

What Firms Must Pay Bribes and How Much?  
An Empirical Study of Small and Medium Enterprises in Vietnam

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## Abstract

This paper uses panel data from the Small and Medium Enterprise Survey in Vietnam from 2005 to 2013 to investigate the incidence and size of corruption in Vietnam. The Heckman's two-step model is employed to take into account censored nature of the data on bribes and sample selection bias. We find strong evidence that the propensity to bribe as well as bribe amounts are highly positively correlated with interaction level with government officials, firms' ability to pay, and regulatory-type burdens imposed on firms. In addition, firms without official business registration licenses are more likely to avoid paying the informal costs. These results are robust when lagged values of profit are used as instruments for profit.

*Keywords:* Bribery, Government Bureaucrats, Small and Medium Enterprises

JEL codes: C34, D22, G38

# 1 Introduction

Corruption occurs in both developed and developing countries in various degrees and has impacted almost all parts of society (Rohwer, 2009). Amundsen (1999) described corruption as “a disease, a cancer that eats into the cultural, political and economic fabric of society, and destroys the functioning of vital organs”. And the World Bank (2011b) considered corruption as “among the greatest obstacles to economic and social development”.

In Vietnam, this problem has provoked growing alarm due to the government’s failure to reduce corruption over the past years. The Corruption Perceptions Index (CPI) 2014, conducted by Transparency International, ranked Vietnam 119 out of 175 countries globally and 18 out of 28 countries in the Asia Pacific region. It is worthy to note that Vietnam’s CPI score was unchanged in three consecutive years from 2012 to 2014 whereas a positive change was recorded in neighboring countries. In addition, according to a report of Provincial Competitiveness Index (PCI) 2014, Vietnam witnessed a significant decline in controlling informal costs that firms had to pay. Specifically, the proportion of firms that paid bribes jumped from 41 percent in 2013 to 66 percent in 2014. And this informal payment cost more than 10 percent of revenues of one among every ten firms.

The study of corruption has attracted considerable attention in the last two decades, focusing on two segments: the determinants of corruption and the effect of corruption on growth<sup>1</sup>. Seminal researches on the first segment include Ades and Di Tella (1997, 1999), Svensson (2000), Persson, Tabellini, and Trebbi (2003), while those on the second comprise Mauro (1995), Wei (1997) and Johnson et al. (1997). Most of these studies share three common features. First, they have primarily based on cross-country analyses. Second, they use perceptive data rather than quantitative data. Third, the interpretation of corruption is based on a function of macro-level factors such as countries’ policies or institutional environment. However, the interpretation grounded on cross-country analyses and perceptive

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<sup>1</sup>For a review and summary, refer to Bardhan (1997), Jain (2001), Reinikka and Svensson (2002) and Aidt (2003).

data has some drawbacks. On one hand, exploiting perception data on corruption can suffer from bias. In particular, certain studies suggest that small firms are more likely to perceive their environment to be more corrupt than their larger counterparts (Batra et al., 2003; Bennedsen et al., 2009). Similarly, more productive companies tend to complain about their business environment more than less productive ones do (Malomo, 2013). On the other hand, macro-level determinants of corruption constrain the interpretation of variation in corruption within a country. In other words, country-level research cannot explain various levels of corruption facing different firms in a country (Svensson, 2003).

To avoid these problems, Svensson (2003) exploited quantitative data on corruption, derived from the 1998 Ugandan enterprise survey which was designed to collect a representative sample of private enterprises, operating in manufacturing and processing sectors. There are two noticeable features in this data set. Not all firms in the sample report that they need to pay the informal cost. And the size of bribes varies widely across firms under a similar policy. To explain such variation, the paper develops a simple bargaining model, in which firms can choose to either pay the bribe or exit the market when facing a request of a public official for a bribe.

In similarity with Svensson (2003), using a panel data set from the Small and Medium Enterprise (SME) Surveys between 2005 and 2013, this paper investigates the corruption in Vietnam, particularly what firms must pay bribes and how much they pay. The Heckman's two-step model is applied to take into account censored nature of the data on bribes and sample selection bias. We find strong evidence that the propensity to bribe as well as the amount of bribes are highly positively correlated with interaction level with public officials, firms' ability to pay and regulatory-type burdens imposed on firms. In addition, firms without official business registration licenses are more likely to avoid paying the informal costs. These results are robust when lagged values of profit are used as instruments for profit.

The paper is structured as follows. Section 2 presents a literature review on corruption,

the incidence and levels of bribery. Section 3 gives a brief overview of corruption in Vietnam. Section 4 outlines the data, the econometric model, and the regression results. Conclusions follow in Section 5.

## 2 Incidence and level of bribery

Previous firm-level studies indicate that the incidence and level of bribery are affected by the interaction level with public officials and firm characteristics<sup>2</sup>. In these studies, there is some probability that a firm faces a request for a bribe from corrupt officials who may take actions to either benefit or hurt the firm's business. A firm's propensity to pay a bribe depends on several factors which can be classified into three groups, namely, (i) control right of public officials over a firm, (ii) bargaining power and (iii) visibility.

### (i) Control right hypothesis

Tanzi (1998) shows that the bribery may arise from the burden of *regulations*. There is no denying that regulations such as licenses, permits, etc are important for the government to manage its society and economy. However, the existence of these regulations along with the monopoly power of government officials in controlling these activities gives officials a good opportunity to extract bribes from those who need the authorization or permits. The author argues that the emergence of these regulations requires frequent and direct contact between government officials and citizens. To cope with these regulations, citizens have to spend a large amount of time which can be reduced considerably if they agree to make informal payments. Svensson (2003) also finds that enterprises usually have to pay the informal cost when they deal with public officials who have the power to affect their business. Without that informal payment, firms are likely to spend more time and more money on accountants and specialized service providers handling regulations.

To measure the burden of regulations, Svensson (2003) uses types of *taxes* that firms have to pay while Malomo (2013) uses the percentage of sales declared for tax purposes.

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<sup>2</sup>See Svensson (2003), Lee et al. (2010); Rand and Tarp (2012) and Malomo (2013).

However, Svensson (2003) fails to demonstrate the effect of types of taxes on the incidence of corruption due to the multicollinearity problem. Using principal components analysis to overcome this issue, the author proves a significant and positive relationship between two variables. Similarly, Malomo (2013) reports that companies that spend higher percentages of their sales on taxes are more likely to pay bribes.

According to Lecraw (1984) and Luo (2007), firms that serve mostly in domestic markets are likely to interact more intensively with local suppliers, customers, employees, and government officials. Repeated exposure to the local environment may increase firms' potential legal vulnerabilities related to various regulatory requirements. Moreover, Kobrin (1987) asserts that exporting firms are characterized with higher technical and managerial capabilities which are strengthened over time through learning and innovation that they can acquire in the global market. These firms' high levels of competitiveness help relax their dependence on domestic markets, hence their susceptibility to government corruption.

There is another argument about the negative relationship between *exports* and the likelihood of bribery. In developing countries and especially those with balance of payments problems, export activities are greatly appreciated because of their contributions to foreign exchange earnings and job generation (Grosse, 1996; Vernon, 1971; UNCTAD, 2006). Public officials are thus more likely to reduce their bribe demands (Lee et al., 2010). Moreover, Lee et al. (2010) explain that the competition among national governments in attracting and supporting export-oriented firms will strengthen these firms' bargaining position. As a consequence, export-oriented firms face lower risks of corruption as well as smaller informal payments.

