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FIRM GROWTH AND CORRUPTION: EMPIRICAL EVIDENCE FROM VIETNAM*

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This article tests whether firm growth reduces corruption, using data from over 10,000 Vietnamese firms. We employ instrumental variables based on growth in a firm's industry in other provinces within Vietnam and in China. We find that firm growth reduces bribes as a share of revenues. We propose a mechanism for this effect whereby government officials' decisions about bribes are modulated by inter-jurisdictional competition. This mechanism also implies that growth reduces bribery more for more mobile firms; consistent with this prediction, we find a larger effect for firms with transferable rights to their land or operations in multiple provinces.

It is a well-known fact that government corruption is higher in poor countries than rich countries. For example, the 10 least corrupt countries according to the 2009 Transparency International Corruption Perceptions Index had an average real (i.e. PPP-adjusted) GDP *per capita* of $36,700; the 10 most corrupt countries had an average real GDP *per capita* of $5,100. This pattern is confirmed in surveys of firms. Figure 1 plots the fraction of firms surveyed by the World Bank Enterprise Survey that reported they were expected to give gifts to public officials in order to 'get anything done' against real GDP *per capita*, and shows a clear, downward-sloping relationship.

A less well-known fact is that within countries, smaller firms pay higher bribes as a percentage of income. Figure 2 shows, using the same World Bank Enterprise Survey, that not only overall, but even looking only within countries, smaller firms appear to pay higher bribes as a share of revenue. Since firms in poor countries tend to be much smaller on average than firms in richer countries (Tybout, 2000; Hsieh and Olken, 2014), it is possible that the link between firm size and corruption explains part of the association between economic development and corruption.

This article investigates this potential link between firm growth and reduced corruption, using microdata on around 10,000 firms from Vietnam collected over a six-year period. We begin by testing, at the province-by-industry level, whether firms in industries with faster employment growth experience faster reductions in the bribe rate (i.e. bribes paid as a share of revenue).[1] Because it is also possible that reduced corruption could cause growth (Mauro, 1995; Wei, 1999*a*), we instrument for industry-level growth

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[1] Industry growth includes both the intensive margin of firm growth and the extensive margin of firm entry, and it is theoretically possible that growing industries could actually experience declining average firm size. We show in our data, however, that growth in an industry overall indeed leads to growth in firm size: about 53% of the total increase in employment in an industry comes from growth of existing firms.

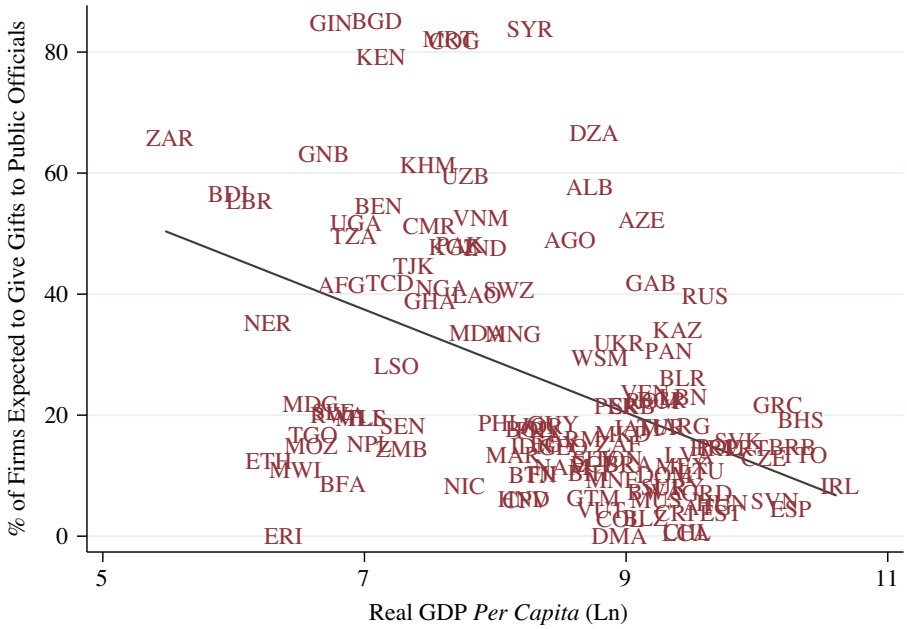

Fig. 1. *Relationship Between GDP and Corruption Using Survey Data from Firms*
Notes. This Figure plots the percentage of firms who expect to give gifts to public officials to get things done for 122 countries in the World Bank Enterprise Survey. For each country, we use the year that the country is most recently surveyed. The *x*-axis is the log of PPP-adjusted GDP *per capita* (chain series), at 2005 constant prices. Colour figure can be viewed at https://academic.oup.com/ej.

with average employment growth rates by industry in other provinces of Vietnam or in neighbouring China. We find that growth reduces the bribe rate.

We then discuss a potential mechanism based on firm size that may underlie the relationship between growth in an industry and reductions in bribe rates: competition among regional governments to attract and retain firms. For government officials choosing how much to extract from a firm in bribes, what puts a check on bribe extraction is that if the amount is too high, a firm will move elsewhere. The government chooses a percentage of a firm's revenues to extract as bribes, trading off higher bribe income generated by a higher bribe rate against the increase in the firm's incentive to leave.

In such a model, an exogenous increase in firm productivity increases firm size which, in turn, reduces the proportion of firm revenues that are extracted as bribes, as long as moving costs are concave in firm size. With concave moving costs, for a fixed bribe rate, a firm's net benefit of moving (reduced bribes minus moving costs) increases as the firm grows. To offset this greater incentive of firms to move, the government will respond by reducing the proportion of revenues that it extracts as bribes. Our empirical finding discussed above matches this prediction.

