so by using dummy variables for the industry to which the firm belongs (Industry fixed effects). In our baseline sample, there are 29 different industries defined as the 3-digit ISIC Rev 3.1 level. Next, we control for (log of) number of full-time workers employed at the end of the last fiscal year (*Firm Size*) and (log of) age of the firm. Larger and older firms may be more susceptible to paying bribes due to their greater visibility/exposure, higher ability to pay bribes due to bigger profits and better access to finance, and fewer outside options due to larger sunk investments. Countering these effects, larger and older firms may be less reliant on publicly provided utilities and services, have stronger political connections and managers who are more skillful in negotiating with the public officials. The net effect of these forces will determine how the age and size of the firm affects the level of corruption it experiences.

A firm’s profitability and, therefore, its ability to pay bribes depends on several additional factors such as management quality, exporting status, foreign ownership of the firm, financial condition, infrastructure availability, and the quality of institutions. Financial condition of the firm and the experience of its top management could affect its ability to deal with corrupt public officials as well its outside options. Exporting firms and firms that have foreign ownership may be more prone to paying bribes, as these firms tend to be more productive and profitable, more visible,

⁵ All the country-level controls described here are lagged by two years to allow for their full effects on corruption. The only exception is primary education. Due to missing data, we use average values of primary education over the last two years (prior to the date of ES) for which data are available.

and have greater interaction with the government due to additional customs-related rules. Therefore, we further control for the following firm-level variables: (log of) number of years of experience the top manager of the firm has working in the industry (*Manager Experience*), dummy variable equal to 1 if the firm has overdraft facility and 0 otherwise (*Overdraft*), dummy variable equal to 1 if the firm has a loan or line of credit and 0 otherwise (*Line of Credit*), total hours of power outages experienced by the firm over the last year (*Power Outages*), losses due to crime, theft and disorder (expressed as a proportion of firms' annual sales) during the last year (*Crime Losses*), percentage of firm's annual sales made abroad (*Exports*), a dummy variable equal to 1 if foreign individuals, companies or entities own 10 percent or more of the firm and 0 otherwise (*Foreign Ownership*), and how much of an obstacle is the (lack of proper) functioning of the courts for firms' operations (*How Much of An Obstacle: Court*) as a proxy for the institutional environment and law and order.

Last, we control for fixed capital investment. Information is available in the ES on whether the firm purchased any fixed assets during the last year or not (*Firm Bought Fixed Assets*). We use this dummy variable as a proxy for capital stock.

Summary statistics of all the variables used in the regressions are provided in Table A3 in Appendix A. The correlation between our main explanatory variable, *Time Tax*, and the various controls is provided in Table A4 in Appendix A.

3. Overall Corruption

3.1 Base regression results

Our baseline regression results for *Overall Corruption* are provided in Table 1. Country and industry fixed effects are included in all the specifications shown while the remaining controls are added sequentially.

The results show that irrespective of the set of controls, there is a large positive relationship between *Overall Corruption* and *Time Tax*, significant at the 5 percent level. Without any other controls (except for country and industry fixed effects), the estimated coefficient value of *Time Tax* equals 0.028 (column 1). That is, for each percentage point increase in the regulatory burden, the overall bribe rate increases by 0.028 percentage point. Alternatively, an increase in regulatory burden from its minimum to maximum level leads to 2.8 percentage points increase in the level of overall corruption. This is a large increase given that the mean level of overall corruption equals about 1.1 percent.

Adding the various controls to the specification hardly changes the estimated coefficient value of *Time Tax* (columns 2-5). For our final specification and with all the controls included, the estimated coefficient value of *Time Tax* equals 0.03 (column 5) compared to 0.028 above (column 1).

Regarding the controls, some are significantly correlated with overall corruption and in the expected direction. First, worse functioning courts is associated with higher corruption, significant at the 5 percent level. Second, higher losses due to crime is associated with higher corruption, significant at the 5 percent level. These two results are consistent with the broader findings in the literature (reviewed above) that worse institutional environment tends to increase corruption. The findings hold in all our baseline regressions. However, in the repeated cross-section estimation, crime losses are not significantly correlated with the two petty corruption measures (discussed below). Third, firms with foreign ownership experience higher level of corruption. This is

consistent with the general findings in the literature that the more productive and profitable firms, and firms with greater visibility and higher ability to pay bribes are likely to be targeted by corrupt public officials. However, some caution is necessary here as the positive relationship between foreign ownership and overall corruption is significant at the 5 percent level in the final specification, but only significant at the 10 percent level in the other specifications (columns 3 and 4). Further, in several of the later robustness checks, we find no significant relationship between corruption and foreign ownership.

The other firm-level controls in Table 1, including firm-size, do not show any significant relationship with overall corruption. One possibility could be that some of the controls such as firm-size have contrasting effects on corruption (discussed above). Thus, the net effect is small and insignificant. However, in some of the later results, firm characteristics such as exports, manager experience, purchase of fixed assets and access to finance are significantly correlated with corruption.

We confirm that the estimated coefficient value of *Time Tax* and its statistical significance remains unchanged from above when we disregard (set to 0) small bribe payments of 0.1 percent or less of the firms' annual sales or less (see Table A5 in Appendix A).

3.2 Repeated cross-section

The results above are based on within-country and across-industry variation in the regulatory burden. Country-wide determinants of corruption and industry-wide factors do not spuriously affect the results as these are controlled for by country and industry fixed effects. However, country and industry fixed effects do not account for determinants of corruption that vary at the country-industry level. Thus, our results above may still suffer from spurious correlation.

To raise our confidence against this problem, we take advantage of the fact that for several countries and industries, multiple rounds of ES conducted over time are available. Thus, we consider changes over time in regulation at the country-year-industry level and how these changes correlate with changes in the level of corruption (repeated cross-section estimation). We control for country-industry fixed effects (instead of just country fixed effects and industry fixed effects) and therefore eliminate the spurious correlation problem mentioned in the previous paragraph.

Specifically, we estimate the following equation:

$$Y_{ijkt} = \alpha + \beta_1 \text{Regulatory Burden}_{ijkt} + CIFE_{jk} + Time_t + Firm\ Controls_{ijkt} + Country\ Controls_{jt} + u_{ijkt} \quad (2)$$

where subscript i denotes the firm, j the country, k the industry (3-digit ISIC rev. 3.1) to which the firm belongs, t denotes the time (latest vs. earlier ES round). Y is the measure of corruption experienced by the firm; Regulatory Burden is time tax averaged over all other firms in the same country-year-industry cell; $CIFE$ denotes dummy variables for each country-industry pair (Country-Industry fixed effects); and $Time$ is a dummy variable equal to 1 for the latest round of ES and 0 for the earlier round. Firm and country controls are as outlined above (section 2.5). Since our regulation measure in equation (2) varies at the country-year-industry level, all the repeated cross-section regressions use robust standard errors clustered at the country-year times industry level.

