Corruption, provincial institutions and manufacturing firm productivity: New evidence from a transitional economy*

Corrupción, instituciones provinciales y productividad manufacturera: Nueva evidencia para una economía en transición

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Abstract

Using data from nationwide surveys of provincial institutions and private manufacturing small medium enterprises, this study provided the first evidence of the impact of provincial institution quality and firms' participation in and intensity of corrupt activities on firm productivity in Vietnam. We found that the bribe intensity instead of whether firms bribed state officials or not (measured by a dummy variable) has a negative effect on firm productivity when the endogeneity of corruption and unobservable characteristics are controlled for. This finding contrasts to a popular belief about a paradox for East Asian countries where corruption is positively associated with firm growth.

Key words: *Corruption, firm productivity, SMEs, Vietnam.*

JEL Classification: *C26; L25*

Resumen

Este trabajo es el primero en proveer evidencia del impacto de la calidad de las instituciones provinciales y la intensidad de la corrupción en la productividad

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de las empresas en Vietnam. Para ello se utilizó información de encuestas nacionales de instituciones provinciales y empresas manufactureras. Controlando por la endogeneidad de la corrupción, se encuentra que la intensidad del uso de sobornos afecta negativamente a la productividad de las empresas. Estos resultados contrastan con la creencia popular que la corrupción y el crecimiento de las firmas están positivamente asociados.

Palabras clave: *Corrupción, productividad de las empresas, PYME, Vietnam.*

Clasificación JEL: *C26; L25*

1. Introduction

Corruption is a worldwide phenomenon, especially in the developing world, which many authors and theories offer various theoretical arguments toward the relationship between corruption and firm performance. On the one hand, resource-based perspectives argue that corruption may erode economic and social institutions and long term development. Specifically, it can destroy critical resources such as firms' reputation, impeding the efficient allocations of resources, and an enterprise's culture (Hung, 2008; Lou, 2002). Consequently, it may drive profit away from firms, and talent, technological advancement and innovation are not sufficiently valued. Firms are dis-incentivized to invest for growth and improve productivity (Murphy, Shleifer, & Vishny, 1993). Corruption in such case is considered as 'sand-in-the-machine' (Ades & Di Tella, 1996). In addition, corruption may prevent the entry of new firms because incumbents tend to exploit their existing corrupt relationship. Corrupt officials try to delay transactions to receive more bribes from public service users (Rose-Ackerman, 1997). Public resources would then be misallocated, not to the-best-users who can offer the best value for money for society instead to whom who offer the highest bribes (Jain, 2001).

On the other hand, the literature has often found a theoretically puzzling positive relationship between corruption and firm productivity, which defies intuition and parallel evidence. For instance, rent-seeking views reveal that engagement in corruption can help firms save time and allows firms to get things done or to overcome bureaucratic administrative processes and unclear or complicated regulations (e.g., Lui, 1985). Firms pay bribes to speed things up or "grease the wheels" which then promotes the growth of firms.

In another way, the institutional theory is recognized as one of the most popular perspectives to explain firm behavior in the transitional economies (e.g., Hoskisson, Eden, Lau, & Wright, 2000; Wright, Filatotchev, Hoskisson, & Peng, 2005). This approach indicates that corruption may not affect firm efficiency. Because corruption is simply an entry cost to join an established game and helps firms survive in their environment (North, 1990). When neighboring firms take part in corruption, other firms are under pressure to act in similar ways. Consequently, corruption is a common practice and has little effect on their productivity.

While theoretical arguments are clear, empirical studies have not been reached a consensus. Early studies of the effects of corruption on economic ef-

ficiency used cross country macro data (e.g., Pierre-Guillaumeméon & Sekkat, 2005). However, firm heterogeneity may affect firm productivity and innovation when the heterogeneity is able to be controlled for at an aggregate level data (Kasahara & Rodrigue, 2008). Furthermore, Halpern, Koren, and Szeidl (2005) show that the studies at the macro-level may suffer from omitted variables and reverse causality bias.