Pfeffer and Salancik (1978) show that the tendency to bribery is associated with the extent of firms' *dependence on the government*. Those companies whose revenues largely come from state contracts tend to be more vulnerable to rent-seeking practices. They are more likely to accept paying bribes in exchange for lucrative public contracts (Hillman, 2005). Using a dummy variable to indicate whether the government is a firm's customer, Rand and

Tarp (2012) and Malomo (2013) find that firms whose business depends more on government contracting are more involved in corruption.

Firms' dependence on the government also takes the form of using publicly provided goods and services such as electricity, water, housing, credit, land, telephone service, waste disposal, health care, education, etc. According to Tanzi (1998), in most countries, the state sector supplies many goods, services, and resources, but sometimes at below-market prices. It probably leads to shortages which require rationing made by public officials. And they may take advantage of their authority in giving favored access to the limited supply to firms that are willing to pay bribes. This is empirically proved by Svensson (2003) and Malomo (2013). Rand and Tarp (2012) imply that when the government is firms' main supplier, they have a higher probability of paying informal costs.

### **(ii) Bargaining hypothesis**

Svensson (2003) builds a bargaining model to explain variation across firms' bribery. A firm's informal payment depends on that firm's "ability to pay", measured by its present and expected profitability and that firm's "refusal power", determined by its technology choice. Higher current and expected future profits weaken the firm's bargaining position, while a technology that yields low sunk costs and higher operation costs has an inverse impact. However, empirical results of this study show no evidence of those links between firms' ability to pay bribes and their power to avoid them and their incidence of corruption. Malomo (2013) and Rand and Tarp (2012) also test these relationships. Malomo (2013) observes that profits and sunk costs do not influence whether or not firms have to pay informal costs but Rand and Tarp (2012) find significant and positive relationships among them.

### **(iii) Visibility hypothesis**

It is argued that a firm's propensity to bribe is affected by its visibility which is proxied by firm size and its formal or informal status. However, there is no consensus about the impact of firm size on bribery. Beck et al.(2005) demonstrate that smaller firms are less likely harassed

by rent-seeking bureaucrats and other institutional problems than their larger counterparts. In the meanwhile, Hellman and Schankerman (2000) claim that smaller firms pay a higher proportion of their income as bribes and are subject to higher frequency of bribe requests. In addition, weak political resources of smaller firms do not allow them to shape regulations in their favor. As a consequence, they become more vulnerable to government extortion (Bennedsen et al., 2009; Harstad and Svensson, 2011).

Regarding formal or informal status, Rand and Tarp (2012) suggest that smaller and informal firms seem to be less exposed to government regulations and corruption. Sharing similar views, Dabla-Norris and Koeda (2008) find that as the cost of complying with taxes, bribes, and burdensome regulations increases, more firms choose to operate informally. Nevertheless, Rand and Tarp (2012) also point out an opposite effect of informality on bribe incidence. In particular, if firms may seek the benefits of informality, they are willing to offer an informal payment to maintain or achieve the informal status. Therefore, the net effect of informality is an open question.

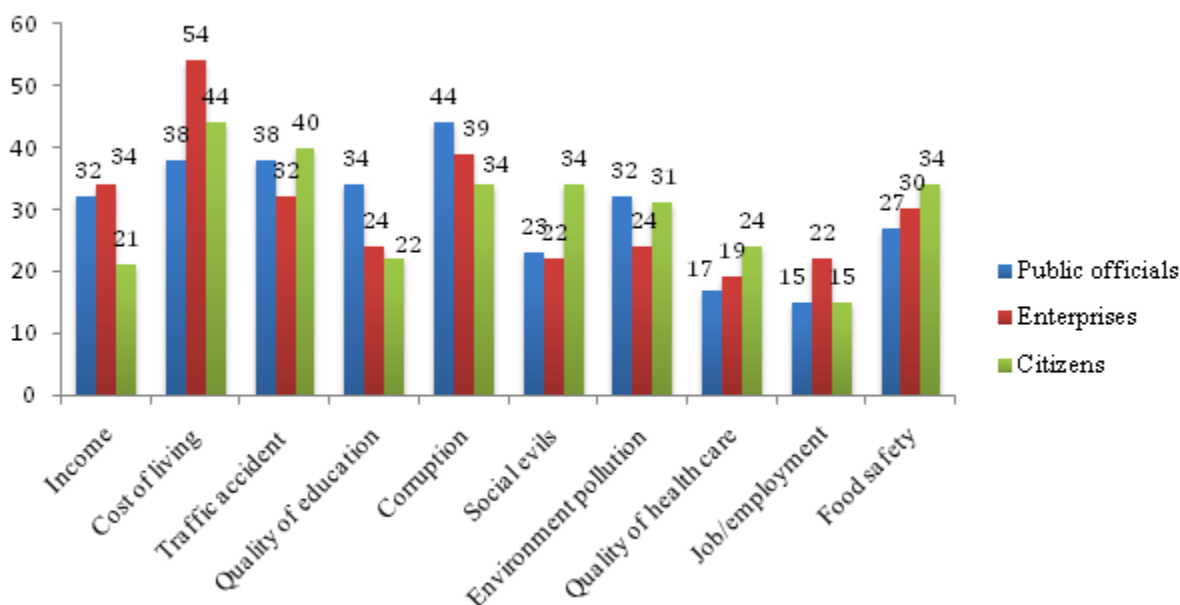
### **3 Corruption in Vietnam**

The war against corruption in Vietnam officially began with the ratification of the Law on Anti-Corruption in 2005. However, the last decade has witnessed a political stagnation in curbing corruption. This problem has become more and more severe as Vietnam is ranked low in the Corruption Perceptions Index 2014 (CPI 2014), published by Transparency International (TI). On a scale from 0 to 100, where 0 is highly corrupt, and 100 is very clean, Vietnam scores 31, ranking 119 out of 175 countries worldwide and 18 out of 28 countries in the Asia Pacific region. It is noticeable that despite some effort to reduce corruption, there has been no change in the public perceptions of corruption in three successive years from 2012 to 2014.