Regression results for overall corruption based on equation (2) are provided in Table 2. These results confirm the findings above of a large positive and significant (at the 5 percent level) relationship between overall corruption and regulation. The estimated coefficient value of $Time$

Tax is somewhat smaller in some of the specifications here than in the baseline results above, but it is still large. In fact, for the final specification, the estimated coefficient value of *Time Tax* in the baseline specification (column 5, Table 1) and the repeated cross-section specification (column 6, Table 2) is exactly equal (coefficient value of 0.03).⁶

Regarding the various controls, larger crime losses and worse functioning courts are associated with higher corruption, significant at the 1 percent level. However, unlike the baseline results, foreign ownership is no longer significantly correlated with corruption. Instead, we find that corruption is lower for the relatively larger firms, significant at the 10 percent level in one specification and 5 percent level in the remaining. The lower corruption for the relatively large firms may seem counter-intuitive as large firms are likely to be more profitable (higher ability to pay bribes) and more visible to corrupt public officials, and therefore, more likely to pay bribes. However, as mentioned in an earlier section, one possibility is that larger firms are better politically connected, have better outside options (if they choose not to pay bribes) and have more resources to guard against corrupt public officials. If these factors are strong enough, it could explain the lower corruption for the relatively large firms. As expected, corruption is significantly lower (at the 5 percent level) in the richer countries (in terms of GDP per capita), in countries with higher education attainment (primary education), and in the more open (in terms of trade) countries. There is also a sharp and significant decline in the level of overall corruption over time, but this becomes insignificant when we control for the various country-level factors (column 6). The implication here is that changes in macro-level factors most likely explain the downward trend. The remaining country and firm-level variables do not show any significant relationship with overall corruption.

⁶ We also experimented with including controls for country size proxied by (log of) total population and the quality of democracy as measured by the Polity2 variable from the Polity database. Adding these controls to the final specification above caused the estimated coefficient value of *Time Tax* to decline slightly from 0.030 (column 6, Table 2) to 0.028 (not shown) and it remained significant at the 5 percent level.

3.3 Poisson estimation results

Our next robustness check involves repeating the regression exercise in Table 1 using the Poisson estimation method. The results are provided in Table A6 in Appendix A. They are consistent with the findings above. That is, for all the specifications considered, there is a large positive relationship between *Time Tax* and overall corruption, significant at the 5 percent level. As for the baseline results, presence of foreign ownership, higher crime and worse functioning courts are associated with higher level of overall corruption, significant at the 5 percent level. The only change we find is that higher manager experience is associated with lower overall corruption, but this relationship is significant only in the final specification (column 5) and at the 10 percent level. Thus, it should be treated with due caution.

3.4 Incidence of Overall Corruption

Logit estimation results for the incidence of overall corruption as the dependent variable are provided in Table A7 in Appendix A. These results again confirm the main findings above. That is, they reveal a large positive relationship between the incidence of overall corruption and *Time Tax*. The relationship is significant at the 5 percent level in all the specifications. As above, higher crime and worse functioning courts are associated with higher incidence of corruption, significant at the 5 and 1 percent level, respectively. However, there is no significant correlation between foreign ownership and the incidence of overall corruption. Instead, we find that the incidence of corruption is higher for firms that export more (significant at the 5 percent level) and lower for firms with more experienced managers (significant at the 10 percent level). These results are consistent with the broader literature that the more visible and profitable firms may be targeted by

public officials for bribes; similarly, more experienced managers are likely to be more skillful in dealing with public officials and therefore less likely to have to pay bribes.

4. Petty Corruption

4.1 Baseline regression results

The baseline regression results for the incidence and depth of petty corruption based on equation (1) above are provided in Table 3. For brevity, only some of the specifications are shown. Results for the full set of specifications are provided in Tables A8 and A9 in Appendix A.

As for the overall corruption, both the petty corruption measures reveal a large positive relationship with regulation. The relationship is significant at the 5 percent level in all the specifications. In terms of the magnitude, consider, for example, the final specification for the depth of petty corruption that includes all the controls. For this specification, the depth of petty corruption rises by about 0.15 percentage point for each percentage point increase in *Time Tax* (columns 6, Table 3).

Regarding the various controls, there are some differences and some similarities with what we found for overall corruption. As with overall corruption, worse functioning courts and higher losses due to crime are significantly associated (at the 5 percent level) with higher petty corruption (incidence and depth). However, we find no evidence of any significant relationship between foreign ownership or exports and petty corruption. Instead, purchase of fixed assets is associated with higher petty corruption (incidence and depth), significant at the 5 percent level or less. The incidence of petty corruption is higher for firms that have overdraft facility vs. those that do not, significant at the 5 percent level. However, we find no such evidence for the depth of petty corruption. Last, firm-size is inversely correlated with the depth of petty corruption. However, this

relationship is significant only in the final specification and that too at the 10 percent level. For the incidence of petty corruption, we find no significant correlation with firm-size. Thus, the results for firm-size here should be treated with due caution.

4.2 Repeated cross-section

Repeated cross-section estimation results for petty corruption are provided in Table 4. Columns 1-3 contain the results for the incidence of petty corruption and columns 4-6 contain results for the depth of petty corruption. For brevity, only results for some of the specifications are shown. Tables A10 and A11 in Appendix A contain the results for the full set of specifications.

The repeated cross-section results are consistent with the main findings above. That is, the incidence and depth of petty corruption are positively correlated with regulation, and this relationship is significant at the 1 percent level in most of the specifications and at the 5 percent level in the remaining. Quantitatively, the corruption-regulation relationship in the repeated cross-section estimation is almost the same as in the baseline estimation for the incidence of petty corruption. It is somewhat stronger in the repeated cross-section estimation for the depth of petty corruption. However, this difference disappears when we include the various controls in the specification. For instance, for the final specification with all the controls included, the depth of petty corruption rises by 0.146 percentage point (column 6, Table 4) in the repeated cross-section results for each percentage point increase in *Time Tax*. The corresponding increase in the baseline estimation is slightly higher, equaling 0.149 percentage point (column 6, Table 3).⁷

⁷ We also experimented with including controls for country size proxied by (log of) total population and the quality of democracy as measured by the Polity2 variable from the Polity database. Adding these controls to the final specification above for the incidence and depth of petty corruption only caused the estimated coefficient value of *Time Tax* to increase in magnitude and it remained significant at the 5 percent level.

There are some changes from the baseline results for the various controls. Worse functioning courts continues to be significantly positively correlated (at the 1 percent level) with higher corruption, but crime losses and corruption are no longer significantly correlated. Firm-size was found to be inversely correlated with the depth of petty corruption in some of the baseline specifications, but only significant at the 10 percent level. This result continues to hold in the repeated cross-section estimation. The purchase of fixed assets was significantly correlated with higher incidence and depth of petty corruption in the cross-section results. There is no such significant relationship in the repeated cross-section results. Instead, in the repeated cross-section results, we find that both the petty corruption measures are significantly inversely correlated (at the 5 percent level or less) with the age of the firm. The baseline results show no such correlation. Last, in the baseline results, the incidence of petty corruption was found to be significantly higher for firms with overdraft facility. This is no longer the case in the repeated cross-section results. Instead, having a line of credit is positively correlated (significant at the 1 percent level) with the incidence and depth of petty corruption in the repeated cross-section results, although no such result was found in the baseline estimation.