With the availability of firm-level data, recent research has emphasized the relationship between corruption and growth at the firm level (e.g., Faruq, Webb, & Yi, 2013). However, the evidence is mixed. For example, while De Rosa, Gooroochurn, and Görg (2013) found a negative relationship between firm productivity and corruption in European countries, other studies in East Asian countries (e.g., Vial & Hanoteau, 2010) reveal a positive link. There is limited evidence in transitional economies where corruption is likely widespread, this motivates us to pursue this topic in a transitional economy of Vietnam.

In the study, we re-examine this question for the case of Vietnam because of three reasons. First, although there are few studies in Vietnam on general corruption topic (e.g., Nguyen & Van Dijk, 2012), there is no empirical evidence of the impact of bribe on firm productivity in Vietnam. Hence, our study provides the first evidence of the impact of corruption on firm productivity in Vietnam. Second, though the anti-corruption and anti-waste laws and various anti-corruption campaigns have been in place, bribes to public officials remain a major challenge for business environment in Vietnam. The frequency and size of bribes have remained at high levels (Edmund Malesky, 2009). While the Communist Party and the government has publicised its anti-corruption efforts, the country has made a very little progress in the corruption rankings. Indeed, the recent Transparency International report in 2014 shows that Vietnam achieved a score of 3.1 out of 10 (or 119 out of 177 countries). There is no improvement in score during last three years and a score of 3.1 remained unchanged. Vietnam was ranked even behind the Philippines and Indonesia where corruption is very severe. Furthermore, a high quality data on corruption and institutional quality at provincial level and firm productivity is available, making this study possible.[1]

There are several empirical challenges when considering the impact of corruption on firm productivity. For instance, most of previous studies measure bribes as a dummy variable, and this measurement cannot capture the severity or level of corruption very well. To deal with this limitation, this study uses both measures. In addition, corruption may be potentially endogenous that may bias the results in the available empirical evidence. We tried to overcome the methodological challenges by using IV approach in which we predict the amount of bribe paid by firms or the likelihood of paying bribe by using the expected amount of bribe by industry in each province within a year.

The paper is structured as follows. Next section presents a theoretical discussion for potential impacts of corruption and institutional quality on firm growth. Section 3 presents data and methodology. Empirical results are presented in section 4, and finding summary and conclusion is in the last section.

[1] More details about the data, please see part 3.1

2. Corruption and the role of institutional quality in the linkage between corruption and firm performance

Corruption is widely defined as the abuse of power by public officials for private gains (Svensson, 2005). Corruption is an outcome of non-transparent legal, economic and political institutions, and affects business and economic development. Corruption is a result of incomplete monitoring and bad or inefficient policies. Firms who want to overcome the barriers and speed up their business process are willing to pay bribes. Following Rand and Tarp (2012), in the current study, bribe is measured as a dummy variable based on the question whether firms paid informal or communication fees, while the ratio of bribe payment amount relative to firm revenue is used to measure the intensity of bribe.

When considering the role of corruption on firm productivity, the provincial institutional quality is also controlled for in our study because of several reasons. First, Méon and Weill (2010) examined a sample of 69 countries and found that corruption is less harmful to efficiency in countries where institutions are less effective. It may even be positively associated with efficiency in countries where institutions are extremely ineffective. They concluded that corruption is ''grease the wheels''. Other studies also reached a consensus that at a higher corruption level, corruption may be correlated with poor institution, corruption greases the wheel of efficiency but at a lower level of corruption (higher CPI-Corruption Perception Index), corruption and economic efficiency go in reverse directions (e.g., Halkos & Tzeremes, 2010).

Similarly, the recent literature also notes that the estimated effect of bribe on firm productivity growth may be biased if institutional quality factor is not taken into account. The institutional quality may affect the relationship between corruption and firm level productivity (Faruq *et al*., 2013).

Also, each province in Vietnam has many disparities in business culture and economic development. They have autonomy to implement or practise policies and regulations even the central government has unique laws/regulations for all regions/provinces. The provinces implement central government's laws in different ways (Malesky, 2004, 2008). Laws in Vietnam are often ambiguous and explained in different ways. Furthermore, the development in institutions across provinces has been uneven. For example, some provinces have made significant improvement in economic governance, business and investment environment, while other provinces lag behind and are very bureaucratic (Malesky, 2007).