Sociological surveys by World Bank (2013) show that corruption is one of three serious



Figure 1: The Most Serious Economic and Social Issues for Vietnam (percent)



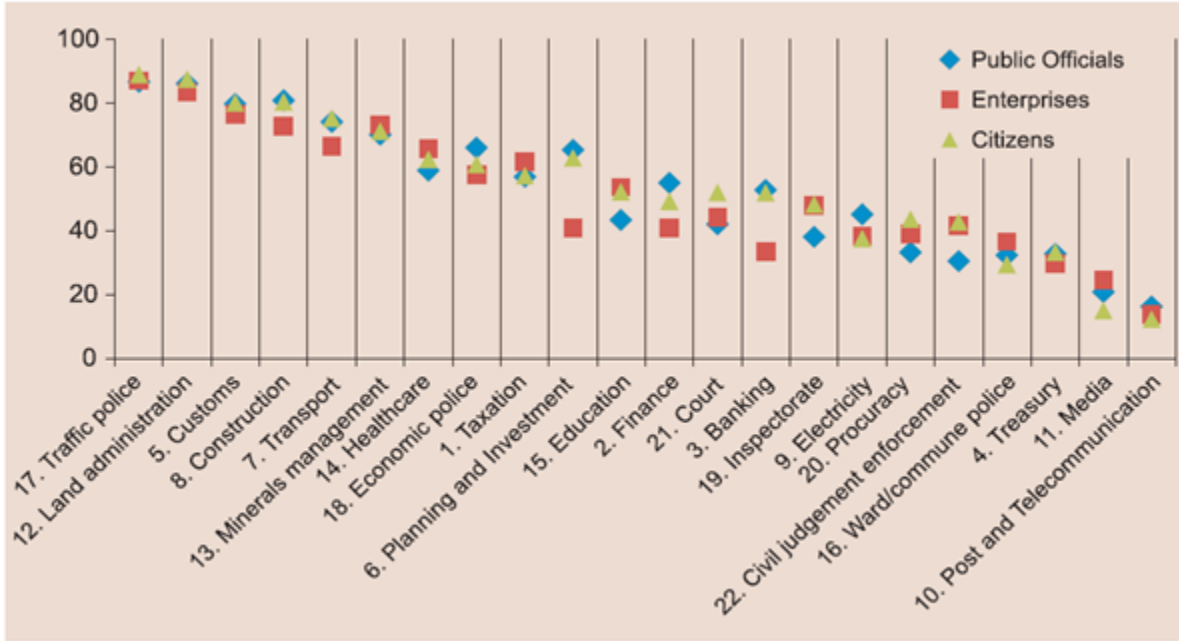
Source: World Bank (2013).

issues drawing the most public attention. These surveys were conducted in ten provinces and cities, focusing on three groups of respondents: citizens, firms, and officials. It is disclosed that perceptions of corruption are on the list of ten serious economic and social problems. Specifically, officials think that corruption is the most acute issue. A group of firms admit that corruption is only the second cause of concern, after the cost of living. Citizens rank corruption at the third place, following the cost of living and traffic accidents. The ten problems that Vietnam is facing are illustrated in Figure 1.

These surveys indicate that corruption in Vietnam occurs in various forms at different levels in many sectors. All the three surveyed groups have high agreement on the prevalence of corruption across sectors. More than 75 percent of the respondents acknowledge that the four most corrupt sectors in Vietnam include traffic police, land administration, customs, and construction. Meanwhile, post and telecommunication, media, treasury, and the ward/commune police are recorded as the four least corrupt sectors (see Figure 2).

The massive corruption is further reflected by the Provincial Competitiveness Index (PCI)

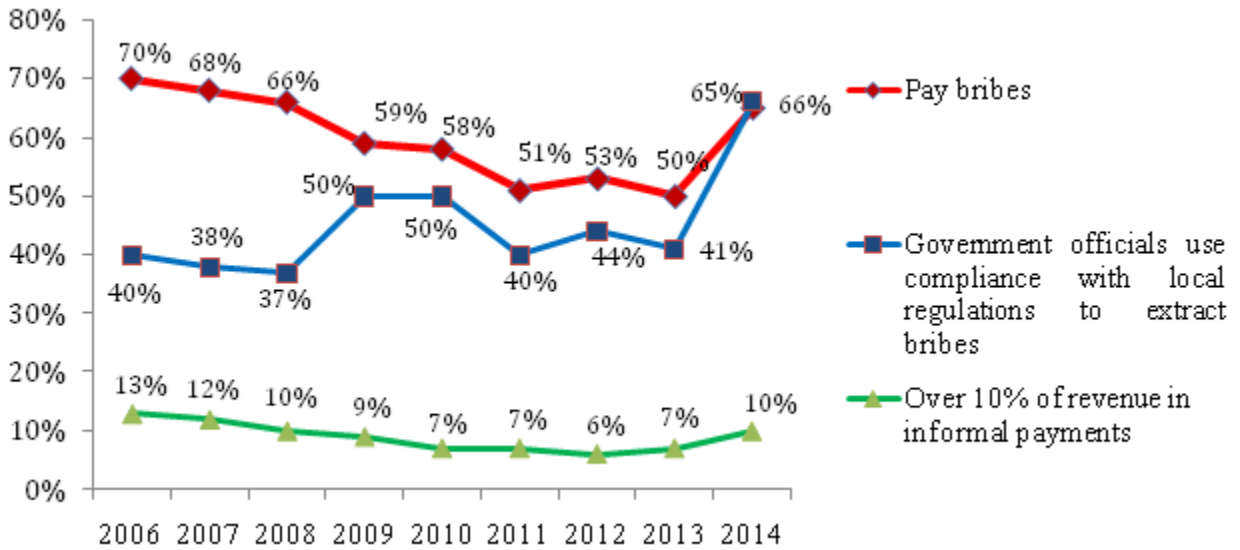
Figure 2: Perceptions of the Prevalence of Corruption Across Sectors (percent)



Source: World Bank (2013).

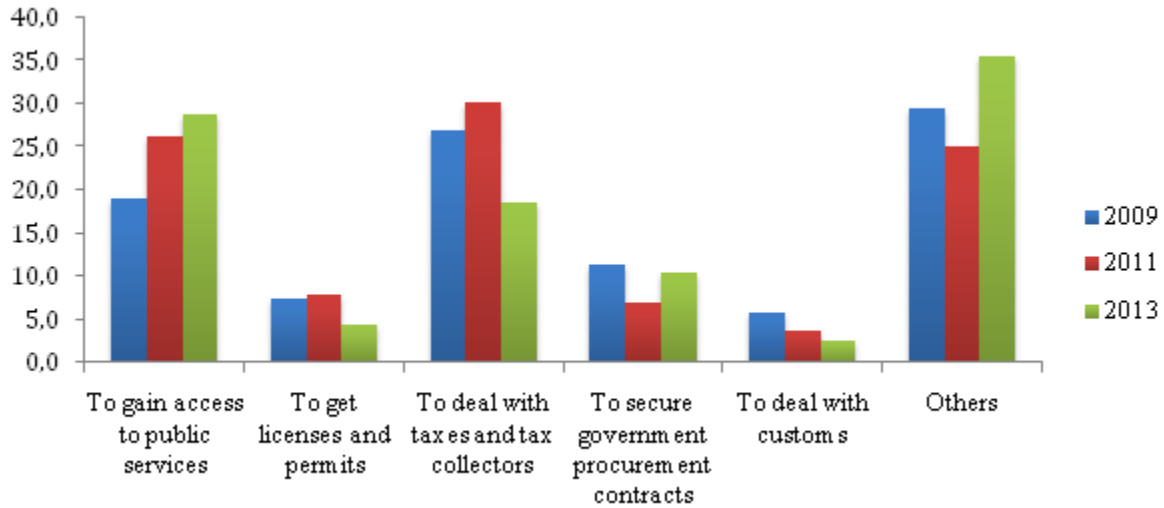
surveys conducted by the Vietnam Chamber of Commerce and Industry (VCCI) with the support of the U.S. Agency for International Development (USAID). Figure 3 shows that the percentage of firms that paid bribes had initially declined from 70 percent in 2006 to 50

Figure 3: Key Indicators of Bribe Payment



Source: VCCI (2015).