Another prediction of this mechanism, if corrupt officials can price-discriminate among firms (Svensson, 2003), is that the negative effect of growth on corruption will be heterogeneous, depending on individual firms' abilities to move. Intuitively, if firms

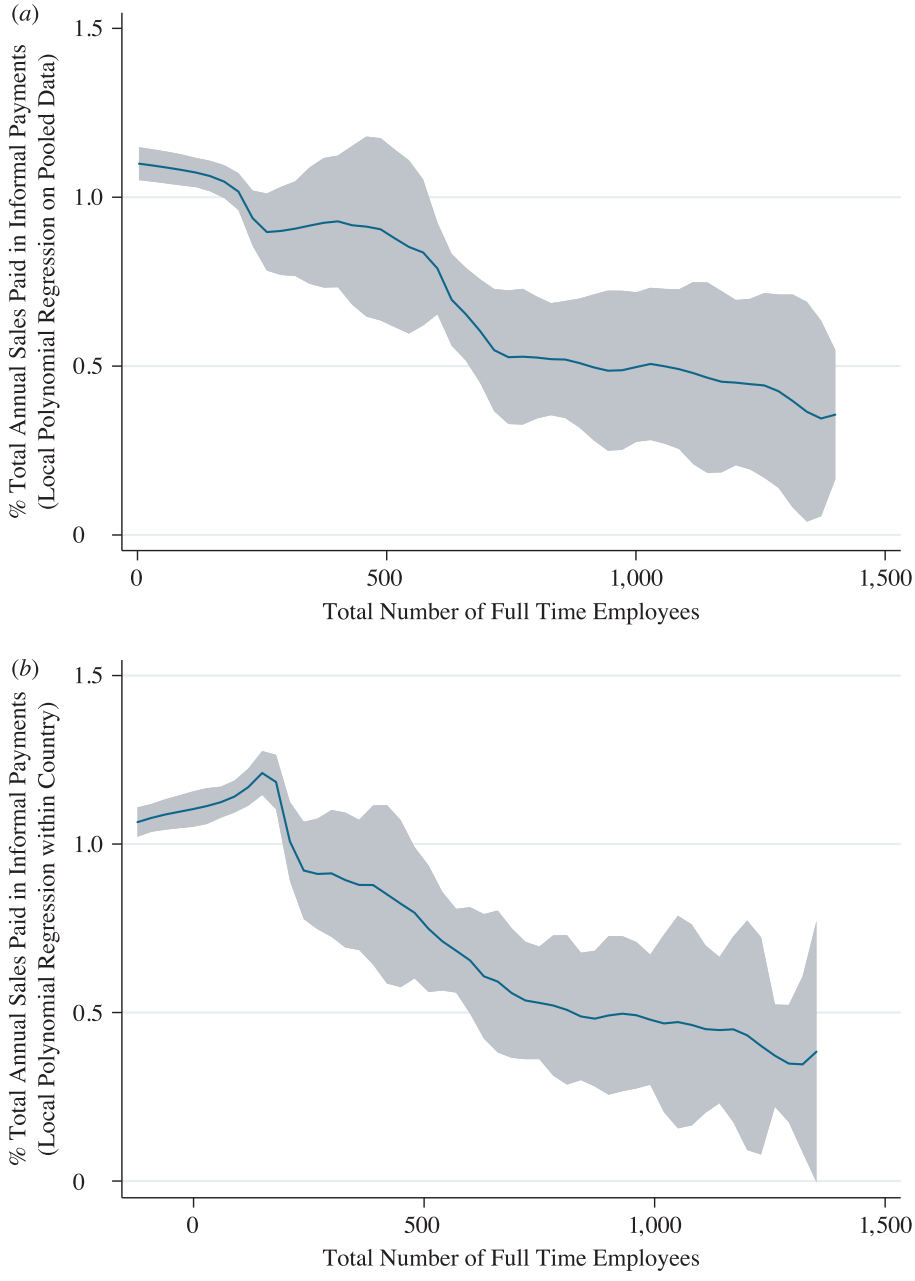

Fig. 2. *Relationship Between Firm Size and Bribes as a Share of Revenue. (a) World Cross-section (b) Within-Country Variation Only*

Note. Colour figure can be viewed at https://academic.oup.com/ej.

are completely tied to one region, then inter-regional competition as a check on the level of bribes vanishes. We show that this intuition also holds for how growth affects bribes: Economic growth reduces corruption by a greater amount if firms are more able to move elsewhere.

We test for the predicted heterogeneous patterns in our Vietnamese data. We argue that Vietnam is a natural setting to test the predictions, given that virtually all business-government interactions occur at the provincial, rather than national, level, so competition between provinces may be at play. To capture heterogeneity in moving costs, we use variation in whether firms possess a land use rights certificate (LURC), which gives them secure and transferable property rights over their land. These property rights make firms more mobile, since they increase their ability to sell their land and relocate should they wish to do so.[2] We test whether having more secure and transferable property rights enhances the negative effect of growth on corruption and find that it indeed does. When a firm owns the plot of land on which it operates and has official permits for that land – so that it is presumably more mobile – economic growth has a stronger negative effect on bribes. These results are robust to controlling for a propensity score that predicts having land use permits as a function of a variety of other firm characteristics.

We also find similar patterns using a second measure of mobility: having operations in multiple provinces. Firms with a presence in multiple provinces can more easily scale back operations in one province and shift elsewhere where they might be subject to less corruption. Thus, economic growth should put more downward pressure on bribes for this group. We find empirical support for this prediction as well.

While the data are consistent with the inter-jurisdictional competition mechanism, it is by no means the only potential mechanism for the negative effect of growth on bribery. We discuss several alternative models, such as a fixed cost of anti-corruption efforts or changes in industry concentration associated with the employment shock. A key differentiating factor is that these other models do not generally explain the fact that the responsiveness of bribes to shocks is stronger for firms that appear more mobile. While no other model seems able to explain the complete set of facts we find – so the mechanism we propose is likely to be at play – other mechanisms no doubt also contribute to the overall effect of growth on bribery that we estimate empirically.