3. Data Sources and empirical methods

3.1. Data sources

This study utilises two data sources. The first data are obtained from the Small and Medium Enterprise Survey in Vietnam, which were conducted in 2005, 2007, 2009 and 2011 by the Institute of Labour Science and Social Affairs, the Central Institute for Economic Management in collaboration with the University of Copenhagen. The survey used the same questionnaire over the years and covered private manufacturing firms in ten provinces in the South, Central and North regions of Vietnam. The data offer an unbalanced dataset of

more than 10,000 observations. More detail of the data can be seen in Rand and Tarp (2012) and Vu, Holmes, Lim, and Tran (2014).[2]

The second data source is from a survey of the Vietnam aggregated Provincial Competitiveness Index (PCI), which were conducted by the Vietnam Competitiveness Initiative in collaboration with the Vietnam Chamber of Commerce and Industry in the period 2005-11 for a purpose of evaluating institutional quality of provincial or local governments. The survey provides nine institutional sub-indices across years of the the period. These indices are : *First*, entry costs including (i) time for firm registration and land acquisition, (ii) time for firms to gain all the necessary licenses needed to start a business as well as the degree of difficulty to obtain such licenses/permits. *Second*, access to the acquired land and the security of business premises after land has had been acquired. *Third*, transparency and access to information, that is whether firms have access to proper planning and legal documents for running their business such as labour and training, whether new policies and laws are communicated to firms sufficiently and predictably implemented. *Fourth*, cost of time to deal with regulatory compliance measure e.g. bureaucratic compliance or decisions to implement local regulations. *Fifth*, informal charges measuring a firm's perception about the corruption from provincial officials. *Sixth*, distortion offering privileges to state owned enterprises e.g. incentives, policy, and access to capital and credit sources toward state-owned enterprises. *Seventh*, private sector development designs services, provinces' private sector business growth promotion programs, development of industrial zones and parks. *Eighth*, employment and worker training, those provincial authorities promote vocational training and skills development for local firms. *Ninth*, legal institutions measuring the trust from firms on provincial courts and contract enforcement.

The combination of the SME survey and PCI survey offers a unique firm-provincial level panel dataset. This panel dataset enables us to measure not only the impact of corruption at firm level but also the effects of institutional quality at the provincial level on firm productivity growth. The variables measured in monetary terms are deflated to 1994 constant prices using the GDP deflator.

Table 1 provides descriptive statistics ofthe variables included in the models. Corruption index decreases considerably from 40.5% in 2005 to 26% in 2007. This is consistent with the decreasing trend for this period shown in Rand and Tarp (2012), which can be explained by effect of the anti-corruption law passed in 2005 and establishment of the National Anti-Corruption Committee in 2006. However, the bribe index experiences a significant increase again through rest of the study period. Our data also provide information about bribe purposes. The most common reason for giving bribes is to get connected with public services. 25.82 % of the surveyed firms committed this sort of corruption, 25.31% of surveyed firms gave bribes to tax collectors, and 12.12 % of the firms used bribes to gain government contracts. Other reasons such as getting licenses and permit and dealing with customs make up 10.3%.

During the study period, while average labour experiences a slight decrease from 2.04 to 1.93, the capital of firms increases significantly in our sample in

[2] The data are shared kindly by Professor John Rand

TABLE 1
STATISTICAL DESCRIPTION OF THE MAIN VARIABLES
IN OUR REGRESSION ESTIMATIONS

Variables[3]	2005[4]		2007		2009		2011	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Value added (log) (million VND)	4.113	1.49	4.244	1.56	4.34	1.62	4.481	1.59
Firm-level variable								
Bribe (Dummy)	0.405	0.49	0.26	0.44	0.34	0.47	0.38	0.48
Bribe intensity (Ratio)	0.002	0.008	0.0016	0.0149	0.0013	0.018	0.0011	0.004
Labour (log) (number of employee)	2.04	1.12	2.05	1.12	2.05	1.14	1.93	1.13
Capital (log) (million VND)	5.13	1.82	5.40	1.85	5.45	1.86	5.81	1.79
Innovation (Dummy)	0.67	0.47	0.48	0.50	0.45	0.49	0.44	0.49
Leverage (Ratio)	0.12	0.39	0.11	0.23	0.10	0.23	0.07	0.19
Institutional quality at province level								
Entry cost	7.19	1.13	7.62	0.71	8.22	0.35	8.62	0.29
Land access	5.33	1.13	5.75	0.80	5.55	0.68	5.7	0.87
Transparency	5.83	1.17	6.07	0.79	5.9	0.33	5.96	0.43
Time cost	4.81	0.93	6.57	0.83	6.11	0.52	6.11	0.68
Informal charge	5.84	0.97	6.15	0.60	5.33	0.54	6.31	0.90
Proactive	4.79	1.51	4.96	1.24	3.76	0.83	4.19	0.98
Private act	5.69	1.62	5.87	1.93	6.29	1.21	5.68	1.37
Worker training	5.68	1.65	5.27	1.01	4.87	0.84	5.20	0.47
Legal framework	3.82	1.16	3.99	0.71	5.21	0.53	5.78	0.34
PCI	53.84	7.18	56.76	5.61	56.59	3.66	59.45	3.24
Observations	2695		2484		2515		2435	

the same period. Innovation and leverage has the same trend with a decreasing trend in the period 2005-11.

For institutional factors at the provincial level, we use both aggregated index (PCI) and several sub-indicators. Some sub-indicators increased significantly throughout the period, while other indices decreased slightly. For example, entry costs increased considerably from 7.19 in 2005 to 8.2 in 2011, but the index of worker training across provinces witnessed a slight decrease in the same period.

[3] 1USD equated to about 16,000 VND; 17,000 VND; 19,000 VND and 20,000 VND in 2005, 2007, 2009, 2011 respectively.

[4] Provincial level indices of 2006 instead of 2005 are used because of two reasons. First, our focus is on 10 provinces, but PCI in 2005 did not survey some of these provinces. In addition, firm-level survey in 2005 was conducted from late October onwards. Thus using CPI of 2006 does match quite well with firm-level data of 2005.

A partial correlation matrix for dependent and independent variables is reported in Table 2. The correlation coefficient between firm productivity and corruption is 0.38 and this tentatively supports the argument of the grease the wheel of corruption. In addition, firm characteristics such as innovation and leverage are also found to have a significant correlation with firm productivity growth. However, the correlation coefficient for innovation and leverage is very small (0.03 and 0.08, respectively).

For institutional quality variables at the provincial level, it was found that many other explanatory variables are significantly correlated with the dependent variable except for the informal charge, proactive and legal framework.

The final row of Table 2 shows the partial correlation matrix between bribe intensity with other covariates in the model. While bribe intensity has a positive significant relationship with dependent variable, it has insignificant linkages with the majority of sub-indicators of institutional quality at the provincial level.

3.2. Empirical method and estimation issues

The impact of corruption on firm productivity is examined using an augmented Cobb-Douglas production function as the common specification in the literature. We conduct a one-stage productivity estimation procedure. This comes from several main reasons. First, usage of one-stage approach may avoid a debate about what the most suitable approach for calculating the productivity (Van, 2003). In addition, the two step approach (e.g. Levinsohn and Petrin, 2003; Olley and Pakes, 1996) has some disadvantages such as identification and estimation issues, although this approach may control for the endogeneity of input factors by using firm's intermediate consumption (see more detailed discussion in Ackerberg *et al*, 2006; and Wooldridge, 2009). Furthermore, De Rosa *et al*. (2013) show that two-step approach is less efficient than one-step approach.

Accordingly, we use the one-stage approach to estimate the linkage between firm productivity and corruption as below:

$$(1)\quad lnVA_{ijt} = \alpha + \beta_1 Bribe_{itj} + \beta_2 lnK_{ijt} + \beta_3 lnL_{ijt} + \beta_4 X_{ijt} + \lambda_t + \lambda_j + \lambda_m + e_{ijt}$$

where *lnva* is log value added of firm *i* in industry *j* at time *t* that is modelled with inputs of $\ln K_{ijt}$ (capital) and $\ln L_{ijt}$ (labour count), and bribe is the main variable of interest. Most of studies measure corruption as a dummy variable and this does not allow capturing the intensity of corruption well and hence, we use both in this study. We also include some firm-level characteristics including leverage, measured by the ratio between total debts over total assets and innovation as these factors also affect firm productivity (e.g.,Griffith, Huergo, Mairesse, & Peters, 2006). Equation (1) also includes dummy variables for year (λ_t), industry λ_j , and location fixed effects (λ_m).

In an extended specification, provincial level institutional quality indices are also controlled for as discussed earlier regarding the role of institutional quality).

$$(2)\quad lnVA_{ijt} = \alpha + \beta_1 \mathrm{Bribe}_{ijt} + \beta_2 lnK_{ijt} + \beta_3 lnL_{ijt} + \beta_4 X_{ijt} + \beta_5 Z_{ijt} + \lambda_t + \lambda_j + \lambda_m + e_{ijt}$$

where Z_{ijts} are factors of institutional quality at the provincial level. Unobservable characteristics and potential endogeneity of the Bribe variable may cause the bias

TABLE 2
CORRELATION MATRIX

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. lnva	1												
2. Leverage	0.16*	1											
3. Bribe	0.38*	0.06*	1										
4. Innovation	0.29*	0.07*	0.19*	1									
5. Entry Cost	–0.11*	–0.04*	–0.06*	–0.17*	1								
6. Land Access	–0.07*	–0.00	–0.06*	–0.07*	0.47*	1							
7. Transparency	0.16*	0.02	0.07*	–0.01	0.09*	0.21*	1						
8. Time Cost	–0.02	–0.02*	–0.07*	–0.12*	0.5*	0.37*	0.31*	1					
9. Informal Charge	–0.02*	–0.01	–0.02*	–0.01	0.46*	0.64*	0.35*	0.51*	1				
10. Proactive	0.002	0.04*	–0.04*	0.02*	0.10*	0.34*	0.42*	0.30*	0.47*	1			
11. Private Act	0.25*	0.02	0.05*	–0.02*	–0.00	–0.14*	0.60*	0.05*	–0.04*	0.29*	1		
12. Labour Training	0.11*	0.03*	0.08*	0.01	0.06*	0.05*	0.67*	–0.00	0.25*	0.53*	0.64*	1	
13. Legal Framework	0.11*	–0.03*	–0.01	–0.12*	0.74*	0.41*	0.18*	0.30*	0.28*	0.00	0.02*	0.13*	1
14. Bribe intensity	0.032*	0.008		0.05*	–0.02*	0.012	0.006	–0.01	0.014	0.01	–0.00	0.014	–0.01

Note: * is statistically significant at the five percent level

Finally, we also examined whether multicoliearity may be a problem in our sample. As shown in Table 2, the highest correlation coefficient with statistically significance is 0.64. This implies that mulcolininearity problem is not a serious problem in our regression since the correlation coefficients among variables are not over 0.8 (Gujarati, 2003). In addition, the formal results reveal that all VIF indexes are below 10, suggesting that there are not multicolineary problems in this data. The results are similar if using bribe intensity instead of bribe.

in estimates from equation 2 when using OLS estimation (Fisman & Svensson, 2007). Although some studies show that the endogeneity of corruption may not be a serious concern in Vietnam because of their measurement (e.g., Nguyen & Van Dijk, 2012). However, this may not be true in our case. Bribe is potentially endogenous since Rand and Tarp (2012) used the same dataset as ours show that corruption in Vietnam itself is determined by other factors. In addition, Asiedu and Freeman (2009) argue that when the data of corruption and firm productivity stemming from the same source at firm level would result in endogeneity problem. Hence, our identification strategy to deal with the potential endogeneity of bribe is to use industry-location averages of corruption as an instrumental variable as suggested by Fisman and Svensson (2007). Accordingly, firm's bribe payments include two elements:

$$b_{ijt} = B_{ijt} + B_{jt} \tag{3}$$

While *Bijt* is payments of firm *i* in industry *j* at time *t* by idiosyncratic reasons, B_{jt} is the share of payments by reasons relating to specific sector in a certain geographical location at time *t*. We conduct two-stage empirical estimation procedure. First, the location-industry average bribe payment (Bjt) along with other exogenous variables are used to estimate the fitted values for $b_{ijt.}$. Then, we model firm productivity growth as a function of the fitted values from the first-stage regression and other exogenous variables as seen in equations (4) and (5).

$$b_{ijt} = f(B_{jt}, \ln K_{ijt}, \ln L_{ijt,} X_{ijt,} Z_{ijt}) \tag{4}$$

$$Lnva_{ijt} = f(\hat{b}_{ijt,} \ln K_{ijt}, \ln L_{ijt}, X_{ijt,} Z_{ijt}) \tag{5}$$

As shown in Fisman and Svensson (2007), the use of industry-location average as an instrument not only overcomes the potential endogeneity of corruption, the bias from unobservables, but also mitigates measurement error in the data. We therefore employ the IV-fixed effect approach to address the potential bias caused by both time-invariant unobservable characteristics and the potential endogeneity of bribe (Vial & Hanoteau, 2010).

4. Empirical results and discussions

We start modelling with contemporary variables to provide some baseline estimates. The OLS and FE models are used. As shown in column 1 of Table 3, there is a positive and significant linkage between bribe payment and firm productivity growth at the one percent level. The estimated coefficient indicates that firms with corruption behaviour have higher productivity than those without paying bribe. This finding is in line with recent results for many East Asian countries when firm productivity increases despite widespread corruption (e.g., Vial & Hanoteau, 2010 for Indonesia). However, the results contrast to the findings by Fisman and Svensson (2007) for African firms. Such mixed results imply that this initial observation by OLS can be biased stemming from unobservable factors or the potential endogeneity problem of corruption.

TABLE 3
BASELINE ESTIMATIONS:
THE IMPACT OF CORRUPTION ON FIRM PRODUCTIVITY

Variables	(1)	(2)	(3)	(4)	(5)
	Pooled OLS	FE	FE	FE	FE
Bribe	0.1244**	0.0768**	0.0768**	0.0832**	
	(0.015)	(0.017)	(0.017)	(0.017)	
Bribe intensity					–0.9078+
					(0.530)
Ll	0.9305**	0.7145**	0.7144**	0.7154**	0.7208**
	(0.009)	(0.019)	(0.019)	(0.019)	(0.017)
Lk	0.1727**	0.0925**	0.0924**	0.0859**	0.0879**
	(0.006)	(0.009)	(0.009)	(0.008)	(0.007)
Leverage	0.2541**	0.0623*	0.0622*	0.0610*	0.0607*
	(0.048)	(0.028)	(0.028)	(0.028)	(0.027)
Innovation	0.1425**	0.0814**	0.0814**	0.0873**	0.0940**
	(0.014)	(0.016)	(0.016)	(0.016)	(0.017)
Entry cost				0.0088	0.0144
				(0.017)	(0.017)
Land access				0.0077	0.0057
				(0.014)	(0.015)
Transparency				–0.0013	0.0037
				(0.014)	(0.014)
Time cost				–0.0924**	–0.0911**
				(0.015)	(0.015)
Informal charge				0.0213	0.0189
				(0.018)	(0.018)
Proactive				0.0200*	0.0172+
				(0.010)	(0.010)
Private act				0.0303**	0.0264**
				(0.009)	(0.009)
Labour training				–0.0371*	–0.0338*
				(0.016)	(0.016)
Legal framework				0.0531**	0.0506**
				(0.016)	(0.017)
Urban dummy	0.3506**	0.3102*			
	(0.015)	(0.129)			
PCI			0.0001		
			(0.002)		
Constant	1.0823**	1.9190**	2.0497**	2.0280**	2.0136**
	(0.030)	(0.086)	(0.101)	(0.087)	(0.104)
Observations	10,033	10,033	10,033	10,033	10,033
R-squared	0.817	0.311	0.311	0.321	0.319

Notes: The dependent variable is the natural log of value added. Robust standard errors are in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Models are controlled for year dummies, urban dummy and technological level dummies.

To control for firm's time-invariant unobserved features, we run the fixed effect estimations. As reported in column2 of Table 3, the sign of impact of corruption on firm productivity growth does not change, although the estimated coefficients are higher. We further control for intuitional quality factors at the provincial level, the estimated results are reported in column 3 of Table 3 for the aggregated index (PCI) and column 4 of Table 3 for sub-indexes of provincial institutional quality. The estimated coefficient of the corruption variable (Bribe) on firm productivity growth is still positive and statistically significant. However, if replacing bribe by bribe intensity, column 5 of Table 3 reveals a negative and significant linkage between bribe intensity and firm productivity.

As expected, innovation has a positive impact on firm productivity. For example, column 2 Table 3 shows that innovators have 9 percent higher productivity than non-innovators, holding all other things constant. Leverage, as measured by the ratio between total debts over total assets, is also observed to be positively associated with firm productivity regardless of model specifications. This may be that firms with higher leverage face higher pressure.

It is worth noting that the results in Table 3 are still potentially biased due to the potential endogeneity of Bribes, which cannot be addressed by the fixed effects method. We therefore employ the instrumental variable fixed effect approach to control for both the endogeneity of bribe variable and unobservable time-invariant factors. The results of testing endogeneity of bribe and bribe intensity at the last line of Table 4 show that all P-values of the test are smaller ten percent, suggesting that the results in Table 3 are upward biased if the endogeneity of Bribe and bribe intensity is not controlled for.

We also conducted weak IV test to avoid the bias induced from weak instruments. The values of Cragg-Donald Wald F statistics are 926, 926, 731, 346, 346 and 301 for six model specifications in columns 1-6 of Table 4 respectively, which are greater than the reported Stock-Yogo's weak identification critical value of 16.38. As a result, the variables of location-industry-year average of bribe and bribe intensity are valid IVs in our estimation

Interestingly, as reported in Table 4, a negative effect of a firm's probability engaging into corruption on firm productivity is observed across all model specifications when we controlled for the endogeneity of corruption. However, the estimated coefficient becomes statistically insignificant. This result supports institutional perspectives. These results are also in line with recent findings that corruption is widespread among Vietnamese firms, and hence firms' engagement in corruption has nothing to do with firm efficiency because it is considered as a norm among firms (DEPOCEN, 2012). Nevertheless, a corruption dummy variable is unable to capture the level of corruption. Hence, the intensity of corruption is considered in the next scenarios. The results are reported in the last columns 4, 5 and 6 of Table 4. Negative and significant impacts of the level of corruption on firm productivity are recorded through different specifications. This implies that the role of corruption on firm productivity can be clouded when measuring only bribe as a dummy variable.

Regarding the size of estimated coefficient of bribe intensity, it is the fact that the bribery dummy variable is not significant (in spite of the correct sign) signals that the bribe intensity coefficient may be small. Specifically, it is noted that the model is not a linear-linear form. Hence, the estimated coefficient of bribe intensity cannot be interpreted directly from the model. In this case, the

TABLE 4
IV-FIXED EFFECT ESTIMATIONS: THE IMPACT OF CORRUPTION ON FIRM PRODUCTIVITY[5]

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Bribe	–0.0456	–0.0456	–0.0009			
	(0.046)	(0.046)	(0.050)			
Bribe intensity				–7.8637+	–7.8634+	–5.2354*
				(4.630)	(4.631)	(2.437)
Ll	0.7227**	0.7226**	0.7210**	0.7177**	0.7177**	0.7198**
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.017)
Lk	0.0947**	0.0947**	0.0874**	0.0987**	0.0987**	0.0906**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Leverage	0.0607*	0.0607*	0.0600*	0.0668*	0.0668*	0.0639*
	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.027)
Innovation	0.0896**	0.0898**	0.0930**	0.0960**	0.0960**	0.0989**
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Entry cost			0.0144			0.0147
			(0.017)			(0.017)
Land access			0.0057			0.0055
			(0.015)			(0.015)
Transparency			0.0039			0.0030
			(0.014)			(0.014)
Time cost			–0.0913**			–0.0904**
			(0.015)			(0.015)
Informal charge			0.0185			0.0205
			(0.018)			(0.018)
Proactive			0.0174+			0.0161
			(0.010)			(0.010)
Private act			0.0267**			0.0246**
			(0.009)			(0.009)
Labour training			–0.0343*			–0.0314+
			(0.016)			(0.016)
Legal framework			0.0508**			0.0495**
			(0.016)			(0.017)
Urban dummy	0.3224*	0.3217*		0.3122*	0.3123*	
	(0.143)	(0.144)		(0.158)	(0.158)	
PCI		0.0002			–0.0000	
		(0.002)			(0.002)	
Observations	8,829	8,829	8,829	8,829	8,829	8,829

[5] We further conduct robustness check of results by looking at several scenarios. First, we removed extreme outliers. The estimated results, reported in Table 4 column 3, change slightly, suggesting that the results are robust. We also further investigate the sensitivity of the coefficient by dropping innovation variable with an argument that innovation may be potentially endogenous. The negative effect of corruption on firm productivity growth is still observed.

Table 4 (continuation)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Instrumental Variables	location–industry–year average of bribe	location–industry–year average of bribe	location–industry–year average of bribe	location–industry–year average of bribe intensity	location–industry–year average of bribe intensity	location–industry–year average of bribe intensity
Weak identification test(Cragg-Donald Wald F statistic) [Stock-Yogo weak id test critical value at 10 percent]	926.312 [16.38]	926.107 [16.38]	731.591 [16.38]	346.577 [16.38]	346.671 [16.38]	301.392 [16.38]
Endogeneity test of Bribe and bribe intensity (P-value)	0.004	0.004	0.07	0.001	0.001	0.067

Notes: The dependent variable is the natural log of value added. Robust standard errors are in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Models are controlled for year dummies and technological level dummies.

estimated coefficient is explained through the mean value approach. In our study, the mean value of bribe intensity for whole sample is 0.0015. Therefore, when bribe intensity increases 1% compared to the mean value, the productivity decreases by 0.0015*5.23% (=0.0078%) 0.0078%), keeping others constant. The change is relatively small.

The estimated results in columns 5 and 6 of Table 4 reveal that while the aggregated index (PCI) of provincial institutional quality does not impact firm productivity, some provincial level sub-indices of institutional quality have significant impact on firm productivity. For example, time cost has a negative and significant impact on firm productivity. In addition, as expected, actions supporting private sectors (Private act) as well as a stable or reliable and clear legal framework help firms improve their productivity. Surprisingly, labour training has no impact on firm productivity, and this may be explained by the outdated education in Vietnam where theory is heavily focused while practical skills are hardly focused, quality of instructors is at warning low levels, and teaching equipment not updated.

5. Summary and conclusion

Unlike previous studies, this study considers for the first time the impact of corruption at both firm and provincial levels on firm productivity in Vietnam. Contrasting to a popular belief about a paradox for East Asian countries, our IV approach estimates reveal a negative impact of bribe intensity on private SMEs' manufacturing productivity. However, the magnitude of the estimated effect is relatively small.

Some provincial institutional factors such as time costs and supporting actions for private sector are positively associated with firm productivity. This

implies that simplification of procedure to save time for enterprises, increasing actions to support private sectoea are necessary to improve productivity of firms

The finding of a co-movement between a low corruption level and the improvement in firms' productivity implies that fights against corruption are necessary for the development of SMEs. Campaigns have been seen for many years, but did not work well, political efforts and willingness from central government particularly from the Communist Party is crucial. A transparent legal framework and effective enforcement should be promoted and put in place in order to curb corruption and level of corruption.

This paper used data from manufacturing SMEs, so its findings may not be represented for whole economy as well as large enterprises who own different resources and business behaviours including markets and negotiating powers. Further extension of this research to other larger firms and other sectors beyond manufacturing is necessary to make a general conclusion about the relationship between corruption and firm productivity. Finally, there is a need for future research to apply in other transitional economies using the same methodology employed in the paper to see whether a negative relationship between corruption and firm productivity is found consistently beyond Vietnam.

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Appendix I: List of the industries by level of technology

Group 1: Low technology
D15: Food and beverages
D16: Cigarettes and tobacco
D17: Textile products
D18: Wearing apparel, dressing and dying of fur
D19: Leather and products of leather; leather substitutes; footwear.
D20: Wood and wood products, excluding furniture
D21: Paper and paper products
D22: Printing, publishing, and reproduction of recorded media
D23: Coke and refined petroleum products and nuclear fuel
D36: Furniture and other products not classified elsewhere
D37: Recycles products

Group 2: Medium technology
D24: Chemicals and chemical products
D25: Rubber and plastic products
D26: Other non-metallic mineral products
D27: Iron, steel and non-ferrous metal basic industries
D28: Fabricated metal products, except machinery and equipment

Group 3: High technology
D29: Machinery and equipment
D30: Computer and office equipment
D31: Electrical machinery apparatus, appliances and supplies
D32: Radios, television and telecommunication devices
D33: Medical equipment, optical instruments
D34: Motor vehicles and trailers
D35: Other transport equipment