Figure 4: Purposes of Bribe Payment



Source: Central Institute for Economic Management (CIEM) (2009, 2011, 2013).

percent in 2013 before jumped back to 65 percent in 2014. The informal cost displayed a similar pattern. The percentage of firms that spent more than 10 percent of their revenues on bribery decreased from 13 percent in 2006 to 6 percent in 2012, then rose to 10 percent in 2014. Moreover, the fact that government bureaucrats use compliance with regulations to extract bribes from firms has become more and more rampant.

Figure 4 reveals main purposes of informal payment. It is used mainly to gain access to public services, to deal with tax collectors, and to secure government procurement contracts. Corruption in public services is escalating as more firms report paying bribes for favored access to limited supplies. However, the reverse holds in tax collection.

Table 1: Average Cost of Bribes Paid, by Sector

Sector	Average (VND)	Average (USD equivalent)
Judiciary	4,600,000	230
Land services	1,437,500	70
Tax and custom	560,000	25
Education system	486,257.5	24
Medical services	422,800	21
Police	400,370.4	20
Registry and permit services	166,666.7	8

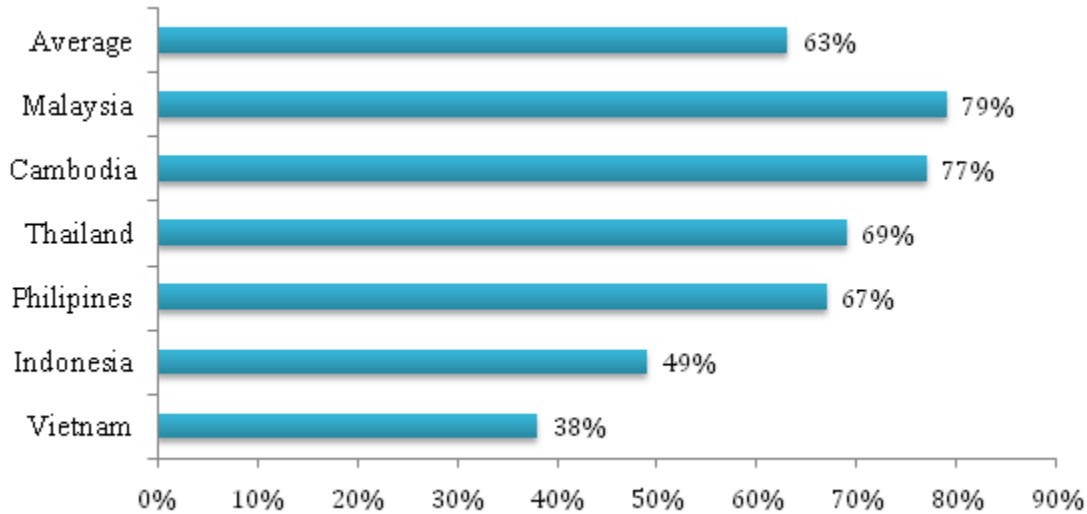
Source: Transparency International (TI) (2013).

In terms of the bribe size, the Transparency International (2013) indicates that average amounts of bribes vary among different sectors (see Table 1). According to the Global Integrity Report (2009) and the Bertelsmann Foundation report on Vietnam (2010), the party controls courts at all levels and the majority of judges are appointed based on personal relationships rather than on legal expertise, the judiciary system in Vietnam lacks impartiality, transparency, and consistency. Consequently, the judiciary has the highest average bribe amount of VND 4.6 million (or roughly USD 230). The second highest is land administration and management where firms pay on average VND 1,437,500 (or some USD 70) to land officials in exchange for information privileges and for execution procedure. These informal payments account for 4 percent to 124 percent of the average monthly salary of the Vietnamese in 2014. Even in key services such as medical and educational sectors, the bribery burden approximates 10 percent.

The Central Institute for Economic Management (CIEM) (2005) identifies four major causes of the endemic corruption are (i) the abuse of public power; (ii) discretionary decisions in policies and administration; (iii) inadequate transparency and accountability of government officials and agencies; and (iv) ineffective implementation and monitoring of government bureaucracies.

In recent years, in an effort to reduce corruption, the Vietnamese government has undertaken several measures such as simplifying firm establishment procedures, reducing permit requirements, setting up ‘one-stop-shops’, etc. More importantly, the anti-corruption legal framework has improved considerably with the adoption of the Anti-Corruption Law in 2005 and the National Strategy on Anti-Corruption to 2020. However, there are enormous challenges of effectively enforcing the laws to increase the faith and trust of the people. The Transparency International (2013) finds that only one-fourth (24 percent) of respondents agree that the government’s anti-corruption efforts are efficient. Thirty eight percent believe that they are inefficient or very inefficient. And the remaining 38 percent think that the efficiency of anti-corruption programs is not clear.

Figure 5: Willingness to Report an Incident of Corruption (Southeast Asia)



Source: Transparency International (TI) (2013).

Regarding the public apprehension about corruption, TI (2013) documents growing unwillingness among the Vietnamese people to denounce corruption over time. In 2010, 65 percent of respondents were willing to report corruptive incidents. But three years later, up to 62 percent of respondents were unwilling to do so while this figure for urban residents is even higher, 66 percent. Additionally, the eagerness to stigmatize corruption in Vietnam is the lowest among several Southeast Asia countries (see Figure 5).

## 4 Data and Econometric Model

### *a. Data*

This study uses a firm-level panel from the Small and Medium Enterprise (SME) Survey in Vietnam from 2005 to 2013. The survey is conducted every two years by the Central Institute for Economic Management (CIEM), the Ministry of Planning and Investment (MPI), the Institute of Labour Science and Social Affairs (ILSSA) (the Ministry of Labour, Invalids and Social Affairs of Vietnam, MoLISA), the Department of Economics at the Copenhagen University, and the Embassy of Denmark in Vietnam. The survey covers over 2,500 enter-

Table 2: Firm-level Variable Definitions

Variable	Description
$Bribe_{it}$	A dummy equals 1 if firm $i$ in year $t$ pays bribes and 0 otherwise
$\ln(Bribe/Labor)_{it}$	Log of reported informal cost per employee
$Firm\_size_{it}$	Log of total employment of firm $i$ in year $t$
$\ln(Sunk\_cost)_{it}$	Log of Capital/Labor ratio
$\ln(Profit/Labor)_{it}$	Log of profit per employee
$\ln(Export/Labor)_{it}$	Log of export revenue per employee
$\ln(Import/Labor)_{it}$	Log of import value per employee
$Government\_aid_{it}$	A dummy equals 1 if firm $i$ in year $t$ receives financial or technical assistance from government and 0 otherwise
$Tax/Sales_{it}$	Percentage of firm $i$ 's sales that is paid for tax purposes
$Regulations\_time_{it}$	Percentage of firm $i$ 's managerial time spent dealing with government regulations each month
$Informality_{it}$	A dummy equals 1 if firm $i$ in year $t$ does not have an official business registration license and 0 otherwise
$\ln(GvntSale/Labor)_{it}$	Log of revenue per employee that comes from government procurement contracts
$\ln(GvntSupplies/Labor)_{it}$	Log of expenditure per employee on goods and services supplied by the government

prises in ten provinces, i.e. Hanoi, Phu Tho, Ha Tay, Haiphong, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, Ho Chi Minh City, and Long An, a large proportion of these firms being repeats from previous years. It contains information on firms' financial performance, employment, ownership, exports and imports, interaction with government officials, bribe payments and other details. Firm-level variables are defined in Table 2. Since we would like to investigate those firms that operate at least in three consecutive years, the sample ends up with 1,753 firms and 7,139 observations. Table 3 indicates that household businesses

Table 3: Panel Data Structure

Number of years observed	Number of firms	Type of ownership				
		Household	Private	Partnership/cooperative	Limited	Joint stock
3	610	382	61	15	125	27
4	406	245	36	20	92	13
5	737	611	43	16	59	8
Total	1753	1238	140	51	276	48

Source: Authors' calculation.

Table 4: Descriptive Statistics of Bribe Amount (VND, in thousands) by Location

Province/City	Obs.	Mean	Std. Dev.	Min	Max
Hanoi	1073	7,615.76	17,853.80	0	150,000
Phu Tho	416	4,121.31	7,162.56	98	50,000
Ha Tay	788	6,791.69	35,157.70	0	500,000
Haiphong	852	5,762.74	13,097.51	99	100,000
Nghe An	872	4,074.02	8,295.76	98	50,000
Quang Nam	415	4,053.61	4,657.27	100	23,000
Khanh Hoa	456	3,695.15	6,847.40	100	40,000
Lam Dong	320	6,576.24	33,773.50	99	300,000
Ho Chi Minh City	1608	20,498.67	238,021.10	98	5,126,314
Long An	339	3,783.95	5,711.56	0	30,000
Whole sample	7,139	9,128.67	118,640.90	0	5,126,314

Source: Authors' calculation.

account for the majority of the SMEs in the sample, more than 70 percent. The remaining includes limited, private, partnership/cooperative, and joint stock firms with 15.7, 8, 2.9, and 2.7 percent, respectively. Since household establishments' scale is normally very small, micro-size firms represent 71.4 percent of the total number<sup>3</sup>. And 61.5 percent of the firms do not have official business registration licenses.

On average a small and medium enterprise in Vietnam bribes VND 9 million. Table 4 discloses that all firms in seven provinces, except Hanoi, Ha Tay, and Long An, have to pay at least VND 98,000. Ho Chi Minh City exhibits the most severe corruption with an average amount of approximately VND 20.5 million, nearly tripling that of Hanoi, the second most severe. The chronic and acute bribery in Vietnam's largest city is clearly affirmed as the maximum bribe in Ho Chi Minh City is over VND 5 billion, more than ten-fold that of Ha Tay. Khanh Hoa, Long An, and Quang Nam witness the lowest means and variations of informal payments.

Bribery varies not only across provinces/cities but also across different types of business ownership and sectors (see Table 5). Despite the smallest number of firms in the sample, joint

<sup>3</sup>The government decree No.90/2001/CP-ND on "Supporting for Development of Small and Medium Enterprises" defines that a micro-size firm has from 1 to 10 employees, a small firm from 11 to 50 employees, and a medium firm from 51 to 300 employees.

Table 5: Descriptive Statistics of Bribe Amount (VND, in thousands) by Ownership and Sector

	Obs.	Mean	Std. Dev.	Min	Max
Household	4,412	2,448.95	4,458.83	0	41,000
Private (Sole proprietorship)	657	7,854.38	22,592.72	0	300,000
Partnership/collective/cooperative	405	9,709.85	16,836.99	0	120,000
Limited liability	1293	13,127.18	34,504.96	98	500,000
Joint stock	372	72,303.20	533,487.80	98	5,126,314
Food products and beverages	1,437	20,404.37	268,144.80	0	5,126,314
Textiles	272	7,852.37	20,931.39	99	150,000
Apparel/Wearables	237	6,186.06	8,895.30	99	50,000
Tanning and dressing leather	532	2,814.19	6,036.98	2	50,000
Wood and wood products	744	8,710.80	37,518.00	99	500,000
Paper and paper products	300	12,493.95	30,045.87	99	240,000
Publishing/printing	280	11,483.27	26,993.45	99	150,000
Chemical products	244	8,144.72	15,844.06	99	100,000
Rubber and plastic products	524	10,623.23	29,596.33	99	296,000
Non-metallic mineral products	388	7,629.95	13,529.41	0	100,000
Fabricated metal products	963	4,296.34	8,246.95	0	100,000
Other machinery and equipment	464	4,947.70	13,491.78	50	120,000
Furniture manufactures	510	3,806.04	6,772.68	0	50,000
Water treatment	244	2,975.39	6,694.59	99	50,000

Source: Authors' calculation.

stock enterprises make the highest maximum and average bribes. The opposite is true for household businesses. Corruption is the worst in food and beverage sector, followed by paper and paper products, publishing/printing, and rubber and plastic products. Those firms doing business in tanning and dressing leather, water treatment, and furniture manufacturing, suffer the least harassment by rent-seeking government bureaucrats. Purposes of informal

Table 6: Purposes of Bribe Payment

	Obs	Percent
Gain access to public services	1987	27.83
Get licenses and permits	460	6.44
Deal with tax and tax collectors	1899	26.60
Secure government procurement contracts	834	11.68
Deal with customs	246	3.45
Other reasons	1713	23.99

Source: Authors' calculation.



Table 7: Descriptive Statistics of Key Variables

	Obs.	Mean	Std. Dev.	Min	Max
Firm_size or ln(Employment)	7139	1.930	1.127	0.000	7.848
ln(Sunk_cost) or ln(K/L)	7139	10.224	1.946	0.000	16.812
ln(Profit/Labor)	7139	9.559	1.103	0.000	15.783
ln(Export/Labor)	7139	0.547	2.896	0.000	19.836
ln(Import/Labor)	7139	0.424	2.578	0.000	20.279
Tax/Sales	7139	0.730	0.687	0.000	3.502
Regulations_time	7139	8.929	20.821	0.000	100.000
ln(GvntSale/Labor)	7139	0.788	3.325	0.000	19.586
ln(GvntSupplies/Labor)	7139	11.481	5.432	0.000	21.131

Source: Authors' calculation.

payment are provided in Table 6. Bribes are used mainly to gain access to public services and (27.8 percent), to deal with tax collectors (26.6 percent), and to win government contracts (11.7 percent). However, 18.2 percent of the firms declare receiving financial or technical assistance from the government.

Table 7 presents some descriptive statistics of key independent variables. For log variables, we add one to level variables before taking the natural logarithm of them so that their minimum value of 0 would produce a value of 0 for log variables. It is noteworthy that firms depend on the government much more as a source of input supplies for firms' operations than as a demander for firms' output. Moreover, firm managers spend on average 9 percent of their working hours dealing with government regulations. In some exceptional cases, they have to devote their whole working time to handling regulations.

#### *b. Econometric Model*

Bribe amounts are observed only for firms that must pay bribes to government officials. These firms normally form a non-randomly selected sample from the SME surveys. The OLS regression of the bribe payment on various variables could produce biased estimates due to missing data on those firms that do not bribe. This problem, called sample selection bias (Heckman, 1979), can be corrected by Heckman's two-step model. It comprises outcome

equation and selection equation:

$$\begin{aligned}
b_i &= \mathbf{w}'_i \boldsymbol{\gamma} + \varepsilon_i, \\
d_i &= 1 \quad \text{if} \quad E(d_i^* | b_i > 0) = \mathbf{x}'_i \boldsymbol{\beta} + u_i > a, \\
d_i &= 0 \quad \text{if} \quad E(d_i^* | b_i = 0) = \mathbf{x}'_i \boldsymbol{\beta} + u_i \leq a, \quad i = 1, \dots, n,
\end{aligned} \tag{1}$$

where  $b_i$  is bribe amount paid by firm  $i$  (observed only for firms that must pay bribes),  $\mathbf{w}_i$  are observed variables related to firm  $i$ 's characteristics such as its ability to pay bribes and its bargaining power,  $a$  is the minimum criterion for a firm's informal payment (if total characteristics  $\mathbf{x}_i$  of firm  $i$  are below this criterion, that firm does not have to make an informal payment),  $d_i = 1$  if firm  $i$  bribes and 0 otherwise,  $\boldsymbol{\gamma}$  and  $\boldsymbol{\beta}$  are unknown parameter vectors,  $\varepsilon_i$  and  $u_i$  are two error terms that are assumed to have a bivariate normal distribution. The outcome equation in (1) represents the desire relationship between the bribe amount and its underlying factors in the population. The selection equation takes into account the non-representative nature of the non-random sample.

There are two approaches to estimating the model (1), that is, the Heckman maximum likelihood procedure and the Heckman two-step procedure, among which the second is more frequently used (Cameron and Trivedi, 2009). Accordingly, the first step is to estimate the selection equation via probit over the whole sample to obtain estimates of  $\boldsymbol{\beta}$ . The model (1) can be stated with the bivariate normal distribution assumption as

$$\begin{aligned}
b_i &= \mathbf{w}'_i \boldsymbol{\gamma} + \varepsilon_i, \\
d_i &= 1(\mathbf{x}'_i \boldsymbol{\beta} + u_i > a) \\
d_i &= 0(\mathbf{x}'_i \boldsymbol{\beta} + u_i \leq a) \\
\begin{bmatrix} \varepsilon_i \\ u_i \end{bmatrix} &\sim N \left[ \mathbf{0}, \begin{pmatrix} \sigma_\varepsilon^2 & \sigma_{\varepsilon u} \\ \sigma_{u\varepsilon} & 1 \end{pmatrix} \right], \quad i = 1, \dots, n,
\end{aligned} \tag{2}$$

where  $\sigma_u^2$  is normalized to 1. Under the assumption of bivariate normal distribution for the two error terms which implies independence between the errors and the regressors, the model (2) can be rewritten as

$$\begin{aligned}
 b_i &= \mathbf{w}'_i \boldsymbol{\gamma} + \sigma_{\varepsilon u} \lambda(\mathbf{x}'_i \boldsymbol{\beta}) + \xi_i, \\
 d_i &= 1(\mathbf{x}'_i \boldsymbol{\beta} + u_i > a) \\
 d_i &= 0(\mathbf{x}'_i \boldsymbol{\beta} + u_i \leq a), \quad i = 1, \dots, n,
 \end{aligned} \tag{3}$$

where  $\sigma_{\varepsilon u}$  is the covariance between  $\varepsilon$  and  $u$ , and  $\lambda(\mathbf{x}'_i \boldsymbol{\beta})$  is the inverse Mills ratio which is implied by the bivariate normality of  $(\varepsilon_i, u_i)'$ . The inverse Mills ratio is defined as

$$\lambda(\mathbf{x}'_i \boldsymbol{\beta}) = \frac{\phi(\mathbf{x}'_i \boldsymbol{\beta})}{\Phi(\mathbf{x}'_i \boldsymbol{\beta})},$$

where  $\phi(\mathbf{x}'_i \boldsymbol{\beta})$  and  $\Phi(\mathbf{x}'_i \boldsymbol{\beta})$  are the probability density function and the cumulative distribution function, respectively, of the univariate standard normal distribution  $N(0, 1)$ .

In the second step, the outcome equation is estimated by OLS in which the vector  $\mathbf{w}_i$  and the constructed value of the inverse Mills ratio are the explanatory variables:

$$b_i = \mathbf{w}'_i \boldsymbol{\gamma} + \sigma_{\varepsilon u} \lambda(\mathbf{x}'_i \boldsymbol{\beta}) + \xi_i.$$

According to Heckman (1979), for identification purpose, the vector  $\mathbf{x}_i$  should include at least one variable that does not show up in the vector  $\mathbf{w}_i$ .

In this paper, the Heckman's two-step model is:

(i) The probit step:

$$\begin{aligned}
\text{Probit}(d = 1|\mathbf{x}) &= \Phi(\mathbf{x}'_i\boldsymbol{\beta}) + u \\
&= \beta_0 + \beta_1\ln(\text{Employment}) + \beta_2\ln(\text{K/L}) + \beta_3\ln(\text{Profit/Labor}) \\
&+ \beta_4\ln(\text{Import/Labor}) + \beta_5\ln(\text{Export/Labor}) + \beta_6\text{Regulations\_time} \\
&+ \beta_7\ln(\text{GvntSale/Labor}) + \beta_8\ln(\text{GvntSupplies/Labor}) + \beta_9\text{Informality} \\
&+ \beta_{10}\text{Government\_aid} + \beta_{11}\text{Tax/Sales} + \sum_{j=1}^{13} \alpha_j\text{sector\_dummy}_j + \sigma_{\varepsilon u}\lambda(\mathbf{x}'_i\boldsymbol{\beta}) + u,
\end{aligned}$$

(ii) The OLS step:

$$\begin{aligned}
\ln(\text{Bribe/Labor})|\mathbf{w} &= \mathbf{w}'_i\boldsymbol{\gamma} + \sigma_{\varepsilon u}\lambda(\mathbf{x}'_i\boldsymbol{\beta}) + \xi_i \\
&= \gamma_0 + \gamma_1\ln(\text{K/L}) + \gamma_2\ln(\text{Profit/Labor}) + \gamma_3\ln(\text{Import/Labor}) \\
&+ \gamma_4\ln(\text{Export/Labor}) + \gamma_5\text{Regulations\_time} + \gamma_6\ln(\text{GvntSale/Labor}) \\
&+ \gamma_7\ln(\text{GvntSupplies/Labor}) + \gamma_8\text{Informality} + \gamma_9\text{Government\_aid} \\
&+ \gamma_{10}\text{Tax/Sales} + \sum_{j=1}^{13} \delta_j\text{sector\_dummy}_j + \xi_i.
\end{aligned}$$

## 5 Empirical Results

The main results of the Heckman's two-step model are reported in Table 8. The estimated coefficient of the inverse Mills ratio,  $\hat{\lambda}$ , is statistically significant at 1% level in the Heckman two-step procedure (columns (1) and (3)). It indicates that the estimation of the outcome equation will be biased without taking into account the fact that bribing firms do not form a randomly selected sample from the SME survey. Therefore, the Heckman's two-step model is required to get rid of the sample selection bias. Another concern is the existence of heteroscedasticity in panel regression which may render inferences from the estimated model unreliable. Breusch-Pagan/Cook-Weisberg test (in Appendices 1 and 2) shows that there are significant differences in error variances across firms. And the maximum likelihood

Table 8: Heckman's Two-Step Model for Bribery

Variables	Incidence of Bribery		Bribe Amount	
	Heckman	Heckman	Heckman	Heckman
	two-step	vce (cluster)	two-step	vce (cluster)
	(1)	(2)	(3)	(4)
Constant	-2.433*** (-11.97)	-2.606*** (-10.88)	0.077 (0.18)	0.628 (1.23)
ln(Employment)	0.351*** (16.61)	0.384*** (19.70)		
ln(K/L)	0.012** (2.03)	0.011* (1.65)	0.014 (1.33)	0.012 (1.05)
ln(Profit/Labor)	0.134*** (7.68)	0.144*** (6.16)	0.310*** (9.99)	0.295*** (5.56)
ln(Import/Labor)	-0.006 (-0.72)	-0.010 (-0.92)	-0.010 (-0.68)	-0.012 (-0.74)
ln(Export/Labor)	-0.018*** (-2.72)	-0.020*** (-2.69)	0.001 (0.13)	-0.002 (-0.20)
Regulations_time	0.003*** (3.20)	0.003*** (3.75)	0.004** (1.84)	0.002 (1.37)
ln(GvntSale/Labor)	0.018*** (3.50)	0.020*** (3.77)	0.029*** (3.02)	0.023** (2.18)
ln(GvntSupplies/Labor)	0.015*** (3.11)	0.012** (2.41)	0.056*** (6.28)	0.052*** (5.82)
Informality	-0.567*** (-12.26)	-0.542*** (-11.85)	-0.798*** (-5.70)	-0.591*** (-5.77)
Government_aid	-0.024 (-0.52)	-0.015 (-0.32)	0.246*** (2.78)	0.216** (2.45)
Tax/Sales	0.026*** (3.57)	0.027*** (3.56)	0.069*** (5.03)	0.062*** (4.32)
Food sector	-0.511*** (-4.35)	-0.455*** (-3.77)	-0.777*** (-3.35)	-0.696*** (-3.24)
Textile sector	-0.620*** (-4.33)	-0.592*** (-4.10)	-1.057*** (-3.79)	-1.002*** (-3.83)
Wearables sector	-0.549*** (-3.83)	-0.527*** (-3.53)	-0.913*** (-3.33)	-0.859*** (-3.41)
Leather sector	-0.274** (-2.32)	-0.227* (-1.90)	-0.906*** (-3.94)	-0.886*** (-4.02)
Wood sector	-0.388*** (-3.15)	-0.346** (-2.81)	-0.443* (-1.87)	-0.411* (-1.87)
Paper sector	-0.346** (-2.34)	-0.320** (-2.21)	-0.241 (-0.89)	-0.254 (-0.92)
Printing sector	-0.306** (-2.10)	-0.276* (-1.86)	-0.142 (-0.52)	-0.122 (-0.51)

	(1)	(2)	(3)	(4)
Chemicals sector	-0.093 (-0.64)	-0.088 (-0.62)	0.084 (0.31)	0.061 (0.23)
Rubber and plastics sector	-0.455*** (-3.41)	-0.431*** (-3.07)	-0.224 (-0.90)	-0.185 (-0.75)
Nonmetallic minerals sector	-0.436*** (-3.16)	-0.406** (-2.87)	-0.630** (-2.41)	-0.617** (-2.54)
Fabricated metals sector	-0.370** (-3.13)	-0.329*** (-2.74)	-0.459** (-2.02)	-0.402* (-1.89)
Machinery and equipment sector	0.113 (0.89)	0.135 (1.06)	0.308** (1.31)	0.293 (1.34)
Furniture sector	-0.002 (-0.02)	0.016 (0.13)	-0.092 (-0.39)	-0.104 (-0.48)
Mills ratio				
lambda	1.576*** (9.60)			
rho = 0				
chi2(1)		213.250		
Prob>chi2		0.000		
Number of observations	7,139	7,139		
Censored observations	5,236	5,236		
Uncensored observations	1,903	1,903		
Wald chi2(23)	270.170	278.240		
Prob>chi2	0.000	0.000		

Notes: z-statistics are in parentheses.

\*, \*\*, \*\*\* denote 10%, 5%, and 1% level of significance, respectively.

Source: Authors' calculation.

estimation (MLE) that clusters at the firm level is employed (columns (2) and (4)). However, the two procedures produce similar results. Hereinafter, we shall interpret the results under the Heckman two-step procedure.

A firm's visibility proxied by its number of employees and informality status is significant at 1% level and has the expected signs. Larger firms will face higher probabilities of paying bribes while smaller ones, especially those not having business registration licenses, are more likely to avoid corruption. Moreover, informal firms pay 55 percent less bribes than their formal counterparts, other things being equal. It is consistent with the hypothesis by Rand and Tarp (2012) that the Vietnamese firms with an informal standing are less prone to corruption.

As firm managers have to spend more time dealing with various government regulations, their firms tend to pay bribes and pay bigger amounts. In addition, when the burden of regulations which is manifested in diverse types of taxes imposed on firms become heavier, the incidence and size of bribes both increase. Every additional 1 percent of sales declared for tax purposes raises the probability of informal payment and its volume by 3 percent and 0.07 percent, respectively.

Firms' engagement in international trade have different impacts. Table 8 implies that exporters are less likely to pay bribes than firms which serve mostly in domestic markets. As exports per labor rise by 1 percent, the incidence of bribe will decline by 2 percent. While domestic oriented firms are exposed more intensively to numerous regulatory requirements, exporting firms have higher technical and managerial capabilities, and hence stronger bargaining power against the government. In contrast, imports do not have a significant influence on firms' bribery.

Furthermore, greater dependence on the government as a client or a supplier is associated with firms' more acute vulnerability to rent-seeking practices. When a firm's sales to or purchases from the government per employee increase by 1 percent, it is 2 percent more inclined to be involved in corruption and its bribe payment is 0.03 percent and 0.06 percent bigger. An interesting point is that although government aid does not affect the incidence of bribery, it affects considerably bribe amounts. Firms that receive financial or technical assistance from the government pay 28 percent more than those who do not.

Regarding the bargaining hypothesis, it is found empirically that greater "ability to pay" (or higher profit per employee) impairs a firm's bargaining position, and stronger "refusal power" (or lower capital-labor ratio) does the opposite. As capital per employee which represents sunk cost associated with chosen technology declines by 1 percent, the probability that firms have to pay bribes falls by 1 percent. On the contrary, when firms make 1 percent more profit per employee, they are 13 percent more likely to pay bribes and their amount is 0.31 percent larger. Additionally, estimated coefficients of sector dummies suggest that the

propensity to bribe varies among industries in Vietnam.

One issue is that how the above results would change if there is a feedback from bribery to profits? In other words, does there exist a reverse causality between bribery and profits? The rent-seeking and regulatory capture approach gives a prediction about the positive relationship between profits and corruption (Svensson, 2003). Politicians and bureaucrats may compete for rent by selling government favor such as subsidies, discretionary tax relief, and other forms of regulations which become primary determinants of firm profitability and then rent-seeking would become widespread (Mbaku, 1992). However, according to causal empiricism, the regulatory process is dominated by large firms that have political power rather than small firms. Most firms in this sample are small. Therefore, it is difficult to prove the feedback from corruption to profits.

In addition, Svensson (2003) argues that it is questionable when treating profits as exogenous. As a robustness test, he uses two sets of instrument variables for profits. Similarly, this paper uses lagged values of profit per employee as an instrument variable for profit per employee. This instrument variable satisfies two conditions. Firstly, the lagged values of profit per employee are highly correlated with profit per employee (correlation coefficient = 0.3). Secondly, the lagged variable occurs in the past and thus cannot be correlated with the error in the present. Table 9 summarizes main results of the Heckman two-step regression using instrument variable technique.

The results are highly consistent with those in Table 8. In regard to the incidence of bribery, seven out of nine variables in Table 8 continue to be significant at 1% level and have the same signs, except capital-labor ratio and government supplies per employee which are no longer significant. Most estimated coefficients of statistically significant variables are larger than those in Table 8. Referring to factors underlying bribe amounts, all significant variables in Table 8 remain good regressors in explaining the variation in bribe amounts.



Table 9: Heckman's Two-Step Model for Bribery, Using Instrument Variables

Variables	Incidence of Bribery		Bribe Amount	
	Heckman	Heckman	Heckman	Heckman
	two-step , IV	vce, IV	two-step , IV	vce, IV
	(1)	(2)	(3)	(4)
Constant	-5.068*** (-9.76)	-5.362*** (-8.27)	-4.674*** (-6.05)	-4.480*** (-3.50)
ln(Employment)	0.388*** (16.96)	0.408*** (19.02)		
ln(K/L)	0.009 (1.62)	0.009 (1.28)	0.006 (0.66)	0.006 (0.51)
ln(Profit/Labor)	0.422*** (7.68)	0.448*** (6.33)	0.885*** (10.82)	0.882*** (6.05)
ln(Import/Labor)	-0.013 (-1.45)	-0.016 (-1.48)	-0.021 (-1.64)	-0.022 (-1.35)
ln(Export/Labor)	-0.016** (-2.39)	-0.016** (-2.18)	0.010 (0.96)	0.008 (0.66)
Regulations_time	0.003*** (3.13)	0.003*** (3.71)	0.003 (1.56)	0.002 (1.33)
ln(GvntSale/Labor)	0.023*** (4.35)	0.025*** (4.61)	0.035*** (3.93)	0.032*** (3.09)
ln(GvntSupplies/Labor)	0.001 (0.21)	-0.002 (-0.28)	0.025*** (2.70)	0.023** (2.12)
Informality	-0.549*** (-11.81)	-0.536*** (-11.59)	-0.618*** (-4.70)	-0.547*** (-5.20)
Government_aid	0.018 (0.38)	0.032 (0.68)	0.339*** (4.03)	0.320*** (3.63)
Tax/Sales	0.025*** (3.36)	0.025*** (3.40)	0.060*** (4.77)	0.058*** (4.17)
Food sector	-0.433*** (-3.68)	-0.383*** (-3.17)	-0.502** (-2.32)	-0.504** (-2.41)
Textile sector	-0.452*** (-3.12)	-0.413*** (-2.80)	-0.573** (-2.16)	-0.578** (-2.17)
Wearables sector	-0.414*** (-2.86)	-0.381** (-2.51)	-0.511** (-1.98)	-0.512** (-2.03)
Leather sector	-0.171 (-1.44)	-0.126 (-1.05)	-0.629*** (-2.92)	-0.648*** (-3.00)
Wood sector	-0.207 (-1.65)	-0.159 (-1.25)	0.017 (0.08)	0.003 (0.01)
Paper sector	-0.326** (-2.21)	-0.297** (-2.04)	-0.124 (-0.49)	-0.149 (-0.56)
Printing sector	-0.274* (-1.88)	-0.243* (-1.64)	-0.011 (-0.04)	-0.024 (-0.10)

	(1)	(2)	(3)	(4)
Chemicals sector	-0.067 (-0.46)	-0.059 (-0.41)	0.162 (0.64)	0.147 (0.58)
Rubber and plastics sector	-0.439*** (-3.29)	-0.415*** (-2.95)	-0.095 (-0.41)	-0.101 (-0.42)
Nonmetallic minerals sector	-0.281** (-2.00)	-0.240* (-1.65)	-0.210 (-0.85)	-0.229 (-0.92)
Fabricated metals sector	-0.290** (-2.44)	-0.253** (-2.10)	-0.215 (-1.01)	-0.212 (-1.01)
Machinery and equipment sector	0.218* (1.71)	0.240* (1.87)	0.502** (2.28)	0.488** (2.27)
Furniture sector	0.073 (0.57)	0.092 (0.73)	0.063 (0.28)	0.048 (0.23)
Mills ratio				
lambda	1.255*** (8.34)			
rho = 0				
chi2(1)		137.69		
Prob>chi2		0.000		
Number of observations	7,139	7,139		
Censored observations	5,236	5,236		
Uncensored observations	1,903	1,903		
Wald chi2(23)	310.02	280.57		
Prob>chi2	0.000	0.000		

Notes: z-statistics are in parentheses.

\*, \*\*, \*\*\* denote 10%, 5%, and 1% level of significance, respectively.

Source: Authors' calculation.

## 6 Conclusions

This paper uses a panel data set from the Small and Medium Enterprise Survey in Vietnam from 2005 to 2013 to investigate the incidence and size of corruption in Vietnam. The Heckman's two-step model is employed to take into account censored nature of the data on bribes and sample selection bias. We find strong evidence that the propensity to bribe as well as bribe amounts are highly correlated with firm characteristics and regulation structure.

In particular, smaller firms and those not having business registration licenses are more

likely to avoid corruption and to pay less bribes than their formal counterparts. As the burden of regulations proxied by managers' time spent on coping with regulations and percentage of sales spent on taxes becomes heavier, firms tend to agree to bribing. In addition, more frequent and intensive interaction with corrupt government officials, measured by sales to and purchases from the government per employee and government assistance, is associated with more rent-seeking practices. Those firms that earn higher profits and higher capital-labor ratios have weaker bargaining positions against government bureaucrats. However, exporting firms' bargaining power is much stronger. To disentangle the two-way causal relationship between bribes and profits, this paper uses lagged values of profit as instruments. The above results are robust to different econometric specifications.

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## Appendix 1

Heteroskedasticity test using Breusch-Pagan / Cook-Weisberg - the Heckman's two-stage model

$H_0$ : Constant variance

Variables: fitted values of  $\ln(\text{Bribe}/\text{Labor})$

Result:

$\text{chi2}(1) = 35.51$

$\text{Prob} > \text{chi2} = 0.0000 \rightarrow \text{reject } H_0.$

## Appendix 2

Heteroskedasticity test using Breusch-Pagan / Cook-Weisberg - the Heckman's two-stage model when using instrument variables

$H_0$ : Constant variance

Variables: fitted values of  $\ln(\text{Bribe}/\text{Labor})$

Result:

$\text{chi2}(1) = 36.43$

$\text{Prob} > \text{chi2} = 0.0000 \rightarrow \text{reject } H_0.$