This article builds on several strands of the literature. While many articles starting with Mauro (1995) argue that corruption impedes growth, there is much less work on the reverse direction, namely the idea that corruption may subside as countries grow (notable exceptions include Treisman, 2000 and Gundlach and Paldam, 2009). This article provides micro-evidence along these lines, along with suggestive evidence of one potential channel. Our model of inter-jurisdictional competition builds on the analysis of the problem of local governments setting tax rates (Epple and Zelenitz, 1981; Wilson, 1986; Epple and Romer, 1991), and in the corruption context, the idea that competition can reduce bribe rates (Shleifer and Vishny, 1993; Burgess *et al.*, 2012). In particular, our model is most directly related to the hypothesis advanced by Menes (2006), who noted in her qualitative study of US cities that the ability of firms to relocate to other jurisdictions

[2] Several recent papers have documented an analogous positive effect of property rights over land on migration for individuals, showing that land titling in Mexico increased both domestic (de Janvry *et al.*, 2012) and international (Valsecchi, 2011) migration.

was one potential reason why urban corruption in the pre-Progressive era was not more severe.

The remainder of the article is organised as follows. Section 1 describes our data and background information on Vietnam. Section 2 describes the empirical strategy, and Section 3 presents the results on the overall effect of growth on bribery. Section 4 discusses verbally how inter-jurisdictional competition could generate the pattern documented in Section 3 and further predicts that the growth-bribery effect varies with a firm's mobility. Section 5 empirically tests the additional prediction and discusses alternative mechanisms through which growth could affect bribery. Section 6 concludes. The formal theoretical model and robustness checks are available in an online Appendix.

1. Setting and Data

1.1. *Background on Vietnam*

Vietnam provides a unique opportunity to study the effect of firm growth on bribery and how competition among subnational governments to attract firms affects bribery. In 1986, Vietnam initiated the *Doi Moi* (Renovation) economic reforms, which eliminated the role of central planning in the economy and opened its borders to international capital and trade flows (Riedel and Turley, 1999). Since that time, the country has achieved an average annual growth rate of 7%, ranking it among the very fastest growing countries in the world over the period. Today, there are well over 350,000 private companies in Vietnam, operating in a range of sectors from food processing and light manufacturing to sophisticated financial services.

The amount of corruption remains substantial in Vietnam. Most international perceptions-based indices put Vietnam around the 30th percentile of corruption (where lower is more corrupt). Similarly, Transparency International's Global Corruption Barometer reports that 44% of Vietnamese report paying a bribe in 2011 (Transparency International, 2011).

Existing research has noted that corruption in Vietnam takes three main forms: grease or speed money to fulfil basic tasks or services; the illegal privatisation of state property; and the selling of state power (Vasavakul, 2008). While all are undoubtedly important, the first is the most directly observable and is the focus of our article. The key recipients are the traffic police, land cadres, customs officers, and tax authorities. These same offices were highlighted as the most corrupt in an internal study prepared by the Party's Internal Affairs Committee (Communist Party of Vietnam, Committee for Internal Affairs, 2005). Gueorguiev and Malesky (2011) document that the same types of bribes are common for firms, finding that 23% of businesses paid bribes to expedite business registration, 35% paid bribes when competing for government procurement contracts, and 70% paid bribes during customs procedures. Firms in Vietnam appear to accept these payments as part of the cost of doing business (Rand and Tarp, 2012).

An important institutional feature of Vietnam is that corruption is largely subnational. Via a series of laws in the early 1990s, most business-government interactions were decentralised to the provincial level, including business registration, environmental and safety inspections, labour oversight, local government procurement, and land allocation. Provincial departments of line ministries are 'dual subordinate', meaning they

report both to the provincial executive (the People's Committee Chairman, or PCOM), as well as the relevant national line ministry. In practice, however, appointments of department directors and budget allocations are set by the PCOM, closely aligning department interests with those of the province. Moreover, proximity matters. The PCOM interacts with department directors regularly, while the line ministries are hundreds of kilometres away in Hanoi. As a result, many studies have documented that the provincial government, more than the central government, is the relevant level of government when thinking about the institutional climate facing firms, including the degree of bribe extraction (Meyer and Nguyen, 2005; Malesky, 2008; Tran *et al.*, 2009). Formal taxation is a notable exception; taxes on firms are determined at the national, not provincial level.

Importantly, the powers of the provincial leadership over subordinate departments and subprovincial governments (district and commune) also mean that corruption is relatively centralised within individual provinces. The provincial leadership has the ability to control the bribe schedule of the province both directly and indirectly. Provincial leaders can punish corrupt subordinates with jail time or revoke their party membership. They can also reduce the incentive for subordinates to bribe by changing their own behaviour, such as lowering their own cut of each activity, or not insisting on bribes by subordinates for appointment to provincial government positions (which increases the motivation and need for the subordinate to take money). More indirectly, they can control the bribes extracted by subordinates through policy changes that reduce opportunities for bribes, such as reducing the number of required certificates and regulatory inspections, formalising specific waiting periods for documents, and increasing transparency about the responsibilities of subordinate officials to businesses and citizens. Indeed, one of the incentives to create the Provincial Competitiveness Index (PCI) survey in the first place was to measure these differences in governance that affect corruption and thereby motivate provincial leaders to reform their activities (Malesky, 2008, 2011).

As with all measures of governance in Vietnam, there is a high degree of subnational variation in firms' responses about corruption in the data we use. Figure 3 shows the distribution across provinces of the average response by firms for two corruption questions from the PCI survey in 2011, the last year of our sample period. In the worst-scoring province, 79% of private firms reported that firms in their line of business were subject to bribe requests. In the best-scoring province, a substantially smaller 21% claimed such activities were common. Similarly, high inter-provincial variation is observed for the share of revenue paid in bribes by firms, the main dependent variable in our analysis. In 2010, 37.5% of firms in the most corrupt province said bribe payments exceeded 2% of their annual revenue, compared to 5.5% in the lowest province.