4.3 Poisson estimation results

Like overall corruption, there is a large proportion of firms that report zero depth of petty corruption. Thus, for robustness, we estimated the relationship between the depth of petty corruption and regulation using the Poisson estimation method. The results are provided in Table A12 in Appendix A. The results confirm a large positive relationship between the depth of petty corruption and regulation, significant at the 5 percent or 1 percent level. There is no difference in the statistical significance of the controls from the baseline results.

5. Conclusion

Theories of corruption and regulation suggest that regulation often leads to corruption. This suggests a simple and practical solution, deregulation, to the vexing problem of corruption faced by the private sector. Empirical evidence on the issue, however, is rather limited. The present paper attempts to fill these gaps in the literature by using firm-level survey data and the actual experience of firms with corruption and regulation. Our results indicate a significantly higher level of overall corruption associated with higher regulatory burden. A similar result holds for petty corruption involving six specific transactions between the private firms and the public officials.

Several issues remain to be explored. We highlight a few here to illustrate the point. First, petty corruption that arises in specific transactions is likely to be better correlated with regulations that are specific to the transactions rather than the overall regulatory burden on the firms. A rigorous analysis of the issue is needed. Second, the measure of regulatory burden we used is a composite measure of the rules on the books and their implementation. However, the effect of rules on the books and their implementation on corruption may be different. This implies the optimal policy to combat corruption will also depend on the role of rules on the books vs. their implementation. Future work in the area can help shed light on the issue. Third, we explored only the overall relationship between corruption and the regulatory burden. It is conceivable that the strength of the relationship may vary depending on the sorts of firms or countries. Future work in the area can help confirm or reject any possible heterogeneity in the corruption-regulation nexus. Fourth, the empirical analysis assumed a linear relationship between corruption and regulation. It is possible that the relationship may be non-linear. Increases in corruption associated with heavier

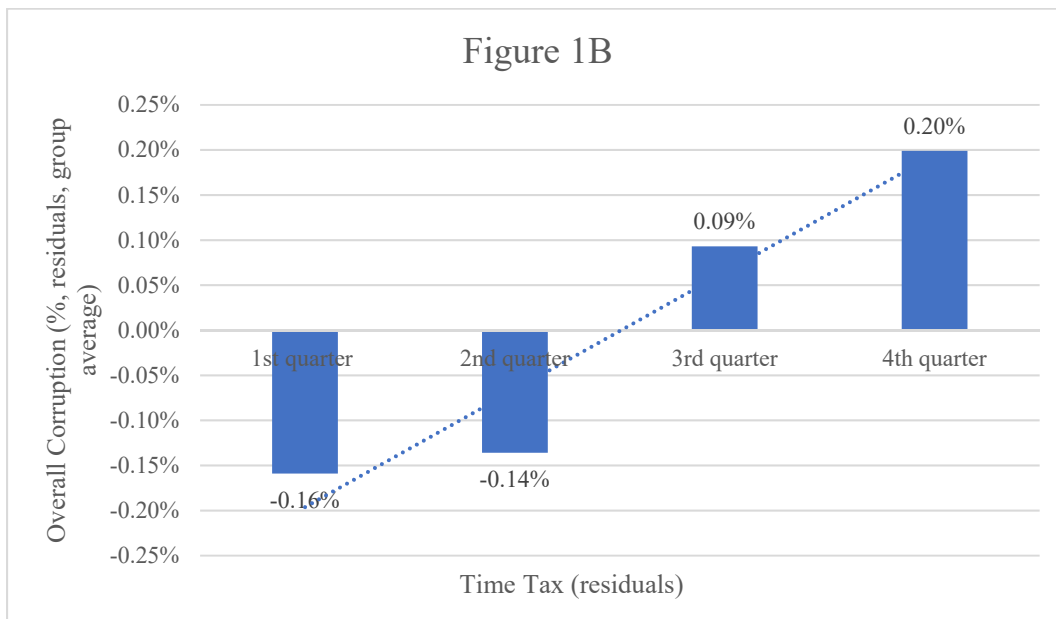
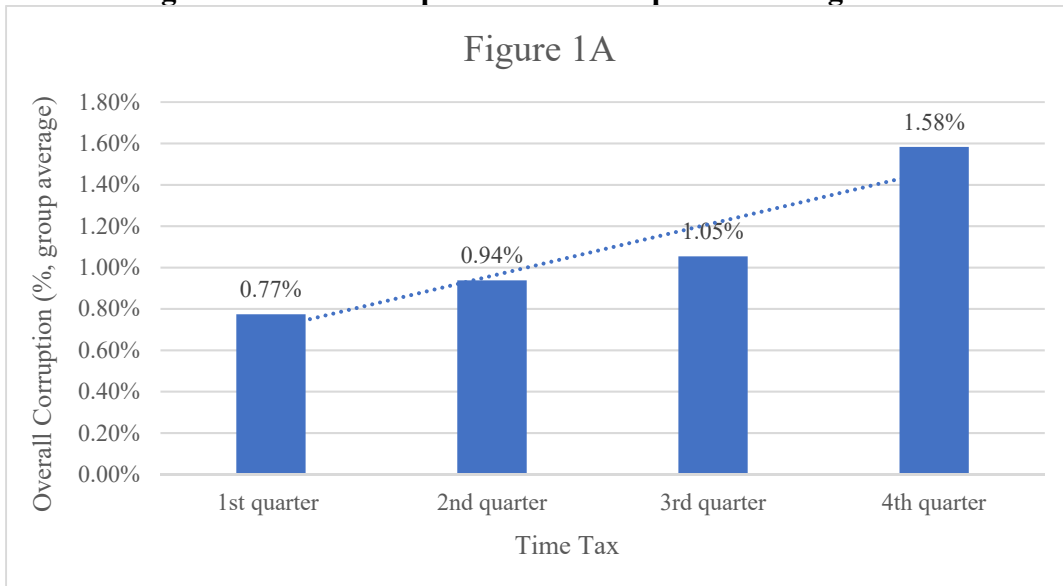
regulation of businesses may be stronger when regulation is relatively low or moderate than when regulation is already high. Such, non-linearities provide an exciting avenue for future research.

References

- Acemoglu, D., & Verdier, T. A. (2000). The Choice Between Market Failures and Corruption. *American Economic Review*, 90: 194 – 211.
- Ades, A., & Di Tella, R. (1997). National Champions and Corruption: Some Unpleasant Interventionist Arithmetic. *Economic Journal*, 107: 1023 – 1042.
- Alesina, A., & Weder, B. (1999). Do Corrupt Governments Receive Less Foreign Aid? National Bureau of Economic Research Working Paper No. 7108.
- Aterido, R., Hallward-Driemeier, M., & Pagés, C. (2011). Big Constraints to Small Firms' Growth? Business Environment and Employment Growth across Firms. *Economic Development and Cultural Change*, 59 (3): 609 – 647.
- Becker, G. S. (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy* 76 (2): 169 – 217.
- Becker, G. S., & Stigler, G. J. (1974). Law Enforcement, Malfeasance and Compensation of De Soto, H. (1989). *The Other Path*. New York: Harper and Row.
- Dimant, E., & Tosato, G. (2018). Causes and Effects of Corruption: What Has Past Decade's Empirical Research Taught Us? A Survey. *Journal of Economic Surveys*, 32 (2): 335 – 356.
- Djankov, S., La Porta, R., Lopez-De-Silanes, F. & Shleifer, A. (2002). The Regulation of Entry. *Quarterly Journal of Economics*, 117: 1 – 37.
- Duvanova, D. (2014). Economic Regulations, Red Tape, and Bureaucratic Corruption in Post-Communist Economies. *World Development*, 59: 298 – 312.
- Fan, C.S., Lin, C. and Treisman, D. (2009). Political Decentralization and Corruption: Evidence from Around the World. *Journal of Public Economics* 93: 14–34.
- Fisman, R., & Svensson, J. (2007). Are Corruption and Taxation Really Harmful to Growth? Firm Level Evidence. *Journal of Development Economics*, 83 (1): 63 – 75.
- Fisman, R. & Golden, M. (2017). *Corruption: What Everyone Needs to Know*. University of Oxford: Oxford University Press.
- Holcombe, R., & Boudreaux, C. (2015). Regulation and Corruption. *Public Choice*, 164 (1): 75 – 85.
- Kaufmann, D., & Wei, S. (2000). Does 'Grease Money' Speed Up the Wheels of Commerce? IMF Working Papers No. 00/64.
- Keefer, P., & Knack, S. (1995). Institutions and Economic Performance: Cross Country Tests Using Alternative Institutional Measures. *Economics and Politics*, 7: 207 – 227.
- Klitgaard, R. E. (1988). *Controlling Corruption*. Berkeley: University of California Press.
- Mauro, P. (1995). Corruption and Growth. *Quarterly Journal of Economics*, 110: 681 – 712.
- Mauro, P. (1997). The Effects of Corruption on Growth, Investment and Government Expenditure: A Cross-Country Analysis. In Elliot, K. A., (Ed.) *Corruption and the Global Economy*, pp. 83 – 108. Peterson Institute for International Economics.
- Pigou, A. C. (1938). *The Economics of Welfare*. London: Macmillan and Co.
- Pounov, C. (2016). Corruption's Asymmetric Impacts on Firm Innovation. *Journal of Development Economics*, 118: 216 – 231.
- Rand, J., & Tarp, F. (2012). Firm-Level Corruption in Vietnam. *Economic Development and Cultural Change*, 60 (3): 571 – 595.
- Rose-Ackerman, S. (1978). *Corruption: A Study in Political Economy*. Academic Press, New York.
- Shleifer, A., & Vishny, R. (1993). Corruption. *Quarterly Journal of Economics*, 108: 599 – 617.

- Svensson, J. (2003). Who Must Pay Bribes and How Much? *Quarterly Journal of Economics*, 118 (1): 207 – 230.
- Svensson, J. (2005), Eight Questions About Corruption. *Journal of Economic Perspectives*, 19 (3): 19 – 42.
- UNODC, UNDP and the UNODC-INEGI (2018), “*Manual on Corruption Surveys*,” Center of Excellence in Statistical Information on Government, Crime, Victimization and Justice, Vienna, United Nations. Available online at: https://www.unodc.org/documents/data-and-analysis/Crime-statistics/CorruptionManual_2018_web.pdf
- Wei, S. (2000). How Taxing is Corruption on International Investors? *The Review of Economics and Statistics*, 82: 1 – 11.

Figure 1: Relationship between Corruption and Regulation



Source: Enterprise Surveys, World Bank.

Note: Figure 1B represents a partial scatter plot. It is based on residuals obtained from regressing overall corruption on country and industry fixed effects (Y-axis) and from regressing Time Tax (as defined above) on country and industry fixed effects (X-axis). Only the latest round of ES data (baseline sample) is used.

Table 1: Overall Corruption (OLS)

Dependent variable: <i>Overall Corruption</i>	(1)	(2)	(3)	(4)	(5)
<i>Time Tax</i> (country-industry average)	0.028** (0.012)	0.028** (0.012)	0.029** (0.012)	0.029** (0.012)	0.030** (0.012)
Firm Size (logs)		0.014 (0.059)	-0.044 (0.084)	-0.083 (0.098)	-0.103 (0.098)
Age of Firm (logs)			0.140 (0.224)	0.145 (0.222)	0.114 (0.223)
Manager Experience (logs)			-0.176 (0.164)	-0.177 (0.161)	-0.168 (0.161)
Exports (ratio of sales)			0.029 (0.303)	0.042 (0.308)	-0.056 (0.306)
Foreign Ownership (dummy)			0.613* (0.328)	0.628* (0.328)	0.572** (0.288)
Firm Bought Fixed Assets (dummy)				0.173 (0.193)	0.153 (0.185)
Overdraft (dummy)				0.046 (0.187)	0.080 (0.186)
Line of Credit (dummy)				0.247 (0.253)	0.183 (0.249)
Power Outages (total time)					-0.001 (0.001)
How Much of An Obstacle: Courts					0.159** (0.076)
Crime Losses (proportion of annual sales)					19.589** (8.216)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	0.169 (0.214)	0.132 (0.258)	0.190 (0.390)	0.186 (0.402)	0.205 (0.412)
Number of observations	25,388	25,388	25,388	25,388	25,388
R-squared	0.097	0.097	0.099	0.100	0.124

Note: Standard errors in brackets. All standard errors are Huber-White robust and clustered on the country times industry level. Significance is denoted by *** (1%), ** (5%), * (10%).

Table 2: Repeated cross-section results for Overall Corruption

Dependent variable: <i>Overall Corruption</i>	(1)	(2)	(3)	(4)	(5)	(6)
<i>Time Tax</i> (country-industry avg.)	0.025** (0.011)	0.025** (0.011)	0.025** (0.011)	0.025** (0.011)	0.023** (0.011)	0.030*** (0.010)
Time (dummy)	-0.360*** (0.096)	-0.368*** (0.096)	-0.360*** (0.094)	-0.345*** (0.096)	-0.278*** (0.094)	0.507 (0.335)
Firm Size (logs)		-0.095** (0.042)	-0.084* (0.047)	-0.130*** (0.049)	-0.123** (0.048)	-0.121** (0.050)
Age of Firm (logs)			-0.081 (0.121)	-0.071 (0.121)	-0.109 (0.120)	-0.175 (0.137)
Manager Experience (logs)			0.045 (0.085)	0.037 (0.084)	0.025 (0.083)	0.035 (0.097)
Exports (ratio of sales)			-0.002 (0.202)	-0.001 (0.201)	-0.008 (0.200)	-0.111 (0.219)
Foreign Ownership (dummy)			0.018 (0.230)	0.016 (0.230)	0.046 (0.229)	-0.064 (0.217)
Firm Bought Fixed Assets (dummy)				0.151 (0.121)	0.127 (0.122)	0.180 (0.137)
Overdraft (dummy)				0.293 (0.178)	0.266 (0.172)	0.330* (0.196)
Line of Credit (dummy)				0.072 (0.115)	-0.005 (0.115)	0.058 (0.130)
Power Outages (total time)					0.001 (0.001)	0.001 (0.001)
How Much Of An Obstacle: Courts					0.245*** (0.068)	0.259*** (0.079)
Crime Losses (proportion of annual sales)					9.782*** (2.894)	10.458*** (3.302)
GDP per capita (logs)						-3.980** (1.700)
Primary Education						-0.011** (0.005)
Trade Openness						-0.020** (0.010)
GDP per capita Growth Rate (annual, %)						-0.009 (0.015)
Inflation (annual, %)						0.019 (0.026)
Government Size (Higher values imply smaller government size)						0.132 (0.128)
Govt. Effectiveness (WGI)						0.247 (0.586)
Country-Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.167***	1.470***	1.519***	1.424***	1.243***	37.069**

	(0.123)	(0.172)	(0.359)	(0.371)	(0.368)	(14.677)
Number of observations	22,928	22,928	22,928	22,928	22,928	20,412
R-squared	0.186	0.187	0.187	0.188	0.196	0.193

Standard errors in brackets. All standard errors are Huber-White robust and clustered at the country-year times industry level. Significance is denoted by *** (1%), ** (5%), * (10%). Sample size varies due to missing data.

Table 3: Petty Corruption (Incidence and Depth)

	Dependent variable: <i>Petty Corruption Incidence</i> (logit results)			Dependent variable: <i>Petty Corruption Depth</i> (OLS results)		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Time Tax</i> (country-industry average)	0.017**	0.016**	0.018**	0.138**	0.140**	0.149**
	(0.008)	(0.008)	(0.008)	(0.069)	(0.069)	(0.069)
Firm Size (logs)		0.034	-0.017		-0.240	-0.695*
		(0.036)	(0.042)		(0.355)	(0.397)
Age of Firm (logs)			-0.012			-0.640
			(0.104)			(0.979)
Manager Experience (logs)			-0.105			-0.758
			(0.094)			(1.026)
Exports (ratio of sales)			-0.104			2.221
			(0.178)			(1.650)
Foreign Ownership (dummy)			0.014			-0.027
			(0.175)			(1.669)
Firm Bought Fixed Assets (dummy)			0.356***			2.645**
			(0.115)			(1.176)
Overdraft (dummy)			0.268**			1.467
			(0.135)			(1.270)
Line of Credit (dummy)			0.120			0.783
			(0.116)			(1.097)
Power Outages (total time)			-0.000			-0.000
			(0.001)			(0.010)
How Much Of An Obstacle: Courts			0.175***			1.605***
			(0.047)			(0.490)
Crime Losses (proportion of annual sales)			2.276***			29.574**
			(0.865)			(12.773)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.338	-0.391	-0.602	0.794	1.465	4.181
	(0.454)	(0.461)	(0.521)	(2.026)	(2.331)	(3.486)
Number of observations	20,142	20,142	20,142	20,142	20,142	20,142
R-squared				0.187	0.187	0.195

Standard errors in brackets. All standard errors are Huber-White robust and clustered on the country times industry level. Significance is denoted by *** (1%), ** (5%), * (10%)

Table 4: Repeated cross-section results for Petty Corruption (Incidence and Depth)

	Dependent variable: <i>Petty Corruption Incidence</i> (log odds ratios from logit estimation)			Dependent variable: <i>Petty Corruption Depth</i> (OLS results)		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Time Tax</i> (country-industry average)	0.017*** (0.006)	0.016*** (0.006)	0.014** (0.007)	0.183*** (0.068)	0.155** (0.065)	0.146** (0.071)
Time (dummy)	-0.258** (0.101)	-0.136 (0.102)	0.237 (0.178)	-2.009** (0.998)	-1.094 (0.995)	3.594 (2.474)
Firm Size (logs)		-0.025 (0.046)	-0.029 (0.045)		-0.681* (0.401)	-0.614 (0.399)
Age of Firm (logs)		-0.199*** (0.073)	-0.220*** (0.084)		-1.839*** (0.661)	-2.170*** (0.748)
Manager Experience (logs)		0.079 (0.069)	0.048 (0.076)		0.290 (0.672)	0.044 (0.724)
Exports (ratio of sales)		-0.020 (0.230)	-0.251 (0.253)		1.122 (2.049)	-0.205 (2.324)
Foreign Ownership (dummy)		0.006 (0.150)	0.066 (0.168)		-0.165 (1.559)	-0.046 (1.701)
Firm Bought Fixed Assets (dummy)		0.146 (0.114)	0.217* (0.127)		0.263 (1.165)	1.148 (1.321)
Overdraft (dummy)		0.024 (0.138)	0.019 (0.137)		0.219 (1.359)	-0.206 (1.360)
Line of Credit (dummy)		0.343*** (0.106)	0.360*** (0.113)		2.920*** (0.986)	2.919*** (1.012)
Power Outages (total time)		-0.000 (0.001)	-0.000 (0.001)		-0.008 (0.009)	-0.007 (0.011)
How Much Of An Obstacle: Courts		0.309*** (0.037)	0.290*** (0.041)		3.110*** (0.429)	2.726*** (0.448)
Crime Losses (proportion of annual sales)		1.560 (1.089)	1.903 (1.175)		17.008 (15.153)	22.189 (17.003)
GDP per capita (logs)			-2.000** (0.840)			-25.490* (13.107)
Primary Education			-0.002 (0.004)			-0.033 (0.048)
Trade Openness			-0.001 (0.007)			-0.025 (0.075)
GDP per capita Growth Rate (annual, %)			0.001 (0.016)			0.054 (0.119)
Inflation (annual, %)			-0.017			-0.219

			(0.020)			(0.224)
Government Size			0.070			1.375
(Higher values imply smaller government size)			(0.106)			(0.982)
Govt. Effectiveness (WGI)			0.507			5.837
			(0.433)			(4.429)
Country-Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.847***	-0.858***	14.227**	13.428***	14.743***	233.667**
	(0.145)	(0.330)	(6.238)	(1.007)	(2.721)	(112.142)
Number of observations	20,477	20,477	18,189	20,477	20,477	18,189
R-squared				0.223	0.238	0.255

Standard errors in brackets. All standard errors are Huber-White robust and clustered on the country-year times industry level. Significance is denoted by *** (1%), ** (5%), * (10%). Sample size varies due to missing data.

Appendix A

Table A1: Correlation between overall and petty corruption

Panel A: Spearman's rank correlation

		<i>Overall Corruption</i>	<i>Incidence of Overall Corruption</i>
Country-level averages	<i>Petty Corruption Incidence</i>	0.62***	0.72***
	<i>Petty Corruption Depth</i>	0.60***	0.73***
Country-Industry level averages	<i>Petty Corruption Incidence</i>	0.50***	0.52***
	<i>Petty Corruption Depth</i>	0.50***	0.53***

Panel B: Pearson's correlation

		<i>Overall Corruption</i>	<i>Incidence of Overall Corruption</i>
Country-level averages	<i>Petty Corruption Incidence</i>	0.56***	0.72***
	<i>Petty Corruption Depth</i>	0.55***	0.68***
Country-Industry level averages	<i>Petty Corruption Incidence</i>	0.24***	0.53***
	<i>Petty Corruption Depth</i>	0.22***	0.53***

Note: Significance level is denoted by *** (1%). The correlations are obtained by first collapsing the data at the country and country-industry level and then computing the simple correlation coefficients.

Table A2: Correlations with external (macro-level) corruption indicators**Panel A: Spearman's rank correlation**

	Overall Corruption	Incidence of Overall Corruption (dummy)	Petty Corruption Incidence	Petty Corruption Depth
Control of Corruption (Worldwide Governance Indicators; N=131)	0.506***	0.567***	0.646***	0.620***
Corruption Perception Index (Transparency International; N=120))	0.411***	0.494***	0.601***	0.568***
Corruption (ICRG; N=88)	0.236***	0.179***	0.357***	0.365***

Panel B: Pearson's correlation

	Overall Corruption	Incidence of Overall Corruption (dummy)	Petty Corruption Incidence	Petty Corruption Depth
Control of Corruption (Worldwide Governance Indicators; N=131)	0.374***	0.414***	0.535***	0.509***
Corruption Perception Index (Transparency International; N=120))	0.301***	0.365***	0.538***	0.494***
Corruption (ICRG; N=88)	0.196*	0.121	0.299**	0.268**

N denotes the countries in the sample. Number of countries varies due to missing data on the corruption indicator. All indicators shown vary at the country level. All the corruption indicators have been re-scaled so that higher values of the indicators imply higher corruption. Significance level is denoted by ***(1%), **(5%) and *(10%).

Table A3: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
<i>Firm-level variables from ES</i>					
Overall Corruption (% of annual sales)	25,388	1.09	4.94	0	100
Petty Corruption Incidence	20,142	0.17	0.38	0	1
Petty Corruption Depth	20,142	13.47	31.70	0	100
Time Tax	25,388	9.77	9.32	0	90
Firm Size (logs)	25,388	3.05	1.20	0	10.3
Age of Firm (logs)	25,388	2.62	0.81	0	5.4
Manager Experience (logs)	25,388	2.67	0.76	0	4.1
Exports (ratio of sales)	25,388	0.09	0.23	0	1
Foreign Ownership (dummy)	25,388	0.12	0.32	0	1
Firm Bought Fixed Assets (dummy)	25,388	0.46	0.50	0	1
Overdraft (dummy)	25,388	0.43	0.50	0	1
Line of Credit (dummy)	25,388	0.38	0.49	0	1
Power Outages (total time)	25,388	25.72	84.15	0	720
How Much of An Obstacle: Courts	25,388	0.92	1.20	0	4
Crime Losses (proportion of annual sales)	25,388	0.01	0.04	0	0.8
<i>Macro or country-level variables</i>					
GDP per capita (logs)	20,412	8.66	1.02	6.43	10.26
Primary Education	20,412	100.49	16.96	33.96	145.86
Trade Openness	20,412	78.79	31.40	0.17	156.55
GDP per capita Growth Rate (annual, %)	20,412	2.47	5.38	-14.56	25.11
Inflation (annual, %)	20,412	5.99	4.53	-1.09	24.69
Government Size	20,412	6.79	1.20	3.81	9.46
Govt. Effectiveness (WGI)	20,412	-0.33	0.67	-1.75	1.28

Note: Base specification sample is used for firm-level variables from the ES. For macro or country-level variables, the repeated cross-section sample is used. Number of observations vary due to missing data.

Table A4: Correlation between *Time Tax* and the various controls

Variable	Correlation with <i>Time Tax</i>
Firm Size (logs)	0.034
Age of Firm (logs)	0.015
Manager Experience (logs)	0.071
Exports (ratio of sales)	-0.009
Foreign Ownership (dummy)	0.014
Firm Bought Fixed Assets (dummy)	0.034
Overdraft (dummy)	0.063
Line of Credit (dummy)	0.078
Power Outages (total time)	-0.078
How Much of An Obstacle: Courts	0.036
Crime (proportion of firms' annual sales)	0.008

Note: Base specification sample is used. Sample size: 25,338 firms.

Table A5: Overall Corruption Adjusted

Dependent variable: <i>Overall Corruption</i> (adjusted)	(1)	(2)	(3)	(4)	(5)
<i>Time Tax</i> (country-industry average)	0.028** (0.012)	0.028** (0.012)	0.029** (0.012)	0.029** (0.012)	0.030** (0.012)
Firm Size (logs)		0.014 (0.059)	-0.044 (0.084)	-0.083 (0.098)	-0.103 (0.098)
Age of Firm (logs)			0.140 (0.224)	0.145 (0.222)	0.114 (0.223)
Manager Experience (logs)			-0.176 (0.164)	-0.177 (0.161)	-0.168 (0.161)
Exports (ratio of sales)			0.029 (0.303)	0.042 (0.308)	-0.056 (0.306)
Foreign Ownership (dummy)			0.613* (0.328)	0.628* (0.328)	0.572** (0.288)
Firm Bought Fixed Assets				0.174 (0.193)	0.153 (0.185)
Overdraft (dummy)				0.046 (0.187)	0.080 (0.186)
Line of Credit (dummy)				0.246 (0.253)	0.183 (0.249)
Power Outages (total time)					-0.001 (0.001)
How Much Of An Obstacle: Courts					0.159** (0.076)
Crime Losses (proportion of annual sales)					19.591** (8.216)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	0.169 (0.214)	0.133 (0.258)	0.190 (0.390)	0.187 (0.402)	0.206 (0.412)
Number of observations	25,388	25,388	25,388	25,388	25,388
R-squared	0.097	0.097	0.099	0.100	0.124

Note: Standard errors in brackets. All standard errors are Huber-White robust and clustered on the country times industry level. Significance is denoted by *** (1%), ** (5%), * (10%).

Table A6: Poisson Estimation Results for Overall Corruption

Dependent variable: <i>Overall Corruption</i>	(1)	(2)	(3)	(4)	(5)
<i>Time Tax</i> (country-industry average)	0.017** (0.008)	0.017** (0.008)	0.018** (0.008)	0.018** (0.008)	0.018** (0.009)
Firm Size (logs)		0.008 (0.060)	-0.048 (0.076)	-0.073 (0.082)	-0.092 (0.079)
Age of Firm (logs)			0.137 (0.196)	0.140 (0.182)	0.125 (0.183)
Manager Experience (logs)			-0.190 (0.143)	-0.199 (0.136)	-0.211* (0.122)
Exports (ratio of sales)			0.080 (0.309)	0.098 (0.311)	-0.178 (0.297)
Foreign Ownership (dummy)			0.477** (0.204)	0.495** (0.206)	0.470** (0.193)
Firm Bought Fixed Assets (dummy)				0.154 (0.148)	0.167 (0.151)
Overdraft (dummy)				0.002 (0.181)	0.048 (0.172)
Line of Credit (dummy)				0.292 (0.225)	0.260 (0.224)
Power Outages (total time)					-0.000 (0.001)
How Much Of An Obstacle: Courts					0.123** (0.052)
Crime Losses (proportion of annual sales)					4.581*** (0.894)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Number of observations	25,388	25,388	25,388	25,388	25,388

Note: Standard errors in brackets. All standard errors are Huber-White robust and clustered on the country times industry level. Significance is denoted by *** (1%), ** (5%), * (10%). All regressions include a constant term (not shown).

Table A7: Incidence of Overall Corruption (Logit)

Dependent variable: <i>Overall Corruption Incidence</i>	(1)	(2)	(3)	(4)	(5)
<i>Time Tax</i> (country-industry average)	0.019** (0.009)	0.019** (0.009)	0.020** (0.009)	0.020** (0.009)	0.019** (0.009)
Firm Size (logs)		0.022 (0.039)	-0.018 (0.047)	-0.047 (0.052)	-0.061 (0.051)
Age of Firm (logs)			0.089 (0.091)	0.094 (0.090)	0.079 (0.091)
Manager Experience (logs)			-0.126* (0.075)	-0.134* (0.075)	-0.143* (0.075)
Exports (ratio of sales)			0.538** (0.211)	0.543** (0.212)	0.507** (0.208)
Foreign Ownership (dummy)			-0.005 (0.253)	0.015 (0.256)	-0.014 (0.237)
Firm Bought Fixed Assets (dummy)				0.103 (0.118)	0.090 (0.117)
Overdraft (dummy)				0.060 (0.135)	0.076 (0.134)
Line of Credit (dummy)				0.275** (0.131)	0.248* (0.129)
Power Outages (total time)					0.001 (0.001)
How Much Of An Obstacle: Courts					0.196*** (0.043)
Crime Losses (proportion of annual sales)					4.220** (1.652)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	-0.539 (0.831)	-0.593 (0.833)	-0.553 (0.866)	-0.480 (0.869)	-0.636 (0.856)
Number of observations	25,388	25,388	25,388	25,388	25,388

Note: Standard errors in brackets. All standard errors are Huber-White robust and clustered on the country times industry level. Significance is denoted by *** (1%), ** (5%), * (10%). Coefficients shown are log odds ratios obtained from logit estimation.

Table A8: Petty Corruption Incidence (logit estimation, log odds ratios)

Dependent variable: <i>Petty Corruption Incidence</i>	(1)	(2)	(3)	(4)	(5)
<i>Time Tax</i> (country-industry)	0.017** (0.008)	0.016** (0.008)	0.016** (0.008)	0.018** (0.008)	0.018** (0.008)
Firm Size (logs)		0.034 (0.036)	0.045 (0.042)	-0.015 (0.043)	-0.017 (0.042)
Age of Firm (logs)			-0.016 (0.106)	-0.004 (0.104)	-0.012 (0.104)
Manager Experience (logs)			-0.079 (0.093)	-0.091 (0.093)	-0.105 (0.094)
Exports (ratio of sales)			-0.068 (0.175)	-0.061 (0.179)	-0.104 (0.178)
Foreign Ownership (dummy)			0.012 (0.175)	0.039 (0.174)	0.014 (0.175)
Firm Bought Fixed Assets (dummy)				0.366*** (0.113)	0.356*** (0.115)
Overdraft (dummy)				0.270** (0.134)	0.268** (0.135)
Line of Credit (dummy)				0.145 (0.116)	0.120 (0.116)
Power Outages (total time)					-0.000 (0.001)
How Much Of An Obstacle: Courts					0.175*** (0.047)
Crime Losses (proportion of annual sales)					2.276*** (0.865)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	-0.338 (0.454)	-0.391 (0.461)	-0.263 (0.489)	-0.382 (0.518)	-0.602 (0.521)
Number of observations	20,142	20,142	20,142	20,142	20,142

Standard errors in brackets. All standard errors are Huber-White robust and clustered on the country times industry level. Significance is denoted by *** (1%), ** (5%), * (10%). Coefficient values shown are log odds ratios from logit estimation.

Table A9: Petty Corruption Depth (OLS)

Dependent variable: <i>Petty Corruption Depth</i>	(1)	(2)	(3)	(4)	(5)
<i>Time Tax</i> (country-industry average)	0.138** (0.069)	0.140** (0.069)	0.141** (0.069)	0.149** (0.069)	0.149** (0.069)
Firm Size (logs)		-0.240 (0.355)	-0.221 (0.378)	-0.646 (0.403)	-0.695* (0.397)
Age of Firm (logs)			-0.582 (0.992)	-0.547 (0.987)	-0.640 (0.979)
Manager Experience (logs)			-0.670 (1.025)	-0.691 (1.024)	-0.758 (1.026)
Exports (ratio of sales)			2.131 (1.691)	2.275 (1.684)	2.221 (1.650)
Foreign Ownership (dummy)			-0.136 (1.719)	0.051 (1.735)	-0.027 (1.669)
Firm Bought Fixed Assets (dummy)				2.712** (1.180)	2.645** (1.176)
Overdraft (dummy)				1.488 (1.268)	1.467 (1.270)
Line of Credit (dummy)				1.072 (1.093)	0.783 (1.097)
Power Outages (total time)					-0.000 (0.010)
How Much Of An Obstacle: Courts					1.605*** (0.490)
Crime Losses (proportion of annual sales)					29.574** (12.773)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	0.794 (2.026)	1.465 (2.331)	4.880 (3.420)	4.435 (3.462)	4.181 (3.486)
Number of observations	20,142	20,142	20,142	20,142	20,142
R-squared	0.187	0.187	0.188	0.191	0.195

Standard errors in brackets. All standard errors are Huber-White robust and clustered on the country times industry level. Significance is denoted by *** (1%), ** (5%), * (10%).

Table A10: Repeated cross-section results for Petty Corruption Incidence (logit, log odds ratios)

Dependent variable: <i>Petty Corruption Incidence</i>	(1)	(2)	(3)	(4)	(5)	(6)
<i>Time Tax</i> (country-industry average)	0.017*** (0.006)	0.017*** (0.006)	0.017*** (0.006)	0.018*** (0.006)	0.016*** (0.006)	0.014** (0.007)
Time (dummy)	-0.258** (0.101)	-0.259** (0.101)	-0.251** (0.101)	-0.235** (0.100)	-0.136 (0.102)	0.237 (0.178)
Firm Size (logs)		0.007 (0.035)	0.026 (0.043)	-0.031 (0.047)	-0.025 (0.046)	-0.029 (0.045)
Age of Firm (logs)			-0.165** (0.075)	-0.156** (0.076)	-0.199*** (0.073)	-0.220*** (0.084)
Manager Experience (logs)			0.118* (0.068)	0.111* (0.067)	0.079 (0.069)	0.048 (0.076)
Exports (ratio of sales)			0.116 (0.224)	0.079 (0.226)	-0.020 (0.230)	-0.251 (0.253)
Foreign Ownership (dummy)			-0.017 (0.148)	0.027 (0.150)	0.006 (0.150)	0.066 (0.168)
Firm Bought Fixed Assets (dummy)				0.159 (0.112)	0.146 (0.114)	0.217* (0.127)
Overdraft (dummy)				0.059 (0.136)	0.024 (0.138)	0.019 (0.137)
Line of Credit (dummy)				0.403*** (0.107)	0.343*** (0.106)	0.360*** (0.113)
Power Outages (total time)					-0.000 (0.001)	-0.000 (0.001)
How Much Of An Obstacle: Courts					0.309*** (0.037)	0.290*** (0.041)
Crime Losses (proportion of annual sales)					1.560 (1.089)	1.903 (1.175)
GDP per capita (logs)						-2.000** (0.840)
Primary Education						-0.002 (0.004)
Trade Openness						-0.001 (0.007)
GDP per capita Growth Rate (annual, %)						0.001 (0.016)
Inflation (annual, %)						-0.017 (0.020)
Government Size						0.070

Govt. Effectiveness (WGI)						(0.106)
						0.507
						(0.433)
Country-Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.847***	-0.868***	-0.810***	-0.772**	-0.858***	14.227**
	(0.145)	(0.177)	(0.313)	(0.322)	(0.330)	(6.238)
Number of observations	20,477	20,477	20,477	20,477	20,477	18,189

Standard errors in brackets. All standard errors are Huber-White robust and clustered at the country-year times industry level. Significance is denoted by *** (1%), ** (5%), * (10%). Sample size varies due to missing data.

Table A11: Repeated cross-section results for Petty Corruption Depth

Dependent variable: <i>Petty Corruption Depth</i>	(1)	(2)	(3)	(4)	(5)	(6)
<i>Time Tax</i> (country- industry average)	0.183*** (0.068)	0.184*** (0.068)	0.181*** (0.068)	0.184*** (0.069)	0.155** (0.065)	0.146** (0.071)
Time (dummy)	-2.009** (0.998)	-2.055** (1.006)	-1.855* (1.008)	-1.726* (0.997)	-1.094 (0.995)	3.594 (2.474)
Firm Size (logs)		-0.554 (0.351)	-0.341 (0.373)	-0.729* (0.413)	-0.681* (0.401)	-0.614 (0.399)
Age of Firm (logs)			-1.528** (0.661)	-1.522** (0.676)	-1.839*** (0.661)	-2.170*** (0.748)
Manager Experience (logs)			0.495 (0.674)	0.491 (0.668)	0.290 (0.672)	0.044 (0.724)
Exports (ratio of sales)			1.311 (2.030)	1.222 (2.041)	1.122 (2.049)	-0.205 (2.324)
Foreign Ownership (dummy)			-0.484 (1.569)	-0.144 (1.560)	-0.165 (1.559)	-0.046 (1.701)
Firm Bought Fixed Assets (dummy)				0.474 (1.162)	0.263 (1.165)	1.148 (1.321)
Overdraft (dummy)				0.584 (1.382)	0.219 (1.359)	-0.206 (1.360)
Line of Credit (dummy)				3.431*** (0.995)	2.920*** (0.986)	2.919*** (1.012)
Power Outages (total time)					-0.008 (0.009)	-0.007 (0.011)
How Much Of An Obstacle: Courts					3.110*** (0.429)	2.726*** (0.448)
Crime Losses (proportion of annual sales)					17.008 (15.153)	22.189 (17.003)
GDP per capita (logs)						-25.490* (13.107)
Primary Education						-0.033 (0.048)
Trade Openness						-0.025 (0.075)
GDP per capita Growth Rate (annual, %)						0.054 (0.119)

Inflation (annual, %)						-0.219 (0.224)
Government Size						1.375 (0.982)
Govt. Effectiveness (WGI)						5.837 (4.429)
Country-Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	13.428*** (1.007)	15.245*** (1.577)	17.015*** (2.558)	16.144*** (2.643)	14.743*** (2.721)	233.667** (112.142)
Number of observations	20,477	20,477	20,477	20,477	20,477	18,189
R-squared	0.223	0.223	0.224	0.226	0.238	0.255

Standard errors in brackets. All standard errors are Huber-White robust and clustered on the country-year times industry level. Significance is denoted by *** (1%), ** (5%), * (10%). Sample size varies due to missing data.

Table A12: Petty Corruption Depth (Poisson results)

Dependent variable: <i>Petty Corruption Depth</i>	(1)	(2)	(3)	(4)	(5)
<i>Time Tax</i> (country-industry average)	0.012**	0.013**	0.012**	0.014***	0.014***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Firm Size (logs)		-0.024	-0.025	-0.058*	-0.059**
		(0.027)	(0.028)	(0.030)	(0.029)
Age of Firm (logs)			-0.041	-0.031	-0.035
			(0.075)	(0.073)	(0.072)
Manager Experience (logs)			-0.049	-0.057	-0.068
			(0.078)	(0.076)	(0.076)
Exports (ratio of sales)			0.151	0.151	0.125
			(0.114)	(0.116)	(0.114)
Foreign Ownership (dummy)			-0.003	0.011	-0.020
			(0.124)	(0.124)	(0.116)
Firm Bought Fixed Assets (dummy)				0.219**	0.207**
				(0.087)	(0.087)
Overdraft (dummy)				0.121	0.117
				(0.099)	(0.098)
Line of Credit (dummy)				0.096	0.077
				(0.081)	(0.080)
Power Outages (total time)					-0.000
					(0.000)
How Much Of An Obstacle: Courts					0.110***
					(0.034)
Crime Losses (proportion of annual sales)					1.278***
					(0.382)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Number of observations	20,142	20,142	20,142	20,142	20,142

Standard errors in brackets. All standard errors are Huber-White robust and clustered on the country times industry level. Significance is denoted by *** (1%), ** (5%), * (10%). All regressions include a constant term (not shown).