# Are Innovating Firms Victims or Perpetrators?

## Tax Evasion versus Bribe Payments and the role of External Finance

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**Abstract:** We investigate the firm-level determinants of corruption and tax evasion across over 25,000 firms in 57 countries. We find that corruption acts as a tax on innovation. Innovating firms pay a larger percentage of their revenues in bribes to government officials than non-innovating firms. Firms that pay more bribes also evade more taxes. We find that firms' trust in the government and their use of formal bank finance are important factors explaining the link between bribes and tax evasion. Comparing the magnitudes of bribes and taxes evaded, innovating firms and firms that use formal financing institutions are more likely to be net victims. Our findings have implications for the role of social trust and external monitoring mechanisms in curbing corruption and tax evasion.

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## Introduction

The adverse effects of corruption on growth and development across countries are the subject of much attention in economics and finance [1] and among policy makers.[2] It is also widely recognized that innovation and entrepreneurship are the engines of economic growth and that understanding the determinants of innovation is a crucial first step in understanding the differences in technological progress and income levels across countries.[3] However, there has been very little research exploring the link between these two key ingredients of growth. While we have good evidence that corruption reduces growth at the macro level, we know little about whether the effects of corruption are particularly adverse for certain types of firms such as innovators. Similarly, while the existing empirical literature on firm innovation has focused on the characteristics of the entrepreneur and the firm, we know little about whether innovators pay more bribes because it enables them to avoid bureaucratic regulation or whether innovators are particularly targeted by corrupt officials.

In this paper we study the participation of innovative firms in bribing of government officials and tax evasion and how these activities is affected by as social capital and financial development in the country. We focus on whether firms are victims, who pay more in bribes than gain by underreporting revenues to tax authorities, or

[1] See Shleifer and Vishny, 1993; Mauro, 1995; Ades and Di Tella, 1997. Svensson (2003, 2005) provides detailed reviews on this subject.

[2] Over the period 1990 – 2006, the World Bank Group approved more than $20 billion in public sector reform programs, a key component of which were anti-corruption and governance programs. In 2007, the World Bank launched the Governance and Anticorruption (GAC) Implementation plan to heighten its focus on combating corruption as an integral part of its mandate to reduce poverty and promote growth.

[3] See, for example, Schumpeter (1934,1942), Baumol (2002) and Aghion and Durlauf (2005) on the importance of innovation for growth and development. Hall and Jones (1999) show that differences in income levels across countries can be explained by differences in their technological progress.

perpetrators, who gain more by avoiding taxes than they lose in paying bribes.[4] Specifically, we examine the following questions:

- Is corruption a tax on innovation? Are there particular innovative activities such as introducing new products and introducing new technology, associated with greater bribe payments to government officials? Do innovative firms that bribe receive special advantages in dealing with bureaucracy and regulation?
- Which firm characteristics, e.g. size, age, industry, and legal status are associated with corrupt bribe payments and underreporting of revenues to tax authorities? Do these characteristics explain the whether a firm is on balance a victim or perpetrator across countries? Are innovators victims, or are they more likely to be perpetrators?
- Is there a link between bribe payments to public officials and tax evasion? Does corruption lead to a lack of trust in the political system leading to tax evasion? Do innovative firms that pay more bribes also evade more taxes?
- What is the role of the financial system in limiting the extent of underreporting of income? How do banks compare with informal financing channels in curbing illegal behavior?

To answer these questions, we use a rich multi-country data set, the World Bank Investment Climate Surveys, with information from over 25,000 firms in 57 countries on their innovation projects, bribe payments, tax evasion, their perception of the government,

[4] Thus, we focus on corruption that is costly to the firm rather than being a benefit to the firm and a cost to society. While both kinds of corruption exist, the literature has generally reached a consensus that corruption is a cost to entrepreneurs rather than "grease". Several papers using surveys report corruption as being an important obstacle to doing business (Beck et al., 2005; Fisman and Svensson, 2007; Johnson et al., 2002; Hellman et al., 2003). On a cross-country level, other studies show that corruption hinders growth and investment (Mauro,1995; De Soto,1989; Frye and Shleifer, 1997; Berkowitz and Li, 2000; Safavian, 2001;Svensson, 2003and Ahlin and Pang ,2008)

and their sources of financing. Our data is unique in two aspects. First, the data allows us to examine firm behavior in small and medium enterprises in developing countries which haven't been the focus of earlier studies though such firms account for the overwhelmingly majority of firms in developing countries. Second, for the very first time, we have consistently collected data across a large cross-section of countries on both types of firm behaviors – their role as victims proxied by the percentage of revenue that they pay as gifts or informal payments to public officials to "get things done" as well as the percentage of income that they hide from tax authorities.[5] Similar data has been used by several papers, including Svensson (2005) and Fisman and Svensson (2007) in a single country context.

We find that after controlling for country and industry fixed effects and a number of firm characteristics, innovating firms on average pay more bribes than firms that do not innovate. Thus, in our sample of countries, corruption acts as a tax on innovation. Second, we find that there is a significant association between bribe payments and tax evasion. In particular, using local average treatment effects (Imbens and Angirst, 1994) we find a causal association between bribes paid and tax evasion for innovating firms.

We also find strong evidence for the role of trust in predicting tax evasion. Firms that trust the government and perceive it to be efficient, predictable in its laws and regulations and protective of property rights are less likely to evade taxes. This relation holds after controlling for the deterrence effect of the country's judicial process through country fixed effects. Using local average treatment effects, we find that firms that have to pay bribes trust the government less and evade more taxes.

[5] The survey and the steps takes to induce reliable and accurate survey responses are provided in the data section of the paper.

We then classify firms into four types: Innocents (firms that do not bribe or evade taxes); Perpetrators (firms that pay no bribes but evade taxes); Victims (firms that pay bribes but do not evade taxes) and Retaliators (firms that pay bribes and evade taxes). Univariate statistics show that there is a wide variation in the distribution of the different firm types across countries and firm characteristics such as size, legal status, industry composition, domestic or foreign and exporting status. Multivariate regressions controlling for country and industry fixed effects reveal that innovating firms are more likely to be Victims or Retaliators rather than Perpetrators.

Finally, we find that the financial sector plays an important role. Firms that use bank finance to finance their new investments and working capital are more likely to be victims, whereas firms that use informal financing and financing from family and friends and other sources are more likely to be perpetrators.

More broadly, our paper advances the existing literature on corruption and its effects on economic growth in several ways. First, most corruption studies treat countries as monoliths without attention to corruption in particular firms or industries. By contrast, we focus on firms and industries, in particular innovative firms. Second, existing research takes the approach that firms in countries where corruption is rife are victims of illegal activity by government officials and thus focus only on bribe payments and firm performance (e.g. Kaufmann and Wei, 1998; Svensson, 2001; Fisman and Svensson, 2007). We take into account that while firms may be victims, they are often also perpetrators. A potentially significant form of their illegality is the underreporting of revenues to tax authorities. We have had little evidence thus far of what firm characteristics are associated with tax evasion, if innovators in particular evade more

taxes, if the two forms of illegality – corruption and tax evasion - are linked, and the extent to which such illegal activities on balance lead to losses or gains to firms that engage in them. Our paper takes a broader approach in viewing firms as both victims and perpetrators and integrating the incidence of corrupt behavior with innovation and financing decisions in the analysis.

A recent economics and finance literature has emphasized the importance of cultural norms and trust for economic exchange (e.g. Guiso, Sapienza, and Zingales, 2004, 2006, 2008; Carlin, Dorabantu, and Viswanathan, 2009). Relatively unexplored in the literature is the role of social capital on firms' participation in illegal activities such as bribes and tax avoidance and whether certain types of firms such as innovators are particularly disadvantaged. However there is an extensive tax moral literature (e.g. Posner, 2000; Scholz and Lubell, 1998; Torgler, 2007; Pommerehne, Hart, and Frey, 1994) that shows that people are more likely pay taxes if they trust the government and are satisfied with government performance. Our paper shows that bribes demanded by public officials are a signal to the firm that the government is dishonest, and this contributes towards loss of trust in the government and thus to tax evasion.

Our paper is unique in its focus on the external governance environment. It is the first paper to examine tax avoidance activities in innovating firms in developing economies. The tax avoidance literature in finance (e.g. Weisbach (2002), Desai and Dharmapala (2006, 2008); Desai, Dyck, and Zingales (2007)) focuses on the importance of corporate governance in reducing managerial diversion in large publicly traded firms in the US. We study smaller firms, many of them family controlled, and we focus on the link between financial intermediaries as external monitors and tax avoidance activities. In

our analysis of tax evasion, we abstract away from corporate governance implications examined in the literature, and which are of more relevance to large firms in developed countries.[6]

The analysis in this paper has significant implications for anti-corruption policy reforms [7]and those geared towards improving tax collection and administration. Our results suggest that financial sector reform is integral to this debate since formal financial intermediation plays a critical role in helping curb tax evasion. The link between bank monitoring and reduced firm illegality is part of the important debate on the role played by banks versus informal institutional networks in stimulating growth. On one hand, there is a large literature (reviewed in Levine (2005)) that shows that a good banking sector is critical for growth and firm innovation (e.g. Ayyagari, Demirguc-kunt, and Maksimovic, 2008; De Mel, McKenzie, and Woodruff, 2009). In addition, Gordon and Li (2005) argue that the financial sector also serves as a moderating influence on curbing tax evasion, although only in rich countries. On the other hand, Allen, Qian and Qian (2005) and Allen and Qian (2008) argue that informal financing channels and alternate governance mechanisms such as those based on reputation and relationships are more important for growth in fast growing economies such as China. However Ayyagari, Demirguc-Kunt, and Maksimovic (2008) show that even in a country like China, which has a weak banking system, financing from the formal financial system is associated with faster firm growth, whereas fund raising from alternative channels is not. This paper adds to this

[6] It is not clear that the principal agent framework in the Desai and Dharmapala papers focusing on agency issues between shareholders and managers is the appropriate framework in developing countries where the nature of the agency problem is very different due to the prevalence of concentrated insider ownership structures.

[7] Corruption has been at the forefront of policy reform. However, as highlighted by a recent World Bank report and profiled in a *Washington Post* editorial ("Corruption Reality Check", May 2008), much of this reform money achieved no results and what little progress that took place was in countries where it was needed the least.

literature by showing that non-bank financing channels are also associated with negative outcomes such as increased tax evasion, thus stressing the need for formal financial sector reform.

The rest of the paper is as follows: Section 2 lays out our hypotheses and links it to the empirical strategy used in the paper. Section 3 describes the data and summary statistics. Section 4 presents the results and section 5 concludes.

## 2. A Framework to Study the link between Innovation, Corruption and Tax Evasion

In many countries the state is underfunded relative to its planned expenditures. The underfunding might occur because the tax base is low due to economic underdevelopment or due to an institutional structure that makes taxation inefficient. As modeled by Ades and Di-Tella (1999), in such environments state employees are likely to be underpaid and insufficiently monitored. Moreover, to the extent that the law enforcement is underfunded or inefficient, corruption by state employees is likely to be hard to detect and punish. State employees thus have an incentive to supplement their income by extorting bribes from businesses Thus, we assume that the bureaucrat prefers not to extort the firm since there is a penalty associated with detection but if he is not paid adequately by the government, then he extorts the firm, charging a bribe from the firm for providing services.

Consistent with Ades and Di-Tella (1999) we view bribes paid by firms as an illegal tax or fee levied by government officials who have the power to hold up a firm by denying services. This interpretation fits the type of corruption which we investigate empirically below. The firms that we analyze in our sample are relatively small and are

unlikely to have market power in the market for corruption. Moreover, as discussed below, much of the bribery is to providers of routine services. We find no evidence that firms that pay bribes outperform firms that do not.

Safavian (2001) and Svensson (2003) find that bureaucrats tailor bribes to firm's ability to pay. Thus, the characteristics of firms that will be extorted by officials depend on the opportunities for extortion and the likelihood of punishment. We conjecture that firms in some industries, like construction, which are usually regulated and subject to inspection are particularly subject to extortion. More generally, we hypothesize that innovating firms, where innovation is broadly defined as activities that are new to the firm, are also in general at high risk for extortion by government officials. Innovations involve changing established business practices and are likely to attract heightened scrutiny by government officials.[8] Thus, innovation may involve activities such as changing the physical layout of a factory or office space, installing telephones, acquiring motor vehicles, opening new premises, importing a new category of goods, or registering a new trademark. Each of those activities increases the opportunities for contact with government employees who have the power to extort the firm, and thus the likelihood that the firm will be victimized. Formally we can state this as

***Prediction 1**: **Innovating firms pay more bribes than firms that do not innovate**.*

Below, we investigate the types of innovation and institutions for which this relation holds.

There are several consequences to this link between innovation and corruption: First, the bribe payments might affect firms' trust in the government as a fair provider of services. Second, being victimized by the government officials might affect the firm's

[8] We test for this link between innovation and bribes below.

compliance with government rules in other contexts, more specifically tax collection system. Thus, the firms could try to recoup some of their losses by evading taxes. Third, the firms might resort to informal financing channels in order to facilitate tax avoidance. We explore each of these possibilities in detail below:

### *2.1. Corruption and Tax Evasion*

Firms could respond to being shaken down by government officials by underreporting income to the tax authorities. There are several reasons to expect such a response. Much research on the role taxpayer morale in public finance suggests that compliance with tax regulation rests on a belief in the legitimacy of the tax process and trust in government. This work suggests that if the implicit contract between the government and the taxpayer is broken, the firm is likely to avoid taxes.

Thus, people are more likely pay taxes and to refrain from cheating if they trust the government (Scholz and Lubell, 1998; Scholz and Pinney, 1995; Torgler, 2007) and are satisfied with government performance (Spicer and Lundstedt (1976), Smith (1992), Alm, Jackson and McKee (1992), Pommerehne, Hart, and Frey (1994)). Therefore, if, as suggested by the trust literature, bribes demanded by public officials are a signal to the firm that the government is dishonest, it leads to loss of trust in the government and thus to evade taxes.

While much of this literature rests on behavioral notions of fairness, several authors suggest that tax avoidance may be a rational response to extortion by government officials. In an asymmetric information model, extortion of a bribe provides a signal to the firm that the government is dishonest and that there is a lower probability that the

taxes will be used for services that the taxpayer implicitly expects. Several papers (e.g. Alm, McClelland and Schulze (1992), Alm, Jackson and McKee (1992a, 1992b,1993) and Pommerehne, Hart, and Frey (1994)) show that this creates incentives for firms to evade taxes at the margin and use the saved funds to provide those services.[9]

Hence we expect firms that pay bribes to evade more taxes.

***Prediction 2: Firms that pay more bribes are more likely to evade taxes by underreporting revenue.***

Below we investigate both the existence of an association between bribery and tax evasion by underreporting firm revenues and the existence of a causal relation between the two. To explore the latter we use firm innovation as an instrument.

To be an instrument for bribery, firm innovation must predict payments of bribes by firms. Innovation must also satisfy an exclusion restriction: It must not have an independent causal effect on the reporting of income by firms. The relation between innovation and bribery is predicted by Proposition 1 and is empirically tested below. The exclusion restriction cannot be tested directly. However, in general there is no reason to believe that firms that innovate are more likely to underreport revenues than other firms.

Below, we first test Proposition 2 using a conventional econometric specification that assumes that all firms, and in particular all innovating firms, respond similarly to the corruption of government officials. However, in our setting firms might exhibit heterogeneous responses to being made to pay bribes. As hypothesized in Proposition 1, some firms might decide to underreport revenues as a result of having to pay bribes. However, other firms might continue to report revenues truthfully regardless of the

[9] Thus, for example, extortion by police might cause a firm to doubt that the state will provide adequate protection from violent crime in future years and to evade taxes, using some of the saved funds to purchase private security.

payments to officials. There also might be some firms who find it value maximizing to evade taxes and risk penalties whether or not they are extorted for bribes by government officials. This heterogeneity is of policy relevance in gauging the effect of corruption of government revenues and low of trust in government institutions.

To investigate heterogeneity in the response of innovating firms to corruption , we generalize the instrumental variable estimation to allow for Local Average Treatment Effects (LATE) Imbens and Angrist (1994). Imbens and Angrist (1994) show that in the same situation, it is possible to identify the average causal effect for firms that are identified by the instrument (in our study, innovators). These are precisely the firms who alter their bribe-paying behavior as a result of innovating. In the Imbens and Angrist (1994) terminology, these firms are referred to as compliers.[10] In our case, the sub-population of compliers is ex ante the sub-sample of interest.

More formally, we consider the population of firms in our sample to be randomly distributed as innovators or non-innovators (i.e. there is a random assignment to treatment (innovation)) and their bribe paying behavior as an indicator of their receipt of treatment. We can divide the firms into four categories using standard econometric terminology based on treatment assignment (i.e. innovation) and receipt of treatment (i.e. corruption):

- *Compliers* are firms that pay bribes when they innovate and do not pay bribes when they do not innovate i.e. they do what they are assigned to do.
- *Always Bribers* pay bribes both when they innovate and when they do not innovate i.e. they always receive the treatment no matter which condition they are assigned.

[10] Because their behavior "complies" with the underlying model.

- *Never Bribers* are firms that never pay bribes i.e. they do not receive the treatment even if they are assigned to the treatment condition.
- *Defiers* are firms that pay bribes when they do not innovate and do not pay bribes when they innovate i.e. they do the opposite of what they are assigned to do.

The compliance behavior of different firms can be summarized from observed treatment (bribes), $W_i$ and instrument (innovation), $Z_i$ as follows:

| **Compliance Types** | | |
|---|---|---|
| | Innovation, $Z_i=0$ | Innovation, $Z_i=1$ |
| Bribes, $W_i=0$ | Compliers / Never Bribers | Defiers / Never Bribers |
| Bribes, Wi=1 | Defiers /Always Bribers | Compliers/Always Bribers |

For each pair of ($Z_i$, $W_i$) values, there are two possible types with the others ruled out. We can rule out additional categories under the monotonicity assumption that for each firm, the level of treatment (bribes) is a monotonic increasing function of the level of the instrument (innovation). Also known as no-defiers assumption (Imbens and Angrist, 1994), this essentially implies that innovation results in the bribe paying behavior of firms to remain unchanged or for those firms whose behavior changes it results in them paying more bribes but does not result in firms refusing to pay bribes when they had previously done so. Thus we have:

| **Compliance Types under No-Defiers Assumption** | | |
|---|---|---|
| | Innovation, $Z_i=0$ | Innovation, $Z_i=1$ |
| Bribes, $W_i=0$ | Compliers / Never Bribers | Never Takers |
| Bribes, $W_i=1$ | Always Bribers | Compliers/Always Bribers |

To identify the average effect of treatment (bribes) on the outcome (tax evasion) for the sub-population of compliers (innovating firms), we next identify the marginal distribution of each compliance type in our population and the conditional outcome

distributions. This identifies the average outcome (tax evasion) by treatment status (bribe paying behavior) for compliers, which can be combined to given the overall average effect for compliers. Thus, the average effect of bribes on tax evasion for the firms that pay bribes when they innovate and firms that do not pay bribes when they do not innovate is estimated using innovation as an instrument for bribes in our tax evasion regression. This gives us an estimate of the average tax evasion influenced by bribe payments to government officials by innovating firms.

### *2.2. Formal versus Informal Financing*

Another consequence of being shaken down by public officials is that firms may resort to alternate financing channels. Firms can finance the investment and payoffs to officials required to innovate in three ways. They can self-finance using retained earnings net of taxes, or obtain external financing from either a bank or from informal sources. Firms face a trade-off in going to banks versus informal sources. On one hand, as formal intermediaries, banks have a lower cost of capital and can make loans at a lower cost. On the other hand, banks need verifiable proof that the borrowing firm can repay the loan and thus evidence of current income as disclosed by the firm.[11] Hence the firms are able to evade less tax if they were to raise money from formal sources. Thus, we have:

> ***Prediction 3: Bank financed firms avoid less taxes than informally financed firms.***

Predictions 2 and 3 have implications for the effect of corruption on public revenues, the development of financial sector and innovation in countries with significant corruption

[11] Thus, we are assuming that the bank cannot verify the existence of income and assets not reported to the tax authorities. This is analogous to the assumption in corporate finance in Hart and Moore (1995) and Bolton and Scharfstein (1996).

problems. There is a debate in the financial literature about role of formal financial system in providing investment to growing small firms. Using Chinese data, Allen, Qian, and Qian (2005) argue that friends and family, private investors, and informal institutions are better able to provide financing to private firms than formal intermediaries. Ayyagari, Demirguc-Kunt, and Maksimovic (2008), using a large sample, argue that for all except the smallest firms, informal financing is associated with worse borrower performance. To the extent that corruption affects innovating firms' incentive to avoid taxes, it will also affect the use of the formal financial system by firms. Hence if we were to classify firms as being victims, who pay more in bribes than gain by underreporting revenues to tax authorities, or perpetrators, who gain more by avoiding taxes than they lose in paying bribes, we should expect innovators and bank financed firms to be more likely victims than perpetrators.

More formally stated,

***Prediction 4: Innovating firms and bank financed firms are more likely to be victims than perpetrators***

Public finance researchers have noted that financing from informal sources has adverse implications for the collection of tax revenues. Moreover, there is a great deal of evidence that a strong financial system is predictive of economic growth (e.g., see Levine (2005) for a review). Prediction 4 suggests that corruption by public officials also has an adverse externality both on the use of the formal financial system by innovating firms, with potentially additional implications for revenue collection and development.

### *2.3. Trust Consideration*

In Section 2.1 we argued that government corruption breaks the contract between the state and the taxpayer. As a result victim firms are more likely to underreport income

because they lose trust in the government. To flesh out this argument we also investigate the relation between underreporting of revenue and the trust in government that firms report. We directly test

***Prediction 5: Lower trust in the government is associated with greater under-reporting of income to tax authorities***

Prediction 5 is tested using a conventional econometric specification where we regress tax evasion on trust in the government. To get an estimate of a more focused estimate of this relation, in some specifications we instrument trust in government using bribe payments or innovation and use the LATE methodology to understand the causal relation between trust and tax evasion for the firms whose tax evasion behavior is affected by their bribe payments.

Prediction 5 is also of independent interest for the light it throws on an alternative explanation of the reasons for tax compliance. The tax morale literature (e.g. Posner (2000), Bejamini and Maital (1985), Myles and Naylor (1996)), argues that the utility of tax evasion to a taxpayer depends on the number of others who evade (larger the number of people who evade taxes, lesser is the stigma associated with it). Lewis (1982), Frey (1997), Frey and Feld (2002), Torgler (2001, 2002)) also argue that tax morale helps explains the high degree of tax compliance. Prediction 5, if consistent with the data, suggests that the tax morale literature needs to be supplemented by consideration of trust between the taxpayer and the state.

## 3. Data, Summary Statistics, and Empirical Specification

We use the World Bank Investment Climate Survey database (IC) that uses standardized survey instruments to benchmark the investment climate of individual economies across the world and to analyze firm behavior and performance. The surveys sample from the universe of registered businesses in each country using standardized survey instruments and follow a stratified random sampling methodology.[12] All the surveys in our sample were administered during 2002-2005.

The IC surveys have two unique advantages that make them suitable for investigating the relation between innovation, corruption and tax underreporting. First, the surveys contain information on both types of illegal activities – bribe payments by firms to public officials as well as the share of income not reported for tax purposes by the firms. The information on bribe payments helps us understand the extent to which firms are victimized and the information on tax avoidance helps us explore the role of firms as perpetrators. Second, the surveys have detailed information on the extent of innovation that the firms undertake. Previously, there has been very little consistent data across countries on the nature of innovative activities undertaken by firms.[13]

[12] The IC surveys and their precursor, the World Business Environment Survey (WBES) have been used to investigate a series of questions in developmental economics including the relation between property rights and contracting institutions (e.g. Acemoglu and Johnson, 2005), investment climate and business environment obstacles to growth (e.g. Beck et al., 2005; Ayyagari et al., 2008), firm financing patterns (e.g. Beck et al., 2008; Cull and Xu, 2005, Ayyagari et al., 2009) and dispute resolution via courts (e.g. Djankov et al., 2003)

[13] Most innovation surveys typically cover only the developed countries and focus on patents and R&D expenditures. However, the issues are likely to be different for most developing countries where imitation and adaptation of already-created and tested innovations, rather than cutting-edge innovations, are likely to be more important .The IC surveys are unique in that they cover mainly developing economies and allow for a broader definition of innovation, to include not only core innovative activities such as the introduction of new products and new technologies, but also other types of activities that promote knowledge transfers such as signing joint ventures with foreign partners or obtaining new licensing agreements, and other actions that adapt the organization of the firm's business activities such as opening a new plant or outsourcing a productive activity. See Schumpeter (1942), Segerstrom (1991), Grossman and Helpman

We focus on the variables used to measure bribe payments and tax evasion in the following sub-section. To capture firm innovation we use a dummy variable, **New Product Innovation,** which takes the value 1 if the firm developed a new product line and 0 otherwise. While new product innovation is our main measure of innovation, as robustness we also use nine other indicators that capture firm innovation and dynamism in a broader sense - *Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Opened a new plant, Agreed to a new joint venture with a foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house, Brought in-house a major production activity that was previously outsourced*, and two aggregate indicators, *Core Innovation* that captures introduction of a new product, upgraded an existing product line and introduced new technology and *Dynamism Index* which includes all of the individual innovation indicators above.

We use the following measures of trust in the government: **Government Efficiency** is taken from firm responses to the survey question where firms were asked to rate the efficiency of the government in delivering services on a scale of 1 (very inefficient) to 6 (very efficient). **Government Predictability** takes values from 1 to 6 where increasing values reflect firms' beliefs that government officials' interpretations of regulations affecting the establishment are consistent and predictable. Note that this variable captures the consistency of *existing* regulations as it affects the firm and is not meant to capture the ex-post beliefs of bribe paying firms. **Property Rights** takes values

(1991), Acemoglu, Aghion, and Zilibotti (2006), Ayyagari, Demirguc-Kunt, and Maksimovic (2008) for highlighting the importance of thinking about innovation broadly in developing countries.

1 to 6 with increasing values reflecting firms' confidence that the judicial system will enforce its contractual and property rights in business disputes.

We use three measures of external finance. **Bank Financing** is a dummy variable that takes the value 1 if the firm reported having a current bank loan or overdraft facility and 0 if the firm said it did not currently have access to a bank loan or overdraft facility. While there is no complementary variable defined for informal finance, the survey also asks firms to report the sources of financing for their new investments and working capital. Hence we construct **Informal Financing** which is a dummy variable that takes the value 1 if the firm reported that the sum of Family, Informal (e.g. moneylender), and Other financing of new investments or working capital is 50% or greater. Informal Financing takes the value 0 if the sum of family, informal and other financing of new investments and working capital is equal to 0 %.

As a measure of firm performance we use the firm's average **Capacity Utilization** which is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm's existing machinery and equipment and regular shifts. As a check we also present results with **Labor Productivity**, which is the ratio of labor productivity of the firm to the mean labor productivity in its country where labor productivity is defined as (Total Sales-Raw Material Costs)/Total Number of Workers in the previous year. Scaling by the country mean allows us to account for the wide heterogeneity in firm performances. Using a ratio also allows us to avoid dealing with exchange rate fluctuations in the time period. We also use **Sales Growth** over the past year as an alternate indicator of firm performance. We prefer capacity utilization as the main performance measure since labor productivity

is a direct function of firm sales and hence may be mis-reported as well and we prefer capacity utilization to sales growth since the latter is available for a much smaller sample of firms. For a smaller sample of countries, we have data on profit margins, which we use as robustness checks.

The IC surveys also contain detailed information on firm size, age, legal status, industry sector, and ownership, all of which are used as firm level controls in our study. The survey defines firms of different sizes, small, medium and large firms, on the basis of the number of full time workers.[14] Small firms are defined as those with less than 20 employees, medium firms employ 20 to 99 employees, and large firms employ 100 or more employees.

### *3.1. Bribes and Tax Evasion*

One of the concerns with self reported measures on corruption and tax evasion is whether reliable data can be collected on illegal activity. However, with appropriate data collection techniques, several surveys now have been able to elicit detailed information from firm managers on corruption. With the IC surveys, given the sensitive nature of the data, government officials are not directly involved in data collection[15] nor are they given any raw data or any information that allows them to identify the responses of individual firms. Thus, firm names and their identities are confidential information. Furthermore, the surveys are conducted by the World Bank in partnership with the local private sector such as independent chambers of commerce or business associations that the local firms

[14] Employment is typically the most reliable figure in developing countries. Hence, number of full time workers is used as a measure of firm size by the World Bank Group and other international survey teams including RPED and the Oxford Centre for the Study of African Economies.
[15] The World Bank does coordinate with the national statistics agency where possible to obtain the sample frame and other information.

have confidence in. In addition, questions on bribes and tax evasion were phrased indirectly in the IC surveys. So the firms were asked about the behavior of a typical firm rather than the firm itself, to avoid implicating the respondent firm with illegal activity.

Other established survey methods were also used to increase data accuracy - corruption-related questions were asked at the end of the interview when the interviewers had presumably established credibility and trust with the respondent and multiple questions were asked on bribe payments. In addition, we performed survey reliability tests by examining answers to the questions across two different points in time or across an equivalent set of firms. More specifically, for a smaller sub-sample of firms over 27 countries, we have additional variables on bribe payments and tax evasion and responses from surveys implemented in 2002 and 2005. We find the responses to be highly correlated across the two years for the various variables. Similar data has been used by several papers including Svensson (2005) and Fisman and Svensson (2007).

The use of self reported measures to study criminal behavior is very common in other areas of research in sociology and criminology. Several researchers (e.g. Chaiken and Chaiken 1982; Mande and English 1987; Homey and Marshall 1991) have shown that self-reports used to estimate the prevalence and frequency of offending among incarcerated adults provide more detailed data than do police and court records and cross-validation of these self-reports with formal records indicates a reasonable degree of validity in the responses of adult inmates (Marquis with Ebener 1981). Junger-Tas and Marshall (1999) report that despite problems related to sampling and international data collection methods, the reliability and validity of data from self-report surveys are higher than for police data collected within each particular country.

All of the above give us confidence that the IC surveys are an important first step in understanding firm's illegal activities. As a measure of bribe payments we construct the variable, **Bribes**, which are firm responses to the question – "*What percent of annual sales value does a typical firm like yours spend on gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc?*"[16] The variable, **Tax Evasion,** is constructed as 1-Tax Compliance, where Tax Compliance is taken from firm responses to the following question – "*Recognizing the difficulties many enterprises face in fully complying with taxes and regulations, what percentage of total sales would you estimate the typical establishment in your area of activity reports for tax purposes?"* [17] Since this variable is not adjusted for corporate tax rates, it provides an upper bound of tax evasion. The survey has no information on the marginal tax rates for each firm that would enable us to quantify the true tax burden of each firm and the magnitude of evasion. As an alternative, we adjust the tax evasion measure using statutory corporate tax rates and 1-year effective corporate tax rates from Djankov, Ganser, McLiesh, Ramalho, and Shleifer (2008). We don't rely only on the tax adjusted measures since the data on corporate tax rates is available for only 47 countries in our sample.[18]

[16] While this is a general variable proxying for the extent of corruption in the economy, in separate questions, the survey also asks firms to report on bribes paid to specific government agencies (tax inspectorate, labor and social security, fire and building safety, sanitation, police, and environmental). All our results exploring the link between corruption and tax evasion are robust to using these alternate measures to examine a sample of firms that report paying bribes in general but not to tax officials.

[17] An existing economics literature on informality uses this variable as a measure of the extent of informal or unofficial activity in the economy (e.g Friedman et al., 2000; Dabla-Norris et al., 2008, Gatti and Honoratti, 2008; La Porta and Shleifer, 2008), However, since our sample consists entirely of registered firms operating in the formal economy, with no firms in the unregistered sector, we prefer to call "percentage of income not reported for tax purposes" as tax evasion rather than informality.

[18] Note that tax evasion is used as a dependent variable in our analysis so there should be no concerns about measurement error related endogeneity biases in our analysis.

To capture the net burden of corruption on firms, we construct the variable **Firm Type** which takes on four values: **Innocents** if the firm reports paying no bribes and evading no taxes, **Perpetrators** if the firm reports paying no bribes but does report evading taxes, **Victims** if the firm reports paying bribes but not evading taxes, and **Retaliators** if the firm reports paying bribes and evading taxes.

### *3.2. Incidence of Bribes and Tax Evasion around the world*

Given the lack of firm-level evidence on corruption and tax evasion, in this section, we first present detailed statistics at the firm level across countries and different institutional regimes on bribe payments and tax avoidance. We then discuss summary statistics.

**Insert Table 1 here**

Table 1 reports averages of Bribes and Tax Evasion and the distribution of firms as Innocents, Perpetrators, Victims, and Retaliators across different country classifications and different firm categories.[19] In the discussion below, we first focus on the incidence of bribes and tax evasion and then on the distribution of firm types. Panel A presents statistics across different regions. Col. 2 of Panel A shows that the average bribe payments are low across all countries ranging from 1.26% of revenue in Europe and Central Asia to 3.72% of revenue in Middle East and North Africa. The tax evasion numbers present an upper bound of tax evasion in each region since they are unadjusted for tax rates and show that tax evasion is highest in East Asia Pacific (27%) and lowest in

[19] In panels A-H, the numbers are first averaged across countries and then across different country classification. In panels I-M, the numbers are averaged across firms in each firm classification.

South Asia (7.6%). In each region the amount of underreported revenue exceeds the proportion of revenue paid out as bribes.

In unreported results across country income categories, we find that the average bribe payments are also low across all income categories, ranging from 0.3% in OECD countries to 2.3% in low income countries. While the numbers are small, we find that the bribe payments are statistically different from zero and also between income categories. Note that our sample is dominated by developing countries so we only have seven high income countries of which six are OECD countries. Reported tax evasion is similarly lowest in OECD countries (7.1%) and highest in the low income countries (24.5%).[20] As a validity check of the survey data on bribe payments, in unreported comparisons, compared our results to two widely used country-level indices, Transparency International's (TI) Corruption Perception Index and the World Bank's Control of Corruption Index described in Kaufmann, Kraay, and Mastruzzi (2007). We find that both the cross-country measures show similar patterns as in our data. The TI measure relates to perceptions of the degree of corruption as seen by business people and country analysts and ranges between 0 (highly corrupt) and 10 (highly clean). In our sample of countries, the TI measure ranges from 6.21 in high income countries to 2.50 in low income countries. The World Bank's Control of Corruption Index measures the degree to which corruption is perceived to exist among businesses, public officials and politicians and ranges from -2.5 (highly corrupt) to +2.5 (non-corrupt). Specifically it is meant to

[20] We also computed tax adjusted measures of tax avoidance, multiplying the tax evasion measure by the country's statutory corporate tax rate and effective corporate tax rates from Djankov et al. (2009) respectively. We find similar results when we use 5-year effective corporate tax rates from Djankov et al. (2009) instead of 1-year effective corporate tax rates. Both the statutory and effective tax adjusted measures show that tax evasion is the highest in low income countries (5.49% and 3.42% respectively) and the least in high income countries (2.18% and 1.28% respectively). A t-test shows the magnitudes of the tax evasion measures to be statistically different across income group categories.

"capture the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests." In our sample of countries, the Control of Corruption Index ranges from 1.13 in high income countries to -0.72 in low income countries. Thus we see that the reported bribe payments by firms vary across countries in a similar fashion as other cross-country indicators do. Corresponding cross-country indicators of Tax Evasion are not available for comparison purposes.

In Panels B-J of Table 1 we present sample statistics across different cross-country institutional indicators. In Panel B, we show statistics across different legal origins as described in La Porta, Lopez-de-Silanes, Shelifer, and Vishny (1998). Bribes and tax evasion are lowest in German law countries at 0.2% and 7.8% respectively and highest in French civil law countries at 2.2% and 23.6% respectively.[21] In Panel C we use the classification in La Porta et al. (1998) to classify countries according to the dominant religious group in the country and find that corruption and tax evasion are highest in Muslim countries (2.2% and 27% respectively) and lowest in Protestant countries (1% and 13.6% respectively). Catholic countries and countries with other dominant religions are in between and seem to have similar levels of corruption (around 1.5-1.7%) and tax evasion (around 17%). In Panels D and E we classify countries into three terciles each according to the extent of ethnic fractionalization as defined in Alesina et al.(2003) and their distance from the equator as classified by La Porta et al. (1998) respectively. We find that corruption and tax evasion are higher in countries that have greater ethnic

[21] When we re-classify some of the Socialist countries into German or French Civil law countries according to the classification in Djankov et al. (2007) we find similar results. Bribes range from 1.25% in German civil law countries to 2.22% in French civil law countries. Tax Evasion is lowest in Socialist law countries (13.3%) and highest in French civil law countries (23.2%)

fractionalization and countries that are closer to the equator. This is consistent with macro evidence in Mauro (1995) showing that ethnic fractionalization is a determinant of corruption.[22]

In Panel F, we classify countries into terciles according to the social trust in the country. As a measure of social trust, we use the survey question from the World Values Survey "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people". The responses are binary with 1 being *most people can be trusted* and 0 being *can't be too careful*. The responses are averaged across all the respondents in each country and the countries are then split into terciles according to the average level of trust in the country. We find that both corruption and tax evasion are higher in countries with lower levels of trust. Our sample size in this table is limited to 45 countries due to the unavailability of the trust measures in other countries.

Finally, in panel G we split countries according to statutory corporate tax rates as reported in Djankov et al. (2009) Here again unavailability of data restricts sample size to 44 countries. We find that while bribes are highest in high tax countries, mean tax evasion is higher (23.4%) in the countries with the tax rates between 27.5-33% than in the countries with corporate tax rates between 34-41% where mean tax evasion is only 14.4%.

When we look at the distribution of firm types across different country classifications, first we find that Innocents make up the largest fraction of firm types in each classification. The highest percentages of Perpetrators are found in South Asia, high income countries, German law countries, Muslim countries, countries with greater ethnic

[22] In panels B, C, E, and F the sample of countries is reduced from 71 to 70 due to missing data for Kosovo. In Panel E the sample is reduced to 68 since we don't have data on ethnic fractionalization for Serbia, and Montenegro as well.

fractionalization, countries closer to the equator, countries with low levels of social trust and in countries with high tax rates in the range of 27.5-33%. By contrast, the largest percentage of firms that pay bribes to public officials but do not evade taxes, the firms that we refer to as Victims, are found in East Asia Pacific, low income countries, Socialist law countries, countries where dominant religions are not Muslims, Catholics or Protestants, countries with greater ethnic fractionalization, countries farthest from the equator, countries with high levels of social trust and in countries with the lowest tax rates. Interestingly the pattern of Retaliators somewhat resembles that of the Victims. Similar to that of the Victims, the largest percentage of Retaliators are found in East Asia Pacific, low income countries, countries following Socialist legal tradition and in countries with the lowest tax rates. In contrast, the largest percentage of Retaliators are also found in Muslim dominated countries, countries with lowest ethnic fractionalization, countries closest to the equator, and in countries with low levels of social trust.

In Panels H-L of Table 1, we show the average bribe payments, tax evasion, and firm types across different types of firms. Small firms report the highest amount of bribe payments (1.54%) and tax evasion (19.01%) compared to medium (1.5% and 17.96% respectively) and large firms (1.14% and 14.55% respectively). In unreported t-tests we find that medium firms evade significantly higher taxes than large firms and significantly lower taxes than small firms where as small and large firms are not significantly different from each other. Domestic firms report significantly higher bribe payments (1.44%) and tax evasion (18.49%) than foreign firms (1.31% and 12.59% respectively). Similarly, non-exporters report significantly higher bribe payments (1.48%) and tax evasion (18.29%) than exporting firms (1.22% and 15.66% respectively). Firms in the agro-

industry report the highest bribe payments (2.21%) and tax evasion (31.35%) compared to manufacturing, services, construction or other sectors. Next is the manufacturing sector within which the highest average bribe payments is in the electronics industry and highest average tax evasion is in auto and auto components followed by electronics. When we look across different legal status, average reported bribes are highest among the cooperatives (1.88%) followed by sole proprietorships (1.55%) and partnerships (1.49%). Corporations report the lowest average bribes (1.28%) after Other Legal structures (1.14%). Average tax evasion is also highest among Cooperatives. While Corporations have higher average tax evasion than partnerships, a closer look at the numbers reveals that it is the privately held, limited companies which have higher average tax evasion than partnerships while the publicly listed companies have lower average tax evasion.

When we look at the distribution of firm types, as in the case of countries, the largest percentage in any category are the Innocents who report paying no bribes and evading no taxes. Within the small firms size class, a larger proportion of firms are Perpetrators (26.9%) compared to Victims (11.6%) and Retaliators (23.8%). Medium Size firms have more Retaliators (24.3%) compared to Perpetrators(19.4%) or Victims (15.9%). Amongst the large firms, 15.8% are Perpetrators, 18.3% are Victims and 17.5% are Retaliators. Across the size classes we find that the percentage of Perpetrators is highest among small firms, Victims is highest among the large firms and Retaliators is highest among the Medium firms.

Across firm ownership categories, 23.35% of domestic firms are Perpetrators compared to 13.2% of foreign firms, 14% of domestic firms are Victims compared to 19% of foreign firms and 22.7% of domestic firms are Retaliators compared to 20.5% of

foreign firms. When we look at exporting status in panel K, we again find a larger proportion of Perpetrators and Retaliators among non-exporters(23% in both cases) compared to exporters (19% and 19.9% respectively) and a smaller proportion of Victims among non-exporters(13.8%) compared to exporters(16.6%).

Across industries, we find that the percentage of Perpetrators is highest in Agro Industry (28.1%) followed by Manufacturing (23.6%), Services (20.5%), Construction (18.6%) and Others (15.2%). By contrast, the percentage of Victims is the smallest in the Agro industry(7.6%) and highest in the Other Industry sectors (21.9%). Percentage of Retaliators are also highest in Agro Industry (33%) followed by Construction (28%), Services(23.1%), Manufacturing(20.9%) and Other(16%).

In panel L, we find that the largest percentage of Perpetrators is among Sole Proprietorships which also have the lowest percentage of Victims across different legal status categories. The largest percentage of Victims is among Partnerships and the largest percentage of Retaliators is among Cooperatives.

**Insert Table 2 here**

Panel A of Table 2 reports the summary statistics for the variables and Panel B shows the correlation matrix between the main variables of interest. Panel A shows that the mean bribe payments in the sample is only 1.34% where as mean tax evasion is 17.10%. Thus in economic terms, tax evasion seems to have a higher prevalence across countries than bribe payments to government officials. However note that these provide only an upper bound for tax evasion since they are unadjusted for corporate tax rates. When we adjust it according to the corporate tax rates, the mean tax evasion is only 4.42%. When we look at the breakdown of firm types, we find that 41% of the sample

report paying no bribes and evading no taxes (Innocents), 22% are Perpetrators in that they do not pay bribes but evade taxes, 14% are Victims in that they pay bribes but do not evade taxes and 22% of the sample are Retaliators in the sense that they pay bribes as well as evade taxes. There are no systematic differences in the distribution of firms across these four categories in terms of country, industry, or firm size.

Table 2 shows that the percentage of firms with bank financing is 49% in the sample and the percentage of firms who finance 50% or more of their new investments or working capital with funds from family, informal or other sources is 14%. A large number of firms in our sample (37%) are innovators in that they introduced or developed a new product line. The mean capacity utilization is 78.8%.

The sample is largely dominated by small and medium sized firms - small firms make up 44% of the sample, medium firms constitute 32%, and large firms constitute 24% of the overall sample. In terms of legal status, 39% of the sample is composed of corporations, 32% are sole proprietorships, 21% are partnerships, 2% are cooperatives and 6% are other legal structures. The average firm age in the sample is 15.62 years. Panel A also shows that 13% of the sample of firms is composed of foreign firms and 21% of the firms are exporters.

The correlation matrix in Panel B shows that the correlation coefficient between tax evasion and bribes is 0.14 and is highly significant at the 1% level. Bribes are significantly positively associated with greater use of informal financing and negatively associated with both the bank financing and bank access. Bribes are also positively associated with innovation suggesting that bribe payments are like a tax on innovating firms. Bribes are negatively associated with capacity utilization. Tax Evasion shows

similar patterns – it is positively associated with informal financing and negatively associated with bank financing and bank access. Tax evasion is also positively associated with innovation and negatively associated with capacity utilization. The financing variables are significantly correlated with each other at the 1% level. Innovation and Capacity Utilization are positively associated with Bank Financing and Bank Access and negatively associated with Informal Financing. In addition, Innovation and Capacity Utilization are themselves negatively correlated at the 5% level. However a closer look at the data reveals that the negative correlation is explained by firms introducing a new product as well as undertaking other forms of innovation like opening a new plant and thus being unable to operate at a high capacity. The correlation between innovation and capacity utilization for firms that did not open a new plant is in fact positive.. We next turn to regression analysis to test the empirical predictions of our model.

### *3.3. Empirical Specification*

In this section we proceed in the following steps to answering questions. First we examine what types of firms pay bribes, focusing in particular on innovating firms. We run the following regression, suggested by Prediction 1:

$$Bribes = \alpha + \beta_1 Innovators + \beta_2 Firm\ Size\ dummies + \beta_3 Age + \beta_4 Legal\ Status\ dummies + \beta_5 Family\ Owned\ dummy + \beta_6 Capacity\ Utilization + \beta_7 Foreign\ Ownership\ dummy + \beta_8 Exporter\ dummy + \beta_9 Industry\ Sector\ Dummies + \beta_{10} Country\ Dummies + \beta_{11} Year\ Dummies + e \quad (12)$$

We next look at the association between Bribes and Tax Evasion, suggested by Prediction 2, by estimating the following regression:

$$Tax\ Evasion = \alpha + \beta_1 Bribes + \beta_2 Firm\ Size\ dummies + \beta_3 Age + \beta_4 Legal\ Status\ dummies + \beta_5 Family\ Owned\ dummy + \beta_6 Capacity\ Utilization + \beta_9 Foreign\ Ownership\ dummy +$$

$\beta_{10}$*Exporter dummy +* $\beta_{11}$*Industry Sector Dummies +* $\beta_{12}$ *Country Dummies +* $\beta_{13}$ *Year Dummies + e* *(13)*

We rely on LATE as described in section 2.2. to analyze the causal relation between bribes and tax evasion for innovating firms. Following Predictions 3 and 4, we then quantify the burden of corruption on firms by looking at the distribution of firms as victims or perpetrators across countries. In particular we look at the effect of financing on the distribution of firms as victims or perpetrators by estimating the following regression.

*Firm Type* $= \alpha +$ $\beta_1$ *Innovation+* $\beta_2$*Financing +* $\beta_3$ *Firm Size dummies +* $\beta_4$ *Age +* $\beta_5$*Legal Status dummies +* $\beta_6$ *Family Owned dummy+* $\beta_7$ *Capacity Utilization +* $\beta_8$*Foreign Ownership dummy+* $\beta_9$*Exporter dummy +* $\beta_{10}$*Industry Sector Dummies +* $\beta_{11}$ *Country Dummies +* $\beta_{12}$ *Year Dummies + e* *(14)*

In the above specification, Firm Type can take values 1-4 for Innocents, Perpetrators, Victims, and Retaliators respectively. Hence we use a multinomial logit specification with Innocents (Bribes=0 and Tax Evasion=0) being the omitted category. Since we expect trust in the government to be one of the channels through which bribes might be related to tax evasion, consistent with Prediction 5, we next directly test for the role of trust through the following estimation:

*Tax Evasion =* $\alpha +$ $\beta_1$ *Trust +* $\beta_2$ *Firm Size dummies +* $\beta_3$ *Age +* $\beta_4$*Legal Status dummies +* $\beta_5$ *Family Owned dummy+* $\beta_6$ *Capacity Utilization +* $\beta_7$*Foreign Ownership dummy+* $\beta_8$ *Exporter dummy +* $\beta_9$*Industry Sector Dummies +* $\beta_{10}$ *Country Dummies +* $\beta_{11}$ *Year Dummies + e* *(15)*

We once again rely on LATE to understand the relation between trust and tax evasion for the firms whose tax evasion behavior is affected by their bribe payments.

Our data consists of pooled cross-sections over time since some of the countries are surveyed in multiple years but during each year a new random sample is taken from the population. As suggested by Wooldridge (2002, page 129), we use the pooled

ordinary least squares estimator with year fixed effects to account for aggregate changes over time to analyze the pooled cross-section data in (12), (13) and (15). We also use country and industry fixed effects in both our pooled estimations (12, 13, and 15) and the multinomial logit estimations (14). . At each step we perform several robustness checks to test that our results are robust to different estimation techniques and samples.

## 5. Results

### *5.1. Are Bribe Payments a Tax on Innovation?*

If bribe payments are a tax on innovation we should expect to see that innovating firms have to give a higher percentage of their sales as gifts or informal payments to public officials (after controlling for general firm performance). Table 3 presents results linking innovation and bribe payments using different controls for firm performance and across different samples for robustness. In all specifications, we drop state firms (firms reporting greater than 50% state ownership).

**Insert Table 3**

Cols. 1 and 2 of Table 3 present results for the largest sample of firms with and without controlling for capacity utilization. In both instances we find that innovating firms on average pay 0.37% of their sales as bribes to public officials. [23]Col. 2 shows a negative association between capacity utilization and bribe payments. So assuming that the bribes are fixed relative to a firm's capacity, this implies that for firms operating very efficiently, bribes are a lower proportion of their overall costs.[24]

[23] Note that the average bribe payment in the full sample of firms is 1.43% of the sales revenue.
[24] Note that previously we found a negative correlation between new product innovation and capacity utilization only for firms that had opened a new plant in addition to introducing new products. Thus if we re-run the specification in column 2 for firms that opened a new plant and those that did not, we find

The positive association between innovation and bribe payments holds when we include additional controls for firm performance using different proxies –labor productivity ratio and sales growth – as in cols. 3 and 4. In unreported specifications where we control for profit reinvestment rates, we again find that innovation is positively associated with bribe payments where as there is no significant association between profit reinvestment rates and bribes. Thus, we find that while firm performance by itself is negatively associated with bribe payments, innovating firms in particular report having to pay higher bribes. In subsequent specifications, we rely on capacity utilization as our main performance measure. The results in the specification with sales growth are stronger – innovating firms pay 0.58% of their sales as bribes – but the number of observations is down to 7470 firms in 31 countries. In unreported results, we find similar results when we replace past year sales growth with sales growth over the past two years or sales growth lagged by one year.

When we look at the control variables, we see that larger firms and older firms report paying a smaller percentage of their sales as bribe payments. Individual or family owned firms pay higher bribes than if the firm was owned by another corporation, bank, investment fund, manager / employees of the firm or the state. Across industry sectors, we find that firms in the construction industry pay higher bribes than firms in the manufacturing industry. We find no variation in bribe payments across legal organization of the firm, domestic versus foreign ownership and whether the firm is an exporter or not.

In col. 5 we repeat the specification in col. 2 for a sample of only small firms. We find that small innovating firms pay a larger fraction of their sales as bribe payments

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capacity utilization to be negatively associated with bribes only in the case of firms that did not open new plants.

rather than small non-innovator suggesting that small innovators firms may be particularly victimized. Col. 6 restricts the sample to manufacturing firms only and again we find a strong association between innovation and bribe payments. In col. 7 we drop agroindustry firms since the summary statistics in Table 2 show that agroindustry firms have the highest bribe payments. We continue to find a strong association between innovation and bribe payments. Our survey also has data on the bribes paid to different government agencies. Since one of the questions we focus on later in the paper is the link between different forms of illegal activity, in particular bribe payments and tax evasion, in col. 8 we restrict the sample to firms that report paying bribes to public officials but specifically not to the tax authorities. Even for this sample of firms we find that innovators pay more bribes in general to public officials than non-innovators.

Since a large sample of our firms (62%) report zero bribe payments, we use alternate estimation techniques other than OLS in cols. 9-10 to address any concerns of the large mass of zeros in our data. In col. 9, we use logit regressions where a dummy variable takes value 1 if firm reported paying bribes and 0 otherwise. While all our results remain unchanged, we do not use this for our main specification since we would lose the variation in percentage of bribe payments by dichotomizing the bribe payments variable.

In col. 10, we treat this as a corner solution model and use a two-limit tobit model to account for the variable Bribes taking on the value zero with positive probability and being a continuous random variable over strictly positive values.[25] We once again find our results unchanged. Being an innovator increases the probability that the firm pay bribes as well as increases the percentage of bribe payments conditional on paying bribes.

[25] Note that we do not have a censoring issue. So it is not the case that we do not observe bribe payments above or below some value.

We prefer the linear regression specification to Tobit since we use country fixed effects with clustered standard errors which biases parameter estimates in non-linear models such as Tobit.[26]

In unreported regressions, we perform the following other robustness test:. First we use data from a smaller sample that allows for better control of profitability. For 27 countries surveyed in 2005 across Europe and Central Asia (ECA), we have data on profit margin for about 6700 firms, where profit margin is defined as the margin by which sales price exceeds operating costs. When we re-estimate our regressions controlling for profit margin, we find that profit margin, by itself is not significant and innovating firms still pay more bribes than non-innovators. For the same set of countries, we have surveys in 2002[27] which also have data on profit margin and we again find that profit margin by itself is not significantly associated with bribe payments whereas innovation is. The 2002 surveys also have data on past profit/sales ratio in 2001 and 1999. Past profitability, both in 1999 and 2001 is significantly associated with bribe payments but controlling for past profitability, innovation is still significantly associated with increased bribe payments.

Second, we check whether our results are robust to the use of alternate bribe variables. The 2002 and 2005 ECA surveys have two other questions on bribes that could

[26] An alternative to the Tobit model is the hurdle model that allows the decision of Bribes>0 versus Bribes=0 to be separate from the decision of *how much* Bribes given that Bribes>0. The hurdle model is a two stage model where in the first stage we look at the determinants of the probability of payment of bribes and in the second stage look at the determinants of the amount of bribes. Our first stage results from the hurdle model (unreported) confirm that innovators are more likely to pay bribes than non-innovators. Due to the lack of convergence in ML estimation in the second stage we are unable to obtain predictions on innovators and the level of bribe payments. Since Bribes are reported as a fraction of sales paid out as bribes and are restricted to the unit interval [0,1], in col. 11, we also estimated a fractional response model using the fractional logit method proposed by Papke and Wooldridge (2001). We once again find that innovators pay more bribes than non-innovating firms.

[27] The surveys in 2002 and 2005 used different random samples of firms. Only about 1400 firms in the 2002 survey were also surveyed by 2005 (by co-incidence).

serve as alternate dependent variables. Firms were asked to report on a scale of 1 to 6 whether it is common for firms in their line of business to have to pay some irregular "additional payments/gifts" to get things done " with regard to customs, taxes, licenses, regulations, services etc, with 1 being Never and 6 being Always. In addition, firms were asked to report on a scale of 1 to 6 whether firms in their line of business usually know in advance about how much this 'additional payment/gifts' with 1 being Never and 6 being Always. With either of these alternate dependent variables, **Bribes_Common** and **Bribes_Known,** we find our results unchanged – Innovating firms are more likely to say that it is common to pay bribes and to also report knowing how much this additional bribe payment is. This is consistent with our interpretation that in our data set corruption can be viewed as a fee imposed on firms by government employees.

Third, our surveys provide detailed information on firms' dealing with different government officials including percentage of senior management's time spent in dealing with requirements imposed by government regulations and the days spent in inspections or meetings with specific agencies including the tax inspectorate, labor and social security, fire and building safety, sanitation/epidemiology, police, and environmental agency. Appendix A shows simple correlations between the time spent dealing with different regulations and bureaucratic agencies and innovation and corruption. We find that innovators and bribe paying firms spend more time dealing with various government regulations and with all bureaucratic agencies as a whole. The survey also has information on the delivery of different services including waits/delays in obtaining a telephone line, electricity connection, water connection, construction permit, import license, and operating license, days of unavailable telephone service, days of water

supply interruptions, days of transport failures, and days of power outages or power surges. In regressions of each of these variables on the interactions of bribe payments and innovation, we find no evidence that bribe payments offer innovators any special advantages either in obtaining better services or in reducing the time spent dealing with specific government agencies. While we don't present these results due to endogeneity concerns associated with including both innovation and bribes in the same equation, the findings provide further suggestive evidence that corruption indeed serves as a tax on innovation rather than benefiting the firms in any specific way.

Finally, in Appendix B we re-estimate the specification in col. 2 of Table 3 with a broader definition of innovation. Most firms in emerging markets are engaged in activities far from the technological frontier and entrepreneurs innovate not just through original inventions but also by adopting new means of production, new products and new forms of organization. Hence, we define the innovation process broadly by using firm responses to the survey questions on whether the firms had undertaken any of the following innovative activities in the last three years: *Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Opened a new plant, Agreed to a new joint venture with a foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house, and Brought in-house a major production activity that was previously outsourced.* The firm responses are coded as 0-1 (No-Yes) dummy variables for each of the questions. We also construct two aggregate indices of innovation from the individual indicators – *Aggregate Innovation Index* is an aggregate index obtained by summing firm responses to all the eight innovative activities the number of

activities in which the firm engages and *Core Innovation* is an aggregate index obtained by summing firm responses to two activities, Developed a major new product line and Introduced new technology that has substantially changed the way that the main product is produced, to reflect the narrow definition of core innovation.

Appendix A shows that most other forms of innovation such as upgrading a product line, introducing new technology, signing new joint ventures, and new licensing agreements are associated with higher bribe payments. Both the aggregate indices, Core Innovation and the Aggregate Innovation Index are positively and significantly (at the 1% level) associated with bribe payments. Very few firms in our sample engage in opening plants and changing sourcing decisions and we find that those activities are not associated with significantly higher bribe payments. Replacing the linear specification with a logit specifications using a dummy variable for bribes paid as the dependent variable we find all types of innovation including opening new plant and sourcing decisions to be significantly associated with higher probability of paying bribes.

Overall, we find strong evidence that bribe payments to government officials are tied to innovative projects confirming that innovating firms are taxed for their innovation. These firms pay off government officials across various departments to be able to get things done and innovate. We also have evidence that smaller firms pay more when they innovate than larger firms.

### *5.2. Bribe Payments and Tax Evasion*

In this section we examine Prediction 3, the link between bribe paymentsand tax evasion. In col. 1 of Table 4, we regress tax evasion on bribes and find that larger the

percentage of sales paid out as bribes to public officials, the larger is the underreporting of revenue to tax authorities. We find similar results when we replace Bribes with a dummy variable in col. 2. Therefore, both the probability of paying bribes and the amount of bribes paid are significantly associated with tax evasion.

**Insert Table 4**

When we look at the control variables, we find that in our sample, larger firms, older firms, firms with higher capacity utilization, and foreign owned firms evade lesser taxes. When we look at legal status, partnerships evade lesser taxes than sole proprietorships. The corporations dummy is not significantly different from sole proprietorships. We also find that family owned firms evade more though the coefficient is not significant in the first two cols. of Table 4. Across industry sectors, we find that only the Other Sector (which consists predominantly of firms in mining and quarrying industries) evades significantly less taxes than the manufacturing industries.

One of the concerns with using a general bribes variable is that our results on tax evasion may be being driven by firms that bribe tax authorities. Hence in col. 3 of Table 4, we drop firms that report bribing tax authorities. Since detailed breakdown of the types of bribes paid is not available for many firms, sample size is reduced from 25,426 to 17,938. Even with this smaller sample, we find that bribes to public officials ( excluding those to the tax inspectorate) are significantly associated with increased tax evasion.

In cols. 4-7 of Table 4 we use different regression specifications to see if our results are robust to choice of estimator. In col. 4, we use logit regressions where a dummy variable takes value 1 if firm reported evading taxes and 0 otherwise. While all our results remain unchanged, we do not use this for our main specification since we

would lose the variation in percentage of tax evasion by dichotomizing the tax evasion variable.

In col. 5, we use a two-limit tobit model to account for Tax Evasion taking on zero values with positive probability and being a continuous random variable over strictly positive values. With the tobit specification, we again find bribes to be strongly associated with tax evasion. As an alternative to tobit, we use a two stage hurdle model (Cameron and Trivedi (1998), Mullahy (1986)) in cols. 6 and 7 where in the first stage we look at the decision to evade taxes and in the second stage we look at the determinants of the extent of tax evasion. The advantage of using a hurdle model is that the processes generating zero outcomes are not constrained to be the same as those generating positive outcomes. Thus a binomial probability model governs the binary outcome of whether a firm reports zero or a positive value of tax evasion and if the tax evasion reported is positive, (i.e. the "hurdle is crossed"), then a truncated-at-zero count data model governs the realization of different levels of tax evasion. The hurdle model is estimated using maximum likelihood estimation as in McDowell (2002) so that there is no loss of information when fitting the hurdle model in two steps. The results from the hurdle model show that the level of bribe payments is associated with both the probability of tax evasion and the extent of tax evasion.

Given the interest on innovation, we analyze further the link between bribes and tax evasion for the sample of innovating firms using instrumental variables and local average treatment effects (LATE) as discussed in section 2.2. A valid instrument is one that is correlated with the endogenous regressor, but uncorrelated with the outcome variable for reasons beyond its effect on the endogenous regressor. Our analysis in Table

3 has shown us that innovation is highly correlated with the endogenous regressor, bribes. In addition, once we control for firm performance a firm's innovation capacity should have no impact on tax evasion. Thus we believe that innovation satisfies the second requirement of an exclusion restriction that innovation not have a direct causal effect on tax evasion.[28] In cols. 7 and 8 of Table 4 we instrument bribes and bribes dummy individually with innovation. The results show that for the sub-population of innovating firms whose bribe paying behavior is influenced by their innovation, we find bribes to be significantly associated with tax evasion. A detailed analysis of LATE is provided in Appendix A.

The first stage F-stats reported in the table reject the hypothesis that innovation is a weak instrument. However, just in case, all the IV regressions use the LIML estimator which is most robust to the weak instrument case. In addition our instruments pass a battery of tests of instruments. In the Anderson-Rubin test which allows for robust inference in the presence of weak instruments, the null hypothesis tested is that the coefficient of the endogenous regressor in the main equation is 0. The null is rejected in both cases as shown in cols. 7 and 8. The Kleibergen-Paap rk LM statistic is a test of whether the instrument satisfies the rank condition and a failure to reject the null suggests that the model is unidentified. Once again, the null is rejected in all cases in Panel A suggesting that the models are identified.

### *5.3. Distribution of firms as Victims vs. Perpetrators: Role of Finance*

[28] Though this is not in itself a test of the exclusion restriction, a casual examination reveals that Innovation is indeed insignificant in our tax evasion regressions.

In this section we use multinomial logit specification to understand the association between innovation, firm financing and firms' participation in illegal activities. The omitted category in all our specifications is Innocents, that is, firms that do not bribe and do not evade taxes.

In Panel A of Table 5 we regress Firm Type on Innovator, our indicator variable denoting whether the firm innovates. We find that in our sample, innovating firms are more likely to be Victims. There is no evidence that innovating firms are Perpetrators. Thus, being an innovator is not associated with a higher probability of avoiding taxes in the absence of corruption by government officials.

In Panel B we look at the effect of financing in addition to innovation. Model 1 of panel B shows that innovating firms and those dependent on Bank Financing are more likely to be Victims. There is no evidence that innovating firms or those that are bank financed are significantly associated with being Perpetrators. Since the number of observations in this model is reduced to 7400 due to the availability of bank finance, in model 2, we replace the bank financing variable with a firm's dependence on informal financing. Interestingly while innovators are more likely to be Victims as before, we find that informally financed firms, that is firms whose financing of new investments is sourced 50% or more from informal, family, and other sources are more likely to be Perpetrators. When we restrict the sample to low income and lower-middle income countries in Model 3, we again find that informal financing is associated with being Perpetrators.

Overall, the results from this table suggest that informal financing is associated with greater tax evasion and especially so in low income and lower middle income

countries. By contrast, bank financed firms are subject to more scrutiny and thus are less likely to evade taxes. The table also shows that innovating firms tend to be victimized by corruption..

It must be noted though that while all our specifications include country fixed effects that alleviates concerns about omitted variable bias, we are unable to address endogeneity concerns. The complexity of the relationships between the multiple endogenous variables – innovation and financing and the categorical dependent variable makes it tough to find multiple instruments at the firm-level in our survey data that affect innovation and financing but not firm participation in illegal behavior. Hence we leave the identification issues in this area for future work.

### *5.4. Bribe payments, Trust in the government, and Tax Evasion*

As discussed in section 2.3, in addition to the rational explanation for why bribe payments to public officials may be related to tax evasion there may be behavioral explanations based on the fact that bribes to public officials violates the social contract between the firm and the government and reduces the firm's proclivity to pay taxes. Thus the firm interprets bribes as an indicator of the government's future provision of public services. In this section, we test this directly by looking at the association between trust and bribes and tax evasion and trust. We begin by first examining whether bribe payments allow firms to benefit in some way in their interactions with public officials. Specifically, in col. 1 of panel A in Table 6, we regress the percentage of senior management's time in a week that is spent dealing with regulations imposed by various government officials on bribes. Next we regress firm's perceptions of the government on

bribes paid. We use Government Predictability and Property Rights as measures of trust in cols. 2 and 3 respectively.

**Insert Table 6**

In col. 1 of panel A we find that the time firms spend dealing with the bureaucracy is increasing in the percentage of sales paid out as bribe payments to public officials. Cols. 2 and 3 show that bribes paid also result in lower trust in the government. Greater the percentage of sales paid out as bribe payments, the firms perceive the government to be less predictable in its laws and regulations and less protective of property rights protection. In cols. 4-6, we try to identify the effect of bribes on trust for innovators using local average treatment effects via instrumental variables (IV) regressions where we instrument for Bribes using Innovators. As discussed earlier in section 3.2., instrumental variable regressions here help us identify the effect of corruption on government trust for the specific sub-sample of firms whose bribe-paying behavior was affected by their innovation. The IV results show that innovating firms that pay bribes tend to think the government to be less predictable and consistent in its interpretation of existing regulations than those innovating firms that do not pay bribes. We also find that innovating firms that bribe spend more time dealing with government regulations than innovating firms that do not pay bribes. When we look at property rights protection, we find that while the bribes coefficient is negative it is not significant suggesting that there is little evidence that innovating firms that bribe tend to have lower confidence in their property rights protection than innovating firms that do not bribe. In all cases, the first stage F-stats are above 10 and significant indicating that innovation is a good instrument for bribes. All the regressions are estimated using Limited Information

Maximum Likelihood (LIML) estimators which is the preferred estimator in the presence of weak instruments (Angrist and Krueger, 2001).

In unreported regressions, we perform several robustness tests of our results. First, using a dummy variable for bribes (Bribes Dummy =1 if Bribes>0 and Bribes Dummy=0 if Bribes=0) provides very consistent results with those reported in Table 6. Second, we find similar results when we use an alternate measure of trust, Government Efficiency**,** which is taken from firm responses to the survey question where firms were asked to rate the efficiency of the government in delivering services on a scale of 1 (very inefficient) to 6 (very efficient). We don't report these results since this variable is available for a much smaller sample of countries. Third, for 27 countries surveyed in 2005 across Europe and Central Asia (ECA), we have additional measures of judicial trust such as firms' perception on the quickness, fairness, honesty, enforcement and affordability of courts. Here again we find bribe payments to be strongly associated with lower trust in each of the cases.

In Panel B of Table 6, we examine the relationship between trust in the government and tax evasion. In cols. 1 and 2, we regress tax evasion on Government Predictability and Property Rights. We find that a higher level of trust in the government and the judicial system is associated with lower tax evasion levels. In cols. 3 and 4, we instrument the trust variables with bribes. In unreported specifications we repeat our instrumental variable estimations dropping firms that report bribing tax authorities to isolate the effect of bribes to public officials other than the tax inspectorate and find all our results to be robust. From panel A, we know that bribes are very strongly associated with the trust measures, satisfying the first condition for an instrument. In addition, our

model predicts that the association between bribes and tax evasion is mediated by trust considerations. Hence we believe that bribes satisfy the exclusion restriction that the only channel through which it impacts tax evasion is through trust considerations.

The instrumental variable specifications once again confirm the association between trust in the government and tax evasion. Interpretation of the IV estimates as LATE for the sample of firms that bribe, show that firms who are held-up by the government official and pay bribes lose trust in the government and hence evade more taxes. The first-stage F-stats are greater than 10 indicating that bribes is a good instrument for trust. In the last col. of Table 6 we go one step further by instrumenting Government Predictability with Innovation. We don't instrument Property Rights with Innovation since we already know from col. 6 in panel A that the casual link between bribes and property rights (judicial trust) using innovators as an instrument is not significant. Col. 5 of panel B also shows that innovators are more likely to evade taxes when they lose trust in the government (due to bribes demanded by public officials). In robustness checks, we find all our results are robust to using a bribes dummy instead of the continuous variable.

While current economic theory does not tell us the mechanisms through which bribe payments and tax evasion should be linked since bribe payments would be a sunk cost to firms, our findings on trust show that factors other than legal enforcement and rational considerations of agents in an economic model – play a key role in determining corporate crime.

### *5.5. Robustness using ECA Surveys*

In this section we perform robustness checks of our main results using a smaller sample of 27 countries across Europe and Central Asia (ECA) that were surveyed in 2005.[29] The data from the smaller sub-sample of countries have the following additional features that make it very attractive for robustness checks: First, as noted earlier, we have data on profit margin for about 6700 firms, where profit margin is defined as the margin by which sales price exceeds operating costs. We also have a dummy variable indicating whether or not the firm was profitable in 2003.

Second, we have several different measures of tax evasion. In addition to the raw measure of tax evasion that is used in the previous tables, we have information on **Tax Evasion _Wagebill** and **Tax Evasion_Labor**. Tax Evasion_Wagebill are firm responses to the survey question "Recognising the difficulties that many firms face in fully complying with labour regulations, what percentage of total workforce would you estimate the typical firm in your area of business reports for tax purposes?" and Tax Evasion_Labor are firm responses to the survey question "Recognising the difficulties that many firms face in fully complying with labour regulations, what percentage of total workforce would you estimate the typical firm in your area of business reports for tax purposes?"

Third in addition to the Government Predictability and Property Rights variables, we have seven other variables that could proxy for firms' beliefs in the judicial system – firms were asked to rate report how often they associated the following descriptions with

[29] The same sample of countries were surveyed in 2002 and we get similar results if we were to use the 2002 surveys. The firms surveyed in 2002 and 2005 were randomly chosen each year and hence we have panel data on less than 1500 firms that were surveyed by coincidence in both years. We do not run pooled regressions across both datasets since the profitability measures were defined differently in the two surveys.

the court system in resolving business disputes – fair and impartial, honest, quick, affordable and able to enforce its decisions.

**Insert Table 7**

We present our results in Table 7 where in addition to the usual set of control variables in eq. (3) we also control for Profit Margin. In panel A, we regress the different measures of Tax Evasion on bribes paid to public officials. Specifically, the OLS regressions in cols. 1 and 2 show that greater the bribes paid to public officials, firms under report their wage bill and labor for tax purposes. Instrumenting bribes with innovators in cols. 3 and 4 shows a stronger association between bribes and tax evasion for the sample of innovating firms whose bribe paying behavior was influenced by their innovation.

In Panel B, we present robustness of the relation between trust and tax evasion using this smaller sample of countries. We use the two different measures of tax evasion and in addition use five other measures of judicial trust that are taken from firm's ranking of their court system on quickness, fair and impartial, honest and uncorrupted, able to enforce decisions and affordability. In the interest of space we only present the IV specifications where each of these trust measures is instrumented with bribes. In all cases we find a strong causal link between firms' perception of the quality of the court system (judicial trust) and tax evasion.

## 6. Conclusion

A key policy issue in development finance is to design institutions that promote innovation and economic growth. In many countries there is considerable illegality in the

relations between government officials and firms. The very institutions designed to promote commerce and ensure a level playing field become platforms that permit state employees to hold up firms opportunistically. On their part, many firms underreport revenues to the state.

In this paper, we use a sample of 25,000 firms in 57 countries to study how the corruption by public employees affects innovation and firms' own dealings with the state's revenue authorities. We have four major findings:

First, innovating firms are more likely to pay bribes to government officials than firms that do not innovate. We find no evidence in our sample that firms that pay bribes have better outcomes than firms that do not pay bribes. Executives of innovating firms spend more time with government officials and the time they spend with officials is predicts the amount of bribes that they pay. Thus, government corruption seems to affect innovating firms disproportionately. We also find small, young and individual or family owned firms pay more bribes than larger and older firms and firms with other ownership structures.

Second, firms that have pay bribes report lower confidence in the government and in the predictability of its rules. Firms that report lower trust in the government are more likely to underreport their revenues to the government. Innovating firms, in particular, that pay bribes have lower confidence in the government and evade more taxes.

Third, when we examine the net burden of corruption and tax evasion across firms, we find that being an innovator increases the probability that the firm pays bribes but does not evade taxes. Thus innovating firms are more likely to be victims of corruption

and less likely to  be perpetrators who cheat on their taxes without having to pay any bribes.

Fourth, the firm's financing source predicts how the firm deals with the government. Bank financing increases the probability that the firm pays bribes but does not underreport income for tax purposes. By contrast, informal financing increases the probability that the firm misreports revenue without paying bribes.

Taken together, these results point to the costs of corruption imposed on firms. Its incidence is highest on innovating firms. In addition, innovating firms and firms that rely on formal bank financing are more likely to pay bribes and not evade taxes. Thus, corruption is likely to have an indirect effect on innovation and the viability of the financial sector by indirectly subsidizing informal finance. Finally, corruption is associated with a loss of trust in the government, which, besides predicting lower compliance with tax laws, is likely to have negative consequences for contracting between firms and the state.

More broadly, our results suggest that bribery of government officials has more complex consequences beyond that of a simple transaction between a corrupt official and a firm. On the one hand, some firms retaliate and recoup the cost of the bribes by underreporting revenues. The economic cost of corruption for those firms might be much lower than the cost of bribes would suggest. On the other hand, the loss of trust involved, and the uneven incidence of bribes between innovating and non-innovating firms, and firms that use the formal financial system and firms that do not, may have an additional distortionary effect.

## Appendix A: Analysis of Local Average Treatment Effects (LATE)

A commonly established insight from recent econometric analysis on the use of instruments (e.g. Heckman 1994; Imbens and Angrist, 1994; Deaton, 2009) is that in situations with heterogeneous responses to treatment, instrumental variables are unable to identify the average effect of treatment in the population. Instead, instrumental variables identify the average effect of treatment for a well-defined sub-population whose behavior is modified by the instrument, known as the "local average treatment effect" (LATE). In our paper where we explore the analysis between bribe payments and tax evasion, we have a similar situation where there are several mechanisms through which corruption and tax evasion may be related which may vary with the context (heterogeneous effects). Hence we use LATE to identify the average causal effect of bribes on tax evasion for a sub-population of innovating firms whose bribe paying behavior is affected by their innovation. The discussion of local average treatment effects below follows the discussion in Imbens and Angrist (1994) and Imbens (2007).

For simplicity, let us denote tax evasion, the outcome variable, by $Y_i$; bribe payments, the treatment indicator, by *Wi*, and innovation, the instrument by $Z_i$. The raw data from our regression sample reveal that 10409 firms report no bribes and no innovation (*Compliers and Never Bribers*), 5459 firms report innovation but no bribes (*Never Bribers and Defiers*), 5475 report bribes but no innovation (*Always Bribers and Defiers*) and 3762 report both bribes and innovation (*Compliers and Always Bribers*). Using this data we can obtain the proportions of various compliance types under the no-defiers or monotonicity assumption. Thus we have:

Proportion of Defiers, $\pi_d = 0$ by assumption.

Proportion of Never Bribers, $\pi_n$ = E[$W_i$| $Z_i$=1] = 5459/(5459+3762)=0.5920.

Proportion of Always Bribers, $\pi_a$ = E[$W_i$| $Z_i$=0] = 5475/(5475+10409) = 0.3447.

Proportion of Compliers, $\pi_c$ = E[$W_i$| $Z_i$=1] – E[$W_i$| $Z_i$=0]

= 3762/(3762+5459) – 5475/(5475+10409) = 0.4080-0.3447

= 0.0633

The average tax evasion numbers in our data is as follows: Average tax evasion when bribes=innovation=0 is 13.11%, when bribes=1 and innovation =0 is 20.01%, bribes=0 and innovation=1 is 12.92%, and bribes=innovation=1 is 22.34%. These numbers can be interpreted in terms of average tax evasion by treatment and instrument status as follows:

E[$Y_i$| $W_i$=0, $Z_i$=1] = 12.92% = E[$Y_i$(0)| Never Briber]

E[$Y_i$| $W_i$=1, $Z_i$=0] = 20.01% = E[$Y_i$(1)| Always Briber]

When ($Z_i$, $W_i$) are equal to (0,0) or (1,1), the conditional outcome expectations are combinations of the expected values for compliers and never bribers and compliers and always bribers respectively:

$$E[Y_i \mid W_i = 0, Z_i = 0] = \frac{\pi_c}{\pi_c + \pi_n} E[Y_i(0) \mid complier] + \frac{\pi_n}{\pi_c + \pi_n} E[Y_i(0) \mid never - briber]$$

and

$$E[Y_i \mid W_i = 1, Z_i = 1] = \frac{\pi_c}{\pi_c + \pi_a} E[Y_i(0) \mid complier] + \frac{\pi_a}{\pi_c + \pi_a} E[Y_i(0) \mid always - briber]$$

From the above, we then have:

$$E[Y_i(0) \mid complier] = \frac{\pi_c + \pi_n}{\pi_c} E[Y_i \mid W_i = 0, Z_i = 0] - \frac{\pi_n}{\pi_c} E[Y_i \mid W_i = 0, Z_i = 1]$$

$$= \frac{0.0633 + 0.5920}{0.0633} \times 13.11 - \frac{0.5920}{0.0633} \times 12.92 = 14.89\%$$

$$E[Y_i(1)\,|\,complier] = \frac{\pi_c + \pi_a}{\pi_c} E[Y_i\,|\,W_i = 1, Z_i = 1] - \frac{\pi_a}{\pi_c} E[Y_i\,|\,W_i = 1, Z_i = 0]$$

$$= \frac{0.0633 + 0.3447}{0.0633} \times 22.34 - \frac{0.3447}{0.0633} \times 20.01 = 35.03\%$$

Thus the local average treatment effect for compliers = 35.03 – 14.89 = 20.14, that is a 20.14% increase in tax evasion as a result of having to pay bribes. Note that the coefficient of 15.263 in col. 9 of Table 4 is different from 20.14 since the IV estimation includes other control variables. A simple IV without any control variables reveals the bribes dummy coefficient to 20.18%, the same as shown in the LATE analysis.

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# Table 1: Bribes and Tax Evasion across Countries and Firms

This table presents the average bribe payments and tax evasion across different country classification and different types of firms. The variables are described as follows: Bribes is the percent of annual sales value that a typical firm spends on gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. Tax Evasion is the percentage of total sales the typical establishment does not report for tax purposes. To capture the net burden of corruption on firms, we construct a Firm Type variable which takes on four values: Innocents if the firm reports paying no bribes and evading no taxes, Perpetrators if the firm reports paying no bribes but does report evading taxes, Victims if the firm reports paying bribes but not evading taxes, and Retaliators if the firm reports paying bribes and evading taxes. Detailed variable definitions and sources are provided in the appendix.

## Across Countries

| | # of Countries | Bribes | Tax Evasion | Innocents Tax Evasion=0, Bribes=0 | Perpetrators Tax Evasion >0, Bribes=0 | Victims Tax Evasion =0, Bribes>0 | Retaliators Tax Evasion >0, Bribes>0 |
|---|---|---|---|---|---|---|---|
| ***Panel A: Across Regions*** | | | | | | | |
| Africa | 12 | 2.00 | 23.18 | 39.27% | 25.84% | 11.90% | 22.98% |
| East Asia Pacific | 6 | 1.92 | 27.00 | 26.60% | 21.11% | 16.55% | 35.74% |
| Europe and Central Asia | 35 | 1.26 | 14.56 | 41.87% | 22.51% | 13.66% | 21.97% |
| Latin America and the Caribbean | 10 | 2.57 | 25.07 | 33.82% | 30.31% | 10.19% | 25.69% |
| Middle East and North Africa | 5 | 3.72 | 25.23 | 30.76% | 22.54% | 16.29% | 30.41% |
| South Asia (Sri Lanka) | 3 | 1.56 | 7.56 | 49.23% | 35.08% | 9.23% | 6.46% |
| *Total* | 71 | | | | | | |
| ***Panel B: Across Legal Origin*** | | | | | | | |
| Common | 11 | 1.50 | 17.93 | 40.30% | 29.99% | 8.93% | 20.77% |
| French | 26 | 2.24 | 23.57 | 37.95% | 26.87% | 12.64% | 22.54% |
| German | 2 | 0.23 | 7.83 | 43.80% | 31.04% | 12.02% | 13.15% |
| Socialist | 31 | 1.58 | 16.56 | 39.02% | 18.61% | 15.33% | 27.05% |
| *Total* | 70 | | | | | | |
| ***Panel C: Across Religions*** | | | | | | | |
| Catholic | 20 | 1.66 | 17.42 | 43.13% | 24.91% | 11.14% | 20.82% |
| Muslim | 16 | 2.19 | 26.97 | 30.95% | 26.44% | 14.72% | 27.89% |
| Others | 32 | 1.50 | 16.68 | 40.41% | 19.82% | 15.08% | 24.69% |
| Protestant | 3 | 0.99 | 13.64 | 43.75% | 23.45% | 10.79% | 22.00% |
| *Total* | 71 | | | | | | |
| ***Panel D: Across Ethnic Fractionalization Terciles*** | | | | | | | |
| 1 (0.8-14.4, 9.09) | 23 | 1.59 | 16.67 | 40.02% | 22.65% | 12.70% | 24.62% |

| | # of Countries | Bribes | Tax Evasion | Innocents Tax Evasion=0, Bribes=0 | Perpetrators Tax Evasion >0, Bribes=0 | Victims Tax Evasion =0, Bribes>0 | Retaliators Tax Evasion >0, Bribes>0 |
|---|---|---|---|---|---|---|---|
| 2 (14.6-26.3, 19.58) | 23 | 1.55 | 18.31 | 42.28% | 21.03% | 13.40% | 23.30% |
| 3 (26.4-36.7, 32.12) | 22 | 1.88 | 22.03 | 36.23% | 24.61% | 14.97% | 24.19% |
| *Total* | 68 | | | | | | |
| ***Panel E: Across Latitudes Terciles*** | | | | | | | |
| 1 | 27 | 2.31 | 25.51 | 31.53% | 28.24% | 13.35% | 26.88% |
| 2 | 19 | 1.64 | 17.35 | 43.90% | 19.45% | 12.83% | 23.82% |
| 3 | 24 | 1.25 | 13.65 | 43.15% | 21.29% | 13.83% | 21.72% |
| *Total* | 70 | | | | | | |
| ***Panel F: Across Trust Terciles*** | | | | | | | |
| 1 | 21 | 1.21 | 20.76 | 41.12% | 24.13% | 12.25% | 22.50% |
| 2 | 17 | 1.31 | 12.89 | 43.39% | 21.97% | 14.62% | 20.02% |
| 3 | 7 | 0.88 | 13.96 | 43.63% | 17.62% | 16.71% | 22.04% |
| *Total* | 45 | | | | | | |
| ***Panel G: Across Statutory Corporate Tax Rate Terciles*** | | | | | | | |
| 1 (12.5-26.7, 20.50) | 18 | 1.22 | 11.68 | 46.23% | 18.28% | 14.96% | 20.53% |
| 2 (27.5-33, 30.59) | 17 | 1.33 | 23.35 | 36.27% | 26.91% | 13.17% | 23.65% |
| 3 (34-41, 35.96) | 9 | 1.49 | 14.40 | 43.19% | 24.29% | 13.02% | 19.51% |
| *Total* | 44 | | | | | | |

## Across Firms

| | # of Firms | Bribes | Tax Evasion | Innocents Tax Evasion=0, Bribes=0 | Perpetrators Tax Evasion >0, Bribes=0 | Victims Tax Evasion =0, Bribes>0 | Retaliators Tax Evasion >0, Bribes>0 |
|---|---|---|---|---|---|---|---|
| ***Panel H: Across Firm Sizes*** | | | | | | | |
| Small (<20) | 17041 | 1.54 | 19.01 | 37.78% | 26.91% | 11.55% | 23.76% |
| Medium (20-99) | 13086 | 1.5 | 17.96 | 40.40% | 19.41% | 15.90% | 24.29% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Large (100 and over) | 9999 | 1.14 | 14.55 | 48.46% | 15.81% | 18.28% | 17.45% |
| *Total* | 40126 | | | | | | |
| ***Panel I: Across Ownership*** | | | | | | | |
| Domestic | 35594 | 1.44 | 18.49 | 40.15% | 23.35% | 13.78% | 22.72% |
| Foreign | 5051 | 1.31 | 12.59 | 47.15% | 13.20% | 19.17% | 20.48% |
| *Total* | 40645 | | | | | | |
| ***Panel J: Across Exporter Status*** | | | | | | | |
| Non-exporter | 31484 | 1.48 | 18.29 | 40.23% | 22.83% | 13.84% | 23.10% |
| Exporter | 8910 | 1.22 | 15.66 | 44.44% | 19.07% | 16.59% | 19.90% |
| *Total* | 40394 | | | | | | |
| ***Panel K: Across Industry Sector*** | | | | | | | |
| Agro Industry | 615 | 2.21 | 31.35 | 31.25% | 28.13% | 7.59% | 33.04% |
| Construction | 2767 | 1.68 | 14.53 | 35.24% | 18.64% | 18.17% | 27.95% |
| Other | 303 | 1.01 | 10.69 | 46.84% | 15.19% | 21.94% | 16.03% |
| Services | 12900 | 1.17 | 14.54 | 41.97% | 20.49% | 14.44% | 23.10% |
| Manufacturing | 24074 | 1.54 | 19.67 | 41.43% | 23.58% | 14.05% | 20.94% |
| *Total* | 40659 | | | | | | |
| ***Panel L: Across Legal Status*** | | | | | | | |
| Cooperative | 837 | 1.88 | 24.38 | 34.73% | 20.47% | 13.18% | 31.63% |
| Corporations | 16734 | 1.28 | 17.19 | 45.64% | 19.44% | 14.91% | 20.01% |
| Sole Proprietorship | 10769 | 1.55 | 20.3 | 36.11% | 28.59% | 11.44% | 23.87% |
| Partnership | 6784 | 1.49 | 14.93 | 37.76% | 20.34% | 16.96% | 24.94% |
| Other | 3927 | 1.14 | 18.84 | 46.62% | 17.40% | 15.96% | 20.03% |
| *Total* | 39051 | | | | | | |

# Table 2: Summary Statistics and Correlations

Panel A presents summary statistics and panel B presents the correlation matrix between the main variables of interest. The variables are described as follows: Bribes is constructed from firm responses to the survey question *What percent of annual sales value does a typical firm like yours spend on gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc?* Tax Evasion is 1-Tax Compliance where Tax Compliance is constructed from firm responses to the survey question *Recognizing the difficulties many enterprises face in fully complying with taxes and regulations, what percentage of total sales would you estimate the typical establishment in your area of activity reports for tax purposes?* Informal Financing is a dummy variable that takes the value 1 if the firm reported that the sum of Family, Informal (e.g. moneylender), and Other financing of new investments or working capital is 50% or greater. Bank Financing is a dummy variable that takes the value 1 if the firm reported having a current bank loan or overdraft facility and 0 if the firm said it did not currently have access to a bank loan or overdraft facility. Past Bank Access is a dummy variable which takes the value 1 if the firm reported having access to a current bank loan or in the recent past (after 1999). New Product Innovation is a dummy variable which takes the value 1 if the firm developed a new product line and 0 otherwise. Capacity Utilization is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm's existing machinery and equipment and regular shifts. Firm Size dummies take values 1 to 3 for Small firms (1-19 employees), Medium firms (20-99 employees), and Large firms (>=100 employees). Corporation, Partnership, Cooperative, Sole Proprietorship, and Other Legal Status are all dummy variables that take the value 1 if the firm is of the corresponding legal form and 0 otherwise. Firm age is the year of the survey -year established. Sector Dummies are 5 industry sector dummies for Agroindustry, Manufacturing, Construction, Services, and Other. Foreign Ownership is a dummy variable that takes the value 1 if the firm is foreign owned and 0 otherwise. Exporter is a dummy variable that takes the value 1 if the firm is an exporter and 0 is it is a non-exporter.

***Panel A: Summary Statistics***

| Variable | N | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Bribes | 25761 | 1.34 | 4.53 | 0 | 100 |
| Tax Evasion | 28375 | 17.10 | 25.73 | 0 | 100 |
| Innocents | 24179 | 0.41 | 0.49 | 0 | 1 |
| Perpetrators | 24179 | 0.22 | 0.42 | 0 | 1 |
| Victims | 24179 | 0.14 | 0.35 | 0 | 1 |
| Retaliators | 24179 | 0.22 | 0.42 | 0 | 1 |
| Informal Financing | 21384 | 0.14 | 0.35 | 0 | 1 |
| Bank Financing | 14143 | 0.49 | 0.50 | 0 | 1 |
| New Product Innovation | 25761 | 0.37 | 0.48 | 0 | 1 |
| Capacity Utilization | 25761 | 78.80 | 20.40 | 1 | 106 |
| Labor Productivity Ratio | 16978 | 0.84 | 2.25 | 1.68E-06 | 86.76 |
| Sales Growth | 7470 | 0.13 | 0.70 | -7.61 | 7.94 |
| Firm Size Dummies | 25761 | 1.71 | 0.78 | 1 | 3 |
| Corporation | 25761 | 0.39 | 0.49 | 0 | 1 |
| Partnership | 25761 | 0.21 | 0.41 | 0 | 1 |
| Cooperative | 25761 | 0.02 | 0.14 | 0 | 1 |
| Sole Proprietorship | 25761 | 0.32 | 0.47 | 0 | 1 |
| Other Legal Status | 25761 | 0.06 | 0.24 | 0 | 1 |
| Age | 25761 | 15.62 | 15.96 | 0 | 202 |
| Sector Dummies | 25761 | 1.66 | 0.89 | 1 | 5 |
| Foreign Ownership Dummies | 25761 | 0.13 | 0.34 | 0 | 1 |
| Exporter Dummy | 25761 | 0.21 | 0.41 | 0 | 1 |

***Panel B: Correlation Matrix***

| | Bribes | Tax Evasion | Informal Financing | Bank Financing | Past Bank Access | New Product Innovation |
|---|---|---|---|---|---|---|
| Tax Evasion | 0.1379[a] | | | | | |
| Informal Financing | 0.0602[a] | 0.13[a] | | | | |
| Bank Financing | -0.0486[a] | -0.0882[a] | -0.215[a] | | | |
| Past Bank Access | -0.0942[a] | -0.1969[a] | -0.2561[a] | 1 | | |
| New Product Innovation | 0.0431[a] | 0.0404[a] | -0.0181[a] | 0.1768[a] | 0.1087[a] | |
| Capacity Utilization | -0.0765[a] | -0.1203[a] | -0.0934[a] | 0.1257[a] | 0.1999[a] | -0.0127[b] |

[a], [b], and [c] represent significance at 1%, 5%, and 10% respectively.

## Table 3: Corruption as a tax on Innovation

The regression model estimated is Bribes/Bribes Dummy = $\alpha$ +$\beta_1$ Innovator +$\beta_2$ Capacity Utilization + $\beta_3$ Sales Growth + $\beta_4$ Labor Productivity + $\beta_5$ Firm Size dummies + $\beta_6$ Family Owned dummy + $\beta_7$Legal Status dummies + $\beta_8$Age + $\beta_9$Foreign Ownership dummy+ $\beta_{10}$ Exporter dummy + $\beta_{11}$ Industry Sector Dummies + $\beta_{12}$Year Dummies + $\beta_{13}$Country Dummies + e. Bribes is the percent of annual sales value that a typical firm spends on gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. Bribes Dummy is a dummy variable that takes the value 1 if Bribes>0 and 0 if Bribes=0. Innovator is a dummy variable which takes the value 1 if the firm developed a new product line and 0 otherwise. Capacity Utilization is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm's existing machinery and equipment and regular shifts. Sales Growth is defined as the percentage increase in sales over the past year. Labor Productivity is the ratio of Firm Size dummies take values 1 to 3 for Small firms (1-19 employees), Medium firms (20-99 employees), and Large firms (>=100 employees).Family Owned dummy takes the value 1 if the largest shareholder is an individual or family. Legal Status Dummies consist of dummy variables for the following legal forms - Corporation, Partnership, Cooperative, Sole Proprietorship (omitted category), and Other Legal Status. Firm age is the year of the survey -year established. Foreign Ownership is a dummy variable that takes the value 1 if the firm is foreign owned and 0 otherwise. Exporter is a dummy variable that takes the value 1 if the firm is an exporter and 0 is it is a non-exporter. The regressions in cols. 1-8 are estimated using ordinary least squares with standard errors clustered at the country level. In col. 9 we use logit estimation and in col. 10 we use two-limit tobit specification.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | OLS | | | | | | | | Logit | 2-limit Tobit |
| | Full Sample | Full Sample | Full Sample | Full Sample | Only Small Firms | Only Manufacturing | Drop Agro Industry | Drop firms that bribe tax authorities | Full Sample | Full Sample |
| | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes Dummy | Bribes |
| Innovator | 0.371[a] | 0.370[a] | 0.380[a] | 0.581[a] | 0.606[a] | 0.416[a] | 0.374[a] | 0.317[a] | 0.313[a] | 1.328[a] |
| | (0.072) | (0.073) | (0.100) | (0.195) | (0.130) | (0.117) | (0.074) | (0.089) | (0.036) | (0.133) |
| Capacity Utilization | | -0.008[a] | -0.007[a] | -0.009[b] | -0.012[a] | -0.005[b] | -0.008[a] | -0.007[a] | -0.005[a] | -0.024[a] |
| | | (0.002) | (0.002) | (0.004) | (0.002) | (0.002) | (0.002) | (0.002) | (0.001) | (0.003) |
| Labor Productivity | | | -0.019[c] | | | | | | | |
| | | | (0.011) | | | | | | | |
| Sales Growth | | | | -0.016 | | | | | | |
| | | | | (0.090) | | | | | | |
| Medium | -0.125 | -0.113 | -0.080 | -0.126 | | -0.222 | -0.128[c] | -0.195[c] | 0.183[a] | 0.278[c] |
| | (0.077) | (0.076) | (0.105) | (0.256) | | (0.133) | (0.073) | (0.104) | (0.040) | (0.154) |
| Large | -0.372[a] | -0.332[a] | -0.319[b] | -0.351 | | -0.437[a] | -0.339[a] | -0.391[a] | -0.021 | -0.561[a] |
| | (0.099) | (0.101) | (0.138) | (0.293) | | (0.156) | (0.101) | (0.109) | (0.061) | (0.207) |
| Age | -0.006[a] | -0.007[a] | -0.006[a] | -0.010[b] | -0.011[b] | -0.007[a] | -0.007[a] | -0.004[b] | -0.004[a] | -0.025[a] |
| | (0.002) | (0.002) | (0.002) | (0.004) | (0.005) | (0.002) | (0.002) | (0.002) | (0.001) | (0.005) |
| Family Owned | 0.178[a] | 0.178[a] | 0.183[b] | 0.444[a] | 0.113 | 0.185[c] | 0.178[a] | 0.144[b] | 0.154[a] | 0.653[a] |
| | (0.061) | (0.062) | (0.076) | (0.133) | (0.097) | (0.096) | (0.062) | (0.060) | (0.052) | (0.142) |
| Corporation | 0.075 | 0.064 | 0.0826 | 0.212 | 0.157 | 0.246 | 0.084 | 0.097 | 0.135 | 0.456[b] |

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | OLS | | | | | | | | Logit | 2-limit Tobit |
| | Full Sample | Full Sample | Full Sample | Full Sample | Only Small Firms | Only Manufacturing | Drop Agro Industry | Drop firms that bribe tax authorities | Full Sample | Full Sample |
| | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes Dummy | Bribes |
| | (0.103) | (0.103) | (0.117) | (0.297) | (0.154) | (0.166) | (0.101) | (0.120) | (0.097) | (0.193) |
| Partnership | 0.008 | -0.0004 | 0.005 | 0.304 | -0.023 | 0.071 | 0.012 | 0.047 | 0.250[a] | 0.672[a] |
| | (0.075) | (0.073) | (0.089) | (0.286) | (0.126) | (0.126) | (0.073) | (0.116) | (0.076) | (0.197) |
| Cooperatives | 0.169 | 0.137 | -0.128 | 0.374 | 0.378 | 0.376 | 0.190 | 0.0645 | 0.0441 | 0.367 |
| | (0.280) | (0.269) | (0.162) | (0.644) | (0.441) | (0.325) | (0.271) | (0.138) | (0.118) | (0.556) |
| Other Legal Status | -0.061 | -0.074 | 0.033 | 0.050 | 0.110 | 0.068 | -0.046 | -0.067 | 0.156 | 0.423 |
| | (0.179) | (0.178) | (0.222) | (0.228) | (0.291) | (0.211) | (0.182) | (0.182) | (0.104) | (0.332) |
| Foreign Ownership | -0.071 | -0.061 | 0.0631 | 0.199 | 0.110 | -0.116 | -0.056 | 0.066 | 0.015 | -0.063 |
| | (0.097) | (0.098) | (0.109) | (0.209) | (0.269) | (0.124) | (0.099) | (0.102) | (0.057) | (0.200) |
| Exporter | -0.006 | -0.001 | -0.036 | -0.102 | 0.354[c] | -0.092 | 0.010 | -0.028 | 0.147[a] | 0.371[b] |
| | (0.083) | (0.084) | (0.102) | (0.179) | (0.197) | (0.113) | (0.084) | (0.091) | (0.042) | (0.174) |
| Services | 0.054 | 0.089 | 0.098 | 0.528 | 0.148[c] | | 0.090 | 0.095 | 0.365[a] | 1.094[a] |
| | (0.062) | (0.062) | (0.089) | (0.608) | (0.086) | | (0.063) | (0.075) | (0.099) | (0.180) |
| Agro Industry | -0.004 | 0.011 | 0.338 | 0.517 | 0.474 | | | 0.269 | -0.048 | 0.296 |
| | (0.279) | (0.259) | (0.416) | (0.512) | (0.581) | | | (0.350) | (0.206) | (0.699) |
| Construction | 0.691[a] | 0.713[a] | 0.597[a] | 0.375 | 0.732[a] | | 0.717[a] | 0.577[a] | 0.796[a] | 3.072[a] |
| | (0.096) | (0.096) | (0.128) | (0.850) | (0.139) | | (0.096) | (0.115) | (0.111) | (0.262) |
| Other Sector | 0.338 | 0.341 | 0.598 | -0.708 | -0.307 | | 0.316 | 0.175 | 0.208 | 1.119 |
| | (0.260) | (0.257) | (0.379) | (0.503) | (0.533) | | (0.266) | (0.184) | (0.250) | (0.803) |
| Constant | 2.630[a] | 3.254[a] | 1.694[a] | 1.698[a] | 3.307[a] | 2.477[a] | 3.213[a] | 2.101[a] | 0.948[a] | 1.659[a] |
| | (0.128) | (0.172) | (0.282) | (0.513) | (0.242) | (0.233) | (0.173) | (0.200) | (0.128) | (0.611) |
| # of Firms | 25761 | 25761 | 16978 | 7470 | 12745 | 13594 | 25482 | 18178 | 25761 | 25761 |
| # of Countries | 57 | 57 | 53 | 31 | 57 | 57 | 57 | 57 | 57 | 57 |
| Adjusted R-sq | 0.055 | 0.056 | 0.047 | 0.034 | 0.062 | 0.041 | 0.056 | 0.055 | | |

[a], [b], and [c] represent significance at 1%, 5%, and 10% respectively

## Table 4: Bribe Payments and Tax Evasion

In cols. 1-7, the regression model estimated is Tax Evasion /Evader Dummy = $\alpha_0$ +$\beta_1$ Bribes/Bribes Dummy +$\beta_2$ Capacity Utilization + $\beta_3$ Sales Growth + $\beta_4$ Labor Productivity + $\beta_5$ Firm Size dummies + $\beta_6$ Family Owned dummy + $\beta_7$Legal Status dummies + $\beta_8$Age + $\beta_9$Foreign Ownership dummy+ $\beta_{10}$ Exporter dummy + $\beta_{11}$ Industry Sector Dummies + $\beta_{12}$Year Dummies + $\beta_{13}$Country Dummies + e. In columns 8-9, the second stage regression is the same as the regression specification in (1) except that Bribes is the predicted value from the first stage regression. The First stage regression is Bribes = $\alpha_1$ +$\gamma_1$ Innovator +$\gamma_2$ Capacity Utilization + $\gamma_3$ Sales Growth +$\gamma_4$ Labor Productivity + $\gamma_5$ Firm Size dummies +$\gamma_6$ Family Owned dummy + $\gamma_7$Legal Status dummies + $\gamma_8$Age + $\gamma_9$Foreign Ownership dummy+ $\gamma_{10}$ Exporter dummy + $\gamma_{11}$ Industry Sector Dummies + $\gamma_{12}$Year Dummies + $\gamma_{13}$Country Dummies + e. Tax Evasion is the percent of annual sales that a typical firm under-reports for tax purposes. Evader is a dummy variable that takes the value 1 if Tax Evasion >0 and 0 if Tax Evasion=0. Bribes is the percent of annual sales value that a typical firm spends on gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. Bribes Dummy is a dummy variable that takes the value 1 if Bribes>0 and 0 if Bribes=0. Innovator is a dummy variable which takes the value 1 if the firm developed a new product line and 0 otherwise. Innovator is a dummy variable which takes the value 1 if the firm developed a new product line and 0 otherwise. Capacity Utilization is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm's existing machinery and equipment and regular shifts. Firm Size dummies take values 1 to 3 for Small firms (1-19 employees), Medium firms (20-99 employees), and Large firms (>=100 employees).Family Owned dummy takes the value 1 if the largest shareholder is an individual or family. Legal Status Dummies consist of dummy variables for the following legal forms - Corporation, Partnership, Cooperative, Sole Proprietorship (omitted category), and Other Legal Status. Firm age is the year of the survey -year established. Foreign Ownership is a dummy variable that takes the value 1 if the firm is foreign owned and 0 otherwise. Exporter is a dummy variable that takes the value 1 if the firm is an exporter and 0 is it is a non-exporter. The regressions in columns 1-3 are estimated using ordinary least squares with standard errors clustered at the country level. In col. 4 we use logit estimation, in col. 5 we use two-limit tobit estimation and in cols. 6-7 we estimate a two-step hurdle model (see Cameron and Trivedi, 1998). The regressions in 8-9 are IV regressions with robust standard errors.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| | Tax Evasion | Tax Evasion | Tax Evasion | Evader Dummy | Evader Dummy | Evader Dummy | Tax Evasion | Tax Evasion | Tax Evasion |
| | | | Drop firms that bribe tax authorities | Logit | Tobit | Two Step Hurdle Model | | Instrumenting bribes with innovation | |
| Bribes | 0.532[a] | | 0.389[a] | 0.084[a] | 0.022[a] | 0.025[a] | 0.010[a] | 2.642[a] | |
| | (0.084) | | (0.077) | (0.019) | (0.001) | (0.004) | (0.002) | (0.978) | |
| Bribes Dummy | | 6.133[a] | | | | | | | 15.263[a] |
| | | (1.360) | | | | | | | (5.343) |
| Capacity Utilization | -0.037[a] | -0.035[a] | -0.030[a] | -0.003[a] | -0.002[a] | -0.002[b] | -0.002[b] | -0.017 | -0.024[b] |
| | (0.010) | (0.010) | (0.011) | (0.001) | (0.000) | (0.001) | (0.001) | (0.012) | (0.010) |
| Medium | -1.878[a] | -2.168[a] | -1.434[b] | -0.160[a] | -0.071[a] | -0.121[a] | -0.127[a] | -1.822[a] | -2.637[a] |
| | (0.408) | (0.430) | (0.601) | (0.044) | (0.016) | (0.031) | (0.031) | (0.398) | (0.442) |
| Large | -3.395[a] | -3.619[a] | -2.750[a] | -0.433[a] | -0.204[a] | -0.328[a] | -0.267[a] | -2.958[a] | -3.732[a] |
| | (0.921) | (0.944) | (1.019) | (0.084) | (0.022) | (0.065) | (0.055) | (0.545) | (0.495) |
| Age | -0.030[c] | -0.029[c] | -0.025 | -0.004[b] | -0.002[a] | -0.003[a] | -0.002[c] | -0.017 | -0.023[b] |
| | (0.016) | (0.017) | (0.017) | (0.001) | (0.000) | (0.001) | (0.001) | (0.012) | (0.010) |
| Family Owned | 0.805 | 0.629 | 0.124 | 0.226[a] | 0.124[a] | 0.178[a] | 0.164[a] | 0.137 | 0.099 |
| | (0.792) | (0.803) | (0.825) | (0.076) | (0.019) | (0.058) | (0.044) | (0.516) | (0.505) |
| Corporation | -1.305 | -1.458 | -1.960 | -0.217[c] | -0.100[a] | -0.117 | -0.044 | -1.518[a] | -1.772[a] |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1.751) | (1.880) | (1.657) | (0.114) | (0.019) | (0.086) | (0.078) | (0.451) | (0.455) |
| Partnership | -1.567[b] | -1.905[b] | -1.988[c] | -0.096 | -0.044[b] | -0.058 | -0.071 | -1.566[a] | -2.444[a] |
| | (0.736) | (0.723) | (1.017) | (0.074) | (0.020) | (0.053) | (0.050) | (0.447) | (0.503) |
| Cooperatives | -1.289 | -1.296 | -0.623 | -0.256[b] | -0.124[b] | -0.155 | 0.000 | -2.350[b] | -2.007[c] |
| | (1.391) | (1.388) | (1.687) | (0.124) | (0.054) | (0.098) | (0.083) | (1.139) | (1.110) |
| Other Legal Status | -3.032 | -3.170 | -2.002 | -0.365[b] | -0.159[a] | -0.245[b] | -0.051 | -2.144[b] | -2.712[a] |
| | (2.014) | (2.016) | (2.107) | (0.148) | (0.033) | (0.098) | (0.078) | (0.903) | (0.868) |
| Foreign Ownership | -3.721[a] | -3.792[a] | -3.474[a] | -0.345[a] | -0.162[a] | -0.279[a] | -0.113[b] | -3.647[a] | -3.917[a] |
| | (1.040) | (1.067) | (1.059) | (0.074) | (0.022) | (0.055) | (0.051) | (0.500) | (0.480) |
| Exporter | 0.384 | 0.210 | 0.381 | -0.052 | -0.023 | -0.039 | 0.003 | 0.487 | 0.060 |
| | (0.570) | (0.577) | (0.578) | (0.050) | (0.018) | (0.037) | (0.047) | (0.450) | (0.474) |
| Services | -1.501 | -1.857 | -2.245 | -0.030 | -0.013 | -0.043 | -0.106 | -1.490[a] | -2.366[a] |
| | (1.631) | (1.671) | (1.813) | (0.103) | (0.018) | (0.082) | (0.084) | (0.366) | (0.495) |
| Agro Industry | 1.382 | 1.541 | 0.459 | 0.150 | 0.029 | 0.037 | 0.090 | 2.181 | 2.652 |
| | (2.786) | (2.909) | (2.744) | (0.351) | (0.062) | (0.192) | (0.071) | (2.373) | (1.937) |
| Construction | -0.541 | -1.106 | -1.183 | 0.109 | 0.060[b] | 0.081 | -0.060 | -1.609[c] | -2.236[b] |
| | (1.327) | (1.264) | (1.663) | (0.119) | (0.027) | (0.088) | (0.075) | (0.849) | (0.990) |
| Other Sector | -3.429[b] | -3.509[a] | -3.010[c] | -0.157 | -0.086 | -0.113 | -0.190[c] | -3.799[a] | -3.583[a] |
| | (1.358) | (1.314) | (1.615) | (0.188) | (0.085) | (0.143) | (0.113) | (1.422) | (1.356) |
| Constant | 30.551[a] | 27.805[a] | 21.915[a] | 1.515[a] | 0.817[a] | 0.685[a] | 3.518[a] | 23.292[a] | 20.865[a] |
| | (1.720) | (1.531) | (2.421) | (0.198) | (0.066) | (0.137) | (0.082) | (3.602) | (4.205) |
| # of Firms | 25426 | 25426 | 17938 | 25426 | 25426 | 25426 | 9427 | 24179 | 24179 |
| # of Countries | 64 | 64 | 64 | 64 | | 64 | 64 | 57 | 57 |
| Adjusted R-sq | 0.225 | 0.228 | 0.259 | | | | | 0.056 | 0.157 |
| ***First Stage F-Stat*** | | | | | | | | 33.66 | 94.12 |
| **Anderson-Rubin Wald Test** | | | | | | | | 8.35 (0.0039) | 8.35 (0.0039) |

[a], [b], and [c] represent significance at 1%, 5%, and 10% respectively

## Table 5: Firms as Victims and Perpetrators: Role of Informal Finance

The regression model estimated is Firm Type = $\alpha$ +$\beta_1$ Innovator + $\beta_1$ Bank Financing or Self Financing + $\beta_3$ Capacity Utilization + $\beta_4$ Firm Size dummies + $\beta_5$ Family Owned dummy + $\beta_6$Legal Status dummies + $\beta_7$Age + $\beta_8$Foreign Ownership dummy+ $\beta_9$ Exporter dummy + $\beta_{10}$Industry Sector Dummies + $\beta_{11}$Year Dummies + $\beta_{12}$Country Dummies + e. Firm Type takes values 1 to 3, 1 for Bribes=0 and Tax Evasion=0 or Bribes>0 and Tax Evasion>0; 2 for Bribes=0 and Tax Evasion>0(Perpetrators) and3 for Bribes>0 and Tax Evasion=0 (Victims). Innovator is a dummy variable which takes the value 1 if the firm developed a new product line and 0 otherwise. Bank Financing takes the value 1 if the firm reported having access to an overdraft facility or line of credit and 0 otherwise. Informal Financing takes the value 1 if the sum of informal financing, family financing, and other financing of new investments was 50% or greater OR the sum of informal financing, family financing, and other financing of working capital was 50% or greater. Informal Financing takes the value 0 if the sum of informal financing, family financing and other financing of new investments AND working capital is equal to 0 %. Capacity Utilization is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm's existing machinery and equipment and regular shifts. Firm Size dummies take values 1 to 3 for Small firms (1-19 employees), Medium firms (20-99 employees), and Large firms (>=100 employees).Family Owned dummy takes the value 1 if the largest shareholder is an individual or family. Legal Status Dummies consist of dummy variables for the following legal forms - Corporation, Partnership, Cooperative, Sole Proprietorship (omitted category), and Other Legal Status. Firm age is the year of the survey -year established. Foreign Ownership is a dummy variable that takes the value 1 if the firm is foreign owned and 0 otherwise. Exporter is a dummy variable that takes the value 1 if the firm is an exporter and 0 is it is a non-exporter. The regressions are estimated using multinomial logits where the omitted category is Firm Type=1. The coefficients reported below are relative risk ratios.

### *Panel A: Innovation and Firm Type*

| | 1 | |
|---|---|---|
| | Firm Type | |
| | (Omitted Category: Bribes=0, Evasion=0; Bribes>0, Evasion>0) | |
| | Bribes=0, Evasion>0 (Perpetrators) | Bribes>0, Evasion=0 (Victims) |
| Innovator | 0.920[c] | 1.167[a] |
| | (0.039) | (0.061) |
| # of Firms | 24179 | |
| # of Countries | 57 | |
| Log Likelihood | -2.02e+04 | |

***Panel B: Innovation, Financing and Firm Type***

| | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| | Firm Type (Omitted Category: Bribes=0, Evasion=0; Bribes>0, Evasion>0) | | Firm Type (Omitted Category: Bribes=0, Evasion=0; Bribes>0, Evasion>0) | | Firm Type (Omitted Category: Bribes=0, Evasion=0; Bribes>0, Evasion>0) | |
| | Bribes=0, Evasion>0 (Perpetrators) | Bribes>0, Evasion=0 (Victims) | Bribes=0, Evasion>0 (Perpetrators) | Bribes>0, Evasion=0 (Victims) | Bribes=0, Evasion>0 (Perpetrators) | Bribes>0, Evasion=0 (Victims) |
| | Full Sample | | Full Sample | | Low and Lower-middle | |
| Innovator | 0.885 | 1.186[b] | 0.958 | 1.289[a] | 0.873[c] | 1.206[a] |
| | (0.078) | (0.090) | (0.050) | (0.089) | (0.066) | (0.068) |
| Bank Financing | 0.821[a] | 1.194[b] | | | | |
| | (0.055) | (0.107) | | | | |
| Informal Financing | | | 1.147[b] | 0.973 | 1.181[b] | 0.931 |
| | | | (0.072) | (0.084) | (0.099) | (0.088) |
| # of Firms | 7400 | | 15176 | | 8323 | |
| # of Countries | 25.000 | | 57.000 | | 37.000 | |
| Log Likelihood | -6019.683 | | -1.26e+04 | | -6921.374 | |

[a], [b], and [c] represent significance at 1%, 5%, and 10% respectively.

## Table 6: Bribe Payments, Trust in the Government, and Tax Evasion

The regression model estimated is Tax Evasion = $\alpha$ +$\beta_1$Trust in Government + $\beta_2$ Capacity Utilization + $\beta_3$ Firm Size dummies + $\beta_4$ Family Owned dummy + $\beta_5$Legal Status dummies + $\beta_6$Age + $\beta_7$Foreign Ownership dummy+ $\beta_8$ Exporter dummy + $\beta_9$ Industry Sector Dummies + $\beta_{10}$Year Dummies + $\beta_{11}$Country Dummies + e. We use two variables to measure Trust in Government: Government Predictability takes values from 1 to 6 where increasing values reflect firms' beliefs that government officials' interpretations of regulations affecting the establishment are consistent and predictable. Property Rights takes values 1 to 6 with increasing values reflecting firms' confidence that the judicial system will enforce its contractual and property rights in business disputes. Bribes is the percent of annual sales value that a typical firm spends on gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. Capacity Utilization is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm's existing machinery and equipment and regular shifts. Sales Growth is defined as the percentage increase in sales over the past year. Labor Productivity is the ratio of Firm Size dummies take values 1 to 3 for Small firms (1-19 employees), Medium firms (20-99 employees), and Large firms (>=100 employees).Family Owned dummy takes the value 1 if the largest shareholder is an individual or family. Legal Status Dummies consist of dummy variables for the following legal forms - Corporation, Partnership, Cooperative, Sole Proprietorship (omitted category), and Other Legal Status. Firm age is the year of the survey -year established. Foreign Ownership is a dummy variable that takes the value 1 if the firm is foreign owned and 0 otherwise. Exporter is a dummy variable that takes the value 1 if the firm is an exporter and 0 is it is a non-exporter. The regressions are estimated using ordinary least squares with standard errors clustered at the country level.

## Panel A:

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | Mgt. time Spent dealing with Public Officials | Government Predictability | Property Rights | Mgt. time Spent dealing with Public Officials | Government Predictability | Property Rights |
| | OLS | OLS | OLS | IV | IV | IV |
| *Instrument* | | | | *Innovators* | *Innovators* | *Innovators* |
| Bribes | 0.309[a] | -0.015[a] | -0.023[a] | 3.334[a] | -0.123[b] | -0.068 |
| | (0.062) | (0.004) | (0.004) | (0.734) | (0.056) | (0.052) |
| Number of Firms | 25192 | 25851 | 26226 | 23258 | 23489 | 23880 |
| Number of Countries | 61 | 62 | 63 | 61 | 62 | 63 |
| Adjusted R-Sq | 0.12 | 0.092 | 0.148 | | | |
| First Stage F-Stat | | | | 30.68 | 35.95 | 37.04 |
| Anderson-Rubin Wald Test | | | | 46.58 (0.000) | 5.34 (0.021) | 1.84 (0.174) |

[a], [b], and [c] represent significance at 1%, 5%, and 10% respectively

## Panel B:

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | | | Tax Evasion | | |
| | OLS | OLS | IV | IV | IV |
| *Instrument* | | | *Bribes* | *Bribes* | *Innovators* |
| Govt. Predictability | -0.510[a] | | -34.523[a] | | -30.938[c] |
| | (0.189) | | (6.061) | | (17.285) |
| Property Rights | | -1.110[a] | | -20.903[a] | |
| | | (0.138) | | (2.442) | |
| Number of Firms | 27355 | 28030 | 23248 | 23635 | 25760 |
| Number of Countries | 63 | 64 | 63 | 64 | 63 |
| Adjusted R-Sq | 0.219 | 0.223 | | | |
| First Stage F-Stat | | | 34.58 | 82.57 | |
| Anderson-Rubin Wald Test | | | 94.99 (0.000) | 92.72 (0.000) | 13.55 (0.000) |

[a], [b], and [c] represent significance at 1%, 5%, and 10% respectively.

## Table 7: Bribe Payments, Trust, and Tax Evasion – Robustness using ECA Sample

The regression model estimated is Tax Evasion = $\alpha$ +$\beta_1$ Bribes/Bribes Dummy + $\beta_1$ Trust in Government + $\beta_3$ Capacity Utilization + $\beta_4$ Sales Growth + $\beta_5$ Labor Productivity + $\beta_6$ Firm Size dummies + $\beta_7$ Family Owned dummy + $\beta_8$Legal Status dummies + $\beta_9$Age + $\beta_{10}$Foreign Ownership dummy+ $\beta_{11}$ Exporter dummy + $\beta_{12}$Industry Sector Dummies + $\beta_{13}$Year Dummies + $\beta_{14}$Country Dummies + e. Government Predictability takes values from 1 to 6 where increasing values reflect firms' beliefs that government officials' interpretations of regulations affecting the establishment are consistent and predictable. Property Rights takes values 1 to 6 with increasing values reflecting firms' confidence that the judicial system will enforce its contractual and property rights in business disputes. Bribes is the percent of annual sales value that a typical firm spends on gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. Capacity Utilization is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm's existing machinery and equipment and regular shifts. Sales Growth is defined as the percentage increase in sales over the past year. Labor Productivity is the ratio of Firm Size dummies take values 1 to 3 for Small firms (1-19 employees), Medium firms (20-99 employees), and Large firms (>=100 employees).Family Owned dummy takes the value 1 if the largest shareholder is an individual or family. Legal Status Dummies consist of dummy variables for the following legal forms - Corporation, Partnership, Cooperative, Sole Proprietorship (omitted category), and Other Legal Status. Firm age is the year of the survey -year established. Foreign Ownership is a dummy variable that takes the value 1 if the firm is foreign owned and 0 otherwise. Exporter is a dummy variable that takes the value 1 if the firm is an exporter and 0 is it is a non-exporter. The regressions are estimated using ordinary least squares with standard errors clustered at the country level.

## Panel A: Bribe Payments and Tax Evasion

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | Tax Evasion (Wage bill) | Tax Evasion (Labor) | Tax Evasion (Wage bill) | Tax Evasion (Labor) |
| | OLS | OLS | IV | IV |
| *Instrument* | | | Innovators | |
| Bribes | 1.913[a] | 1.487[a] | 9.051[a] | 6.502[a] |
| | (0.175) | (0.165) | (2.930) | (2.312) |
| Profit Margin | 0.117[a] | 0.081[a] | 0.076[b] | 0.053[b] |
| | (0.028) | (0.028) | (0.031) | (0.024) |
| Number of Firms | 5186 | 5207 | 5186 | 5207 |
| Number of Countries | 27 | 27 | 27 | 27 |
| Adjusted R-Sq | 0.162 | 0.145 | | |
| First Stage F-Stat | | | 14.22 | 15.31 |
| Anderson-Rubin Wald Test | | | 15.76 (0.000) | 10.99 (0.001) |

[a], [b], and [c] represent significance at 1%, 5%, and 10% respectively.

## Panel B: Trust and Tax Evasion

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tax Evasion (Wage bill) | Tax Evasion (Wage bill) | Tax Evasion (Wage bill) | Tax Evasion (Wage bill) | Tax Evasion (Wage bill) | Tax Evasion (Labor) | Tax Evasion (Labor) | Tax Evasion (Labor) | Tax Evasion (Labor) | Tax Evasion (Labor) |
| | IV | IV | IV | IV | IV | IV | IV | IV | IV | IV |
| Courts are quick | -49.419[a] | | | | | -39.901[a] | | | | |
| | (10.523) | | | | | (8.788) | | | | |
| Courts are fair and impartial | | -37.018[a] | | | | | -29.232[a] | | | |
| | | (6.050) | | | | | (4.969) | | | |
| Courts are honest/uncorrupted | | | -34.472[a] | | | | | -27.706[a] | | |
| | | | (5.506) | | | | | (4.652) | | |
| Courts are able to enforce decisions | | | | -55.795[a] | | | | | -46.799[a] | |
| | | | | (15.180) | | | | | (13.577) | |
| Courts are affordable | | | | | -93.213[b] | | | | | -77.330[b] |
| | | | | | (41.995) | | | | | (35.485) |
| Profit Margin | 0.095 | 0.172[a] | 0.137[b] | 0.201[b] | 0.244 | 0.055 | 0.123[a] | 0.096[b] | 0.149[c] | 0.184 |
| | (0.071) | (0.058) | (0.054) | (0.096) | (0.156) | (0.058) | (0.046) | (0.044) | (0.081) | (0.129) |
| Number of Firms | 4812 | 4750 | 4682 | 4758 | 4708 | 4830 | 4767 | 4700 | 4779 | 4725 |
| Number of Countries | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 |

[a], [b], and [c] represent significance at 1%, 5%, and 10% respectively.

## Appendix B: Innovation, Corruption, and Time Spent Dealing with Bureaucracy

This table shows correlations between innovation, bribes, and the time spent dealing with regulations and different bureaucratic agencies. Bribes Dummy is a dummy variable that takes the value 1 if Bribes>0 and 0 if Bribes=0. Innovator is a dummy variable which takes the value 1 if the firm developed a new product line and 0 otherwise..Bureaucracy is the percentage of senior management's time in a typical week that is spent in dealing with requirements imposed by government regulations [e.g. taxes, customs, labor regulations, licensing and registration] including dealings with officials, completing forms, etc. Tax Inspectorate, Labor and Social Security, Fire and Building Safety, Sanitation/Epidemiology, Municipal Police, Environmental and All Agencies are the number of days spent in inspections and mandatory meetings with officials of each of the corresponding agencies.

| | Innovators | Bribes | Bureaucracy | Tax Inspectorate | Labor & Social Security | Fire & Building Safety | Sanitation/ Epidemiology | Municipal Police | Environmental |
|---|---|---|---|---|---|---|---|---|---|
| Bribes | 0.0616[a] | | | | | | | | |
| Bureaucracy | 0.0483[a] | 0.1258[a] | | | | | | | |
| Tax Inspectorate | 0.0023 | 0.0594[a] | 0.1722[a] | | | | | | |
| Labor & Social Security | -0.0142[b] | 0.0461[a] | 0.1249[a] | 0.3409[a] | | | | | |
| Fire & Building Safety | -0.0101 | 0.0276[a] | 0.0595[a] | 0.2459[a] | 0.3829[a] | | | | |
| Sanitation/Epidemiology | 0.0142[c] | 0.0253[a] | 0.0055 | 0.1074[a] | 0.1264[a] | 0.2036[a] | | | |
| Municipal Police | 0.0016 | 0.0412[a] | 0.0406[a] | 0.2132[a] | 0.2704[a] | 0.3634[a] | 0.1671[a] | | |
| Environmental | 0.002 | 0.0108 | 0.0652[a] | 0.2194[a] | 0.2812[a] | 0.316[a] | 0.1874[a] | 0.2203[a] | |
| All Agencies | 0.0528[a] | 0.1044[a] | 0.1575[a] | 0.6107[a] | 0.5477[a] | 0.4558[a] | 0.4186[a] | 0.4693[a] | 0.2351[a] |

[a], [b], and [c] represent significance at 1%, 5%, and 10% respectively

# Appendix C: Corruption as a tax on Innovation - Robustness

The regression model estimated is Bribes = $\alpha$ +$\beta_1$ Innovator +$\beta_2$ Capacity Utilization + $\beta_3$ Sales Growth + $\beta_4$ Labor Productivity + $\beta_5$ Firm Size dummies + $\beta_6$ Family Owned dummy + $\beta_7$Legal Status dummies + $\beta_8$Age + $\beta_9$Foreign Ownership dummy+ $\beta_{10}$ Exporter dummy + $\beta_{11}$ Industry Sector Dummies + $\beta_{12}$Year Dummies + $\beta_{13}$Country Dummies + e. Bribes is the percent of annual sales value that a typical firm spends on gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. Innovation is one of the following variables: *Developed a major new product line, Upgraded an existing product line, Introduced new technology that has substantially changed the way that the main product is produced, Opened a new plant, Agreed to a new joint venture with foreign partner, Obtained a new licensing agreement, Outsourced a major production activity that was previously conducted in-house and Brought in-house a major production activity that was previously outsourced* are all dummy variables that take the value 1 if the firm undertook the corresponding innovation and 0 otherwise; Aggregate Innovation Index is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the eight different innovative activities described above; Core Innovation is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line, Upgraded an existing product line*, or *Introduced a new technology*. Capacity Utilization is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm's existing machinery and equipment and regular shifts. Sales Growth is defined as the percentage increase in sales over the past year. Labor Productivity is the ratio of Firm Size dummies take values 1 to 3 for Small firms (1-19 employees), Medium firms (20-99 employees), and Large firms (>=100 employees).Family Owned dummy takes the value 1 if the largest shareholder is an individual or family. Legal Status Dummies consist of dummy variables for the following legal forms - Corporation, Partnership, Cooperative, Sole Proprietorship (omitted category), and Other Legal Status. Firm age is the year of the survey -year established. Foreign Ownership is a dummy variable that takes the value 1 if the firm is foreign owned and 0 otherwise. Exporter is a dummy variable that takes the value 1 if the firm is an exporter and 0 is it is a non-exporter. The regressions are estimated using ordinary least squares with standard errors clustered at the country level

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes | Bribes |
| New Product Innovation | 0.370[a] | | | | | | | | | |
| | (0.073) | | | | | | | | | |
| Upgraded Product Line | | 0.325[a] | | | | | | | | |
| | | (0.069) | | | | | | | | |
| New Technology | | | 0.211[a] | | | | | | | |
| | | | (0.059) | | | | | | | |
| Opened new plant | | | | 0.217 | | | | | | |
| | | | | (0.150) | | | | | | |
| New Joint Ventures | | | | | 0.313[c] | | | | | |
| | | | | | (0.171) | | | | | |
| New Licensing | | | | | | 0.404[a] | | | | |
| | | | | | | (0.079) | | | | |
| Outsourced | | | | | | | 0.153 | | | |
| | | | | | | | (0.113) | | | |
| Bring in-house a previously | | | | | | | | 0.235 | | |
| | | | | | | | | (0.196) | | |
| Core Innovation | | | | | | | | | 0.229[a] | |
| | | | | | | | | | (0.038) | |
| Aggregate Innovation Index | | | | | | | | | | 0.144[a] |
| | | | | | | | | | | (0.020) |
| # of Firms | 25761 | 26084 | 26098 | 9497 | 25226 | 24155 | 25231 | 21361 | 26242 | 26243 |
| # of Countries | 57 | 58 | 59 | 43 | 54 | 55 | 54 | 50 | 59 | 59 |
| Adjusted R-Sq | 0.056 | 0.056 | 0.055 | 0.055 | 0.057 | 0.060 | 0.057 | 0.077 | 0.055 | 0.056 |

[a], [b], and [c] represent significance at 1%, 5%, and 10% respectively