1.2. *Description of Data*

To examine the effect of growth on corruption, we use two firm-level data sets, the Vietnam PCI Survey (Malesky, 2011), and the annual enterprise survey collected by the General Statistics Office (GSO) of Vietnam, henceforth referred to as the PCI and GSO data respectively. For each data set, we have five years of repeated cross-sectional firm-level

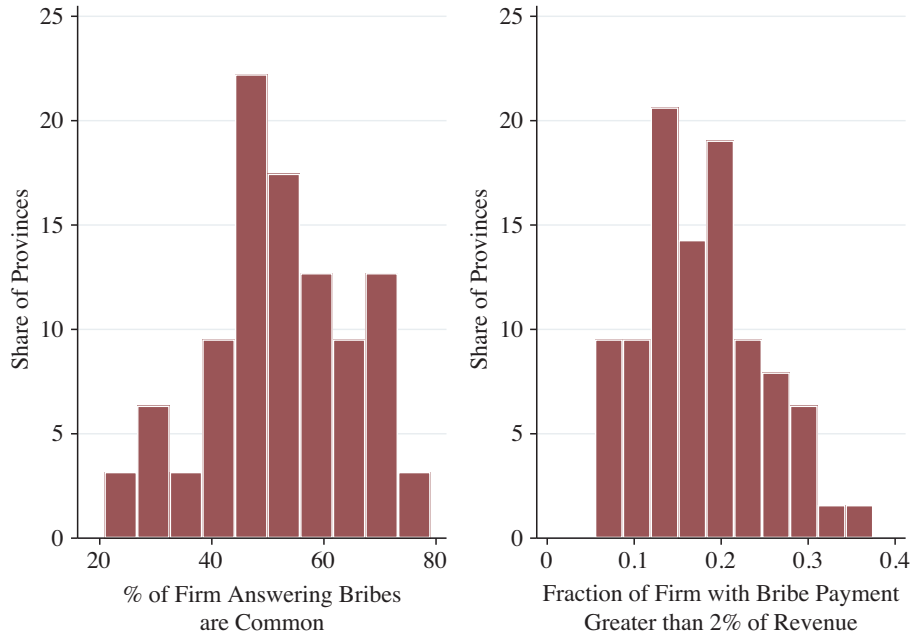

Fig. 3. *Variation in Corruption across Provinces in Vietnam*

Notes. This Figure plots the distribution of corruption across provinces in Vietnam, using data from the 2011 PCI survey. The bribe variables are averages across all firms surveyed within a province. The variable in the left panel is a dummy that equals 1 if the firm responds 'strongly agree' or 'agree' to the following statement: 'It is common for firms like mine to pay informal charges'. The variable in the right panel is a dummy that equals 1 if the firm paid more than 2% of revenues as bribes to public officials. Colour figure can be viewed at https://academic.oup.com/ej.

data from 2006 to 2010. We also use aggregate employment data at the industry-year for 2006 to 2010 from the Chinese Yearbook of Labor Statistics.[3]

The PCI survey is a comprehensive governance survey of formal sector firms across Vietnam's 63 provinces. The PCI (as well as the GSO) regard formal firms as those with an official registration certificate from their provincial Department of Planning and Investment, thereby excluding household operations without such documentation. The PCI survey team randomly sampled from a list of at least partly private companies with a tax code provided by the province's tax authority. Stratification was based on firm size, age and broad sector (agriculture, services, construction and industry) in order to accurately reflect the population of firms in each province. The PCI survey contains basic firm-level information, including the firm's ISIC 2 digit industry code, location (province), year of establishment, total assets and total employment.

What makes the PCI survey well-suited for our study is that it has a module on corruption and red tape faced by the firm. The most relevant question that matches our

[3] The PCI survey is conducted in the early part of each calendar year (March–June). Information about firms' business and operations refer to the previous calendar year. For variables regarding bribe payment, it is reasonable to think that firms are also reporting based on the past year. We therefore lag the PCI survey by one year before merging with the GSO or Chinese Yearbook data. The 2006 to 2010 timeframe thus corresponds to the PCI surveys conducted in early 2007 through early 2011.

theoretical predictions is the amount of unofficial payments to public officials the firm makes, expressed as a percentage of its revenue. To the best of our knowledge, this data set is the only frequently repeated cross-section of firms' corruption experiences that is representative at the sub-national level in the developing world.

For our analysis, we merge the PCI firms with aggregate employment information constructed from the GSO survey at the industry-province-year level.[4] For industry, we use the ISIC alphabetical category. The GSO data also include all formal sector firms in Vietnam, both private and state owned. We restrict our sample to private firms in order to match the PCI sample. The sampling strategy for small size firms (firms with fewer than 10 employees) for the GSO survey varies from year to year. Therefore, to ensure that we have a consistent and well-defined measure for a province-industry's economic conditions in a given year, we exclude the small firms with fewer than 10 employees when constructing the industry-province-year employment and before merging with the PCI. Panel (*a*) of Table 1 presents summary statistics for all the merged firms in the PCI data. For our main analysis, we restrict the PCI sample to firms with 10 or more employees reported for the previous year in order to match the GSO sample. We used lagged employment since it is determined prior to our bribe measure.[5] Our final analysis data set contains 10,901 firms that meet this sample inclusion criterion. Panel (*b*) of Table 1 reports the summary statistics for the final analysis sample. Results on the full sample of firms are presented in online Appendix A.

The key dependent variable is constructed from the PCI question that asks the firm its unofficial payments as a percentage of total revenue. The question is categorical, with the following possible responses: 0, <1%, 1–2%, 2–10%, 10–20%, 20–30%, >30%. Figure 4 shows the histogram of this variable. We transform the variable into a scalar by assigning each response the middle of the corresponding bin, using 0.5% for the <1% category and 35% for the >30% category. The mean of this variable is 3.4%. While this may seem small, recall that this is a percentage of revenues, not profits. If firms averaged 10% net profit margins, for example, this would be the same magnitude as a 34% profit tax. (In the empirical section below, we also consider an alternative specification using ordered probit models that allows the model to determine appropriate breakpoints; results are similar).

The PCI requires general managers or owners to complete and mail in the survey, although there is no way to formally guarantee that the task was not delegated to a subordinate. Over 65% of respondents list their position as CEO, director, or owner, suggesting that the respondents would generally be in a position to know about bribe-payments, and that delegation is not a major threat to our analysis.

The median firm in our final sample has been in business for four years and has between 10 and 49 employees, which is nearly identical to the GSO census

[4] In online Appendix B, we describe the cross validation procedure we use to assess the matching between the two datasets. The results, shown in online Appendix Table A1, are reassuring: PCI firms are a reasonably representative sample of firms in the GSO data and the industry codes we merge on are comparable across the two data sets.

[5] Current and lagged employment have a correlation coefficient of 0.96. We impute lagged employment with current employment for firms with missing lagged employment (except for new firms).

Table 1

Summary Statistics of Firms

	Observations	Median	Mean	SD
Panel (*a*): full sample of PCI firms				
Bribes as percentage of revenue (%)	20,268	0.5	3.238	5.404
Years since establishment	19,771	5	6.071	5.914
Number of employees (PCI)	19,119	19.3	60.938	202.139
Mean employment (GSO, mean for industry-year-province level)	20,268	15.827	31.216	31.842
Log employment (GSO, aggregate for industry-year-province)	20,268	8.947	8.888	1.835
Log of business premise size (hectare)	10,094	6.027	6.463	2.138
Land ownership (dummy)	20,268	1	0.736	0.441
Land use right certificate (dummy)	19,427	1	0.574	0.495
Land ownership without land use right certificate (dummy)	19,427	0	0.151	0.358
Number of other provinces in which firm operates	20,268	0	0.432	0.961
Firm currently operates in more than one province (dummy)	20,268	0	0.258	0.437
Share of registration documents held	16,037	0.167	0.267	0.305
Former household firm (dummy)	20,265	1	0.623	0.485
Former SOE (dummy)	20,265	0	0.061	0.24
Owner is a government official (dummy)	20,265	0	0.113	0.317
Government holds positive share (dummy)	20,265	0	0.028	0.166
Panel (*b*): restricted sample of large PCI firms				
Bribes as percentage of revenue (%)	10,901	1.5	3.401	5.397
Years since establishment	10,682	5	6.869	6.579
Number of employees (PCI)	10,818	19.3	101.277	260.532
Mean employment (GSO, mean for industry-year-province level)	10,901	44.244	65.629	52.366
Log employment (GSO, aggregate for industry-year-province)	10,901	8.909	8.82	1.884
Log of business premise size (hectare)	5,358	6.908	7.237	2.194
Land ownership (dummy)	10,901	1	0.731	0.443
Land use right certificate (dummy)	10,479	1	0.587	0.492
Land ownership without land use right certificate (dummy)	10,479	0	0.134	0.34
Number of other provinces in which firm operates	10,901	0	0.545	1.07
Firm currently operates in more than one province (dummy)	10,901	0	0.314	0.464
Share of registration documents held	8,612	0.167	0.258	0.289
Former household firm (dummy)	10,900	1	0.562	0.496
Former SOE (dummy)	10,900	0	0.104	0.305
Owner is a government official (dummy)	10,900	0	0.141	0.348
Government holds positive share (dummy)	10,900	0	0.044	0.206

Notes. Panel (*a*) reports the summary statistics for all PCI firms during the sample period. Panel (*b*) reports the same summary statistics for firms with 10 or more lagged employees reported for the year before the survey. See online Appendix D for variable descriptions.

aggregates.[6] Figure 5 shows the relationship between the bribe rate and firm size in our sample. Larger firms appear to be paying a smaller percentage of their revenues in bribes. (Larger firms might still pay a larger amount per firm in bribes, but the relevant

[6] We use the GSO fine-grained data on employment to impute the mean and median employment level within the PCI ranges. The median size of firms in the GSO that are between 10 and 49 employees is 19 employees.

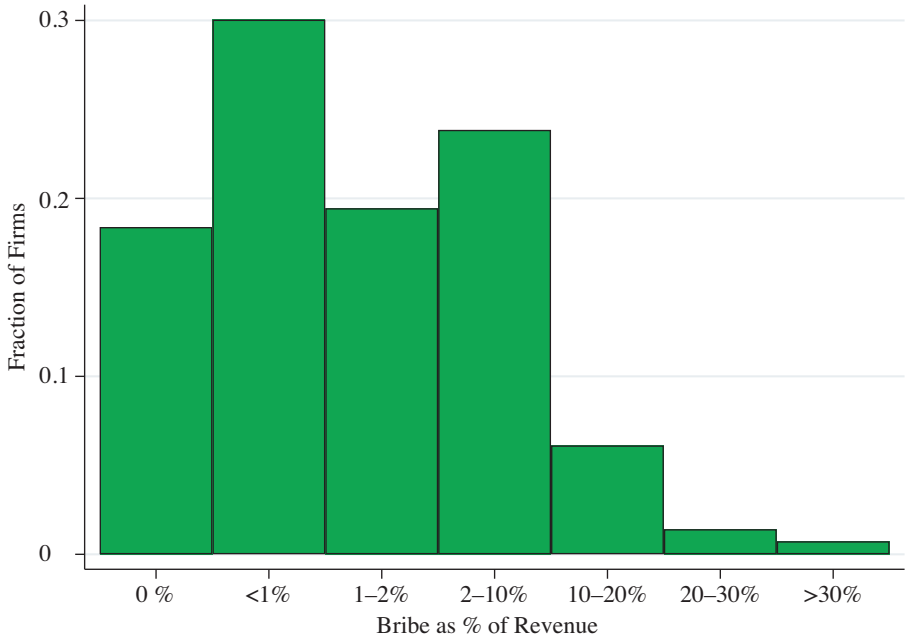

Fig. 4. *Histogram of Bribe Rate*

Notes. This Figure plots the histogram of the bribe rate paid by PCI firms in our final analysis sample (i.e. firms with at least 10 lagged employees and merged with GSO – see subsection 2.2 for details of the sample construction). Colour figure can be viewed at https://academic.oup.com/ej.

metric for gauging the size of the distortion – and the prediction in the theoretical model discussed below – is the bribe rate.)

In addition to corruption activities, the PCI also has variables related to the firm's property rights status that we use to measure the firm's mobility, such as whether the firm owns the land that it occupies and whether the firm has a LURC. We will describe these variables in more detail when we discuss the empirical results. The second proxy for mobility we have in the data is whether the firm operates in multiple provinces. While the majority of firms are wholly located in one province, multi-province firms are reasonably common, with 31.4% having operations in provinces besides their main location.

Table 1 also summarises several control variables we use, including the proportion of registration documents the firm has (a proxy for a firm's general propensity to complete formal paperwork), whether the firm was formerly a household firm, whether it is a former state-owned enterprise (SOE), whether the owner is a government official, and whether the government has an ownership stake in the firm.

Our empirical strategy uses aggregate shocks to a firm's industry size in other provinces of Vietnam, or in China, to predict firm growth in a given province and industry. In the final merged data set, we have 18 distinct industry categories (see online Appendix Table A2 for a description of the industries). The main GSO variable we use in the analysis is the log of aggregate employment in the industry-province-year, which is also summarised in Table 1.

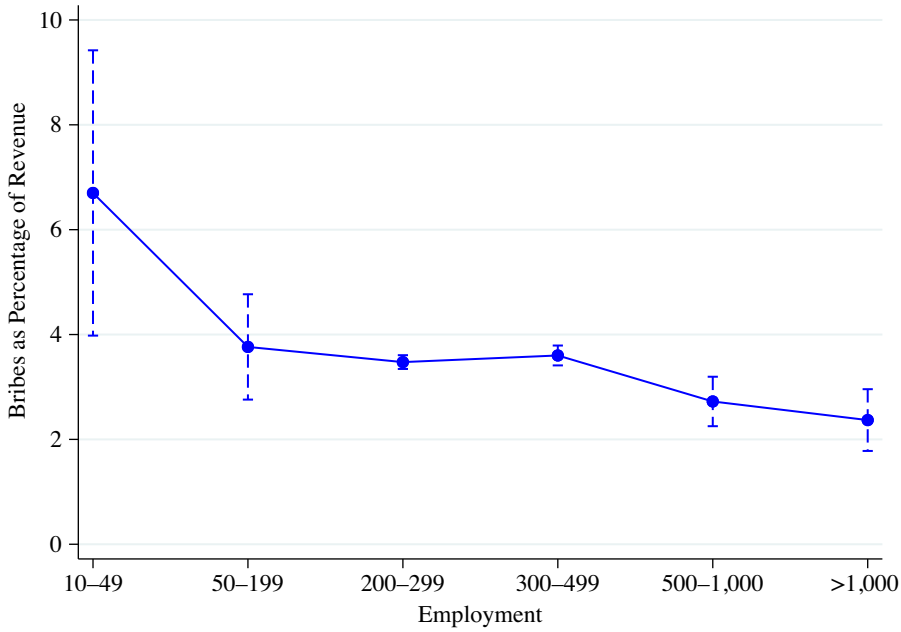

Fig. 5. *Cross-sectional Relationship between Bribe Rate and Firm Employment*
Notes. This Figure plots the mean bribe rate as a percentage of revenue for each employment size category as well as the 95% confidence interval. The sample contains PCI firms in our final analysis sample (i.e. firms with at least 10 lagged employees and merged with GSO – see subsection 2.2 for details of the sample construction). Colour figure can be viewed at https://academic.oup.com/ej.

To construct our China-based instruments, we use the China Labor Statistical Yearbook to calculate industry-year specific total employment in China. The Yearbooks report the number of employed persons by industry, including employment in SOEs, collectives, foreign joint ventures, and private firms/individual workers in urban areas. Note that industry-level employment data is not available for rural areas during this period. Industry codes are based on the Chinese GuoBiao (national code) system, and are broadly consistent with the broad alphabetical code in ISIC Revision 4.

2. Empirical strategy

The hypothesis we aim to test is that firm growth has a negative effect on bribes, or more specifically, bribes as a percentage of the firm's revenues (*Bribes*). Suppose we had a measure of firm productivity A_{ipjt} for firm i in industry j in a particular province, p, and time, t. One could in principle test the hypothesis via OLS as follows:

$$Bribes_{ipjt} = \alpha + \beta A_{ipjt} + \epsilon_{ipjt}. \quad (1)$$

The dependent variable is the amount that firm i paid in bribes as a percentage of its revenue in year t. The prediction is that β in (1) is negative, so that on average productivity growth reduces bribes.

There are two issues with estimating (1) directly. The first is a data problem: we do not directly observe TFP or output prices in the data, so, empirically, we use total employment in the province-industry-time cell ($Employ_{pjt}$) as a proxy.[7] Under the assumption that factor prices are constant, changes in employment reflect changes in A (this is true, for example, in the model we present in online Appendix C), so to the extent we can find a measure of employment that is exogenous with respect to the bribe rate b, we can replace A with *Employ* and test the same predictions. The exogenous variation in *Employ* available in our setting is at the industry-province-year level, rather than the firm level.

Our independent variable is aggregate employment growth in a given industry-province-year cell, rather than firm size. Whether aggregate growth is driven by growth in firm size is an empirical matter; changes in $Employ_{pjt}$ could be driven by entry, or by growth in existing firms, or some combination. For our IV strategy using Chinese data (described below), only aggregate employment data are available, so we are not able to calculate average firm size. However, we can decompose aggregate growth with the Vietnam firm-level data, and we find that there is correlated growth along both margins: predicted total employment is highly correlated with both average firm size in the GSO data and the number of firms. Specifically, if we regress log mean employment and log total number of firms in province-industry-year group on employment in the rest of Vietnam $\log(Employ_{\bar{p}jt})$, controlling for province-industry and year fixed effects (which is the setup for our first IV strategy described below), the coefficients are 0.341 and 0.301 respectively; both are significant at the 1% level. Mathematically, the sum of the two coefficients is equal to the coefficient when regressing the endogenous variable, log total employment in the province-industry-year group, on $\log(Employ_{\bar{p}jt})$. Hence, the ratio of each of the two coefficients to their sum tells us how much a shock to $\log(Employ_{\bar{p}jt})$ affects the intensive *versus* extensive margin. In our setting, about 53% of employment growth ($= 0.341/0.642$) is on the intensive margin. An important point to keep in mind is that, while our theoretical predictions and interpretation of the empirical results focus on the intensive margin, i.e. firm growth, our empirical results are not able to distinguish between these two margins.

Once we have *Employ* as a proxy for industry-level productivity growth, a second issue remains which is that employment levels are potentially endogenous to the bribe level b. Thus, we estimate (1) via two IV strategies, as described below.

2.1. *Rest-of-Vietnam IV*

The first instrumental variable strategy we use is employment in the firm's industry in Vietnamese provinces other than its own, controlling for common national year fixed effects and province-by-industry fixed effects. The IV strategy is predicated on industry-specific employment (or TFP) shocks in an industry being similar across provinces (i.e. on there being a strong first stage). For example, for an industry that supplies to the world market, an increase in output prices would correspond to an increase in A_{ijt}.

A key identification assumption is that industry-specific bribe-setting is determined independently by each province. In particular, we are ruling out a large-scale national crackdown on corruption specific to an industry in a given year, which would violate this

[7] The reason we cannot calculate TFP directly is that we do not have reliable measures of revenue, capital stock and wages in our data.

assumption (note that a national crackdown across all industries would be absorbed by year effects and would not be a problem for our identification strategy; likewise, different average levels of corruption in different regions or industries would be absorbed in region-by-industry fixed effects and would not be a problem). The assumption matches the institutional context of corruption in Vietnam as discussed in subsection 2.1 in which corruption is largely a provincial matter.

Our first-stage specification using the leave-one-out Vietnam IV is as follows:

$$\log(Employ_{pjt}) = \alpha + \beta \log(Employ_{p^- jt}) + \nu_{pj} + \mu_t + \epsilon_{pjt}. \quad (2)$$

The outcome variable, $\log(Employ_{pjt})$, is log total employment for industry j in year t in province p. The variable $\log(Employ_{p^- jt})$ is log total employment for firms in industry j and year t in all provinces other than p. We control for province-industry (pj) and year (t) fixed effects, so the specification is capturing differential changes in employment across industries over time, netting out common national time trends and different average levels by province-industry cell.

The corresponding second-stage equation is as follows:

$$Bribes_{ipjt} = \alpha' + \beta' \log(\widehat{Employ}_{pjt}) + \nu'_{pj} + \mu'_t + \epsilon'_{ipjt}. \quad (3)$$

The IV varies at the industry-province-year level but we implement two-way clustering at the province and industry-year level to correct for possibly correlated errors across time and industry and because most of the variation in the IV (and all of the variation in the case of our China IV) is at the industry-year level.

2.2. *China IV*

One concern with the rest-of-Vietnam IV is that it could be correlated with common industry-year-specific shocks that affect both firm growth and bribe payments, such as a time-specific national regulatory change or a national industry-specific crackdown on corruption. These could be either for exogenous reasons, or potentially an endogenous response of one province to another (as in the model we present in online Appendix C), in which firms best-respond to one another's bribe policy. Thus, we also implement a second identification strategy using growth rates from outside of Vietnam that is not as subject to these concerns.

For our second IV strategy, instead of instrumenting for Vietnamese employment in a particular industry in a particular province with employment in other provinces of Vietnam, we instrument using employment in China. The idea is that many industries in Vietnam and China are subject to the same global business cycles and price and technology shocks, and hence industry-level growth is correlated across the two countries. But, because China is so much larger than Vietnam, it is unlikely that there would be reverse causation where changes in a particular industry's corruption level in Vietnam would substantially affect employment growth in China.

Specifically, we estimate the following first-stage regression:

$$\log(Employ_{pjt}) = \alpha + \beta \log(EmployChina_{jt}) + \nu_{pj} + \mu_t + \epsilon_{pjt}, \quad (4)$$

where we again include province-industry and year fixed effects and cluster at the province and industry-year level.

2.3. *Multiple IVs*

The first-stage equations described above constrain the effect of a shock to *A* or *Employ* in the rest of Vietnam to be the same across industries, and, similarly, the effect of a shock to an industry in China on Vietnamese firms to be the same across industries. In principle, some industries can have positively correlated growth rates between provinces in Vietnam or between China and Vietnam (say, due to common worldwide demand shocks), and some industries can have negatively correlated growth rates (say, because provinces or the two countries compete for a fixed amount of global business). Thus, we also allow the first-stage coefficients to vary by industry. The first stage allowing for different βs for each industry j is as follows for the China case:

$$\log(Employ_{pjt}) = \alpha + \beta_j \log(EmployChina_{jt}) + \nu_{pj} + \mu_t + \epsilon_{pjt}. \tag{5}$$

Allowing the first-stage coefficient to vary by industry is equivalent to having one instrument per industry, e.g. $\log(EmployChina_{jt})$ interacted with an industry dummy. The multiple-IV specification for the rest-of-Vietnam approach is analogous.

In practice, for the rest-of-Vietnam IV strategy, the constraint of a uniform β across industries is reasonable, and the single IV has more precision. For China, the multiple IV first stage fits the data better and yields more precise results.

In the next Section, we present our results on the effect of growth on bribery, using both the rest of Vietnam and China approaches, and using both single and multiple instruments.

3. Results

This Section presents evidence that a positive shock to aggregate productivity decreases unofficial payments by firms.

3.1. *First-Stage Results*

To estimate the first-stage regressions, we use the GSO data and compute total employment for each *pjt* (province-industry-year) cell. For the within-Vietnam IV, the instrument also uses the GSO data and is aggregated at the $p^- jt$ level. For the China IV, the Chinese Yearbook is used and the data vary at the *jt* level. For industries, we classify firms into their alphabetical ISIC code (18 industries in total).[8] Each observation in the first-stage regressions we present is a *pjt* combination.

We report the first-stage results from estimating (2) and (4) in Table 2. We report standard errors with two-way clustering at the province and industry-year level throughout. As seen in column (1), the first-stage coefficient is positive and significant at the 1% level using the within-Vietnam IV; the F-statistic is 26.9. The coefficient on $\log(Employ_{p^- jt})$ is

[8] We have an equally strong first stage using the finer two-digit ISIC codes, but the broader alphabetical codes are more robust to differences in classification across the GSO and PCI data sets, and for the Chinese data, the data are aggregated at the coarser level.

Table 2

First-stage Results

	Dependent variable: log Vietnamese employment in industry-year (in own province)	
Log Vietnamese employment in industry-year (excluding own province)	0.642***	
	(0.124)	
Log Chinese employment in industry-year		0.622**
		(0.315)
Observations	3,367	3,367
F-statistics	26.94	3.886
Province–industry and year fixed effects	√	√

Notes. Each observation is a province-industry-year. The dependent variable is log Vietnamese employment in industry-year in own province. The independent variable is log Vietnamese employment of the same industry-year in all provinces other than own, and log Chinese employment of the same industry-year. Both variables are calculated using the GSO Enterprise Survey data. Industry refers to an ISIC alphabetical industry code. The regression controls for province-industry and year fixed effects. Standard errors are two-way clustered at the province and industry-year level. *** implies significance at 0.01 level, ** 0.5, * 0.1.

0.642. This means that for a 10% increase in total employment in other provinces for industry j in year t, there is a 6.42% increase in one's own province. Theoretically, if the aggregate shock propagates to all regions equally, we should observe a coefficient of 1; the coefficient of 0.642 suggests that much but not all of the temporal variation in productivity in Vietnam is aggregate to an industry.

Column (2) shows the first stage for the China IV. The first-stage coefficient is remarkably similar at 0.622. The coefficient is significant at the 5% level, but the standard error is substantially larger than for the Vietnam IV, which is not surprising because provinces in Vietnam might be more likely to supply the same markets and thus respond to the same demand shocks; merging between data sets is more prone to error with the China approach because the Chinese industry codes differ slightly from the Vietnamese ones, and the composition of firms in the Chinese data is somewhat different (e.g. it comprises only urban firms). The F-statistic is 3.89. Because of this low F-statistic (for an instrument), we focus more on the multiple-IV variant when using the China IV strategy, because it has a stronger first stage.

The multiple-IV first stages for both Vietnam and China are reported in online Appendix Table A3.[9] The F-statistics for the set of instruments are 7.99 using Vietnam and 8.37 using China. For Vietnam, the single IV gives a stronger first stage, while with China, the multiple-IV approach gives a stronger first stage. We report the results for all four permutations, which yield similar second-stage results, but in the discussion, we focus mostly on the single-IV Vietnam results and multiple-IV China results.

[9] The positive first-stage coefficients for transportation and storage, information and communication, financial and insurance activities, real estate, professional and scientific activities, education, health and administration could reflect global business cycles, common interest rate shocks, and synchronicity in public service provision.

The negative first-stage coefficient for mining and quarrying is surprising but could result from interregional competition for global demand, which outweighs the effect of common global market shocks.

Table 3

Effect of Economic Performance on Bribes

Dependent variable: firm's bribe payment as percentage of revenue				
	Single IV (1)	Multiple IV (2)	RF: OLS (3)	RF: Ordered probit (4)
Panel (*a*): rest-of-Vietnam IV				
Log Vietnamese employment in industry-year (in own province)	−1.704**	−1.366*		
	(0.677)	(0.715)		
Log Vietnamese employment in industry-year (excluding own province)			−1.203**	−0.151**
			(0.494)	(0.0676)
Panel (*b*): China IV				
Log Vietnamese employment in industry-year (in own province)	−1.509	−1.149**		
	(0.965)	(0.575)		
Log Chinese employment in industry-year			−1.310	−0.209
			(0.926)	(0.165)
Province–industry and year fixed effects	√	√	√	√

Notes. The dependent variable is the firm's bribe payment as percentage of revenue. This variable is categorical in the data and we recode each category with the corresponding cell mean (see online Appendix D for details). The Table shows the results for firms with 10 or more lagged employees reported for the year before the survey. (The results for the full sample is shown in online Appendix Table A4.) Industries refer to ISIC alphabetical industry codes. All regressions control for province-industry and year fixed effects. Standard errors are two-way clustered at the province and industry-year level. *** implies significance at 0.01 level, ** 0.5, * 0.1.

3.2. *Effect of Employment Growth on Bribes*

The IV results are shown in Table 3. The top panel presents the within-Vietnam instrument and the bottom panel, the China instrument. All specifications control for province-industry and year fixed effects, and standard errors are clustered at the province and industry-year levels.

Starting with the top panel, column (1) uses the single instrument and has a coefficient of −1.704, which is significant at the 5% level. Growth in firm employment leads to a drop in the rate of bribe extraction from firms. The coefficient magnitude suggests that a 10% increase in a firm's employment level leads to a 0.18 percentage point decline in the bribe rate. Column (2) uses multiple IVs (one per industry) and finds a similar result.

Panel (*a*), columns (3) and (4) report the reduced form results. Our outcome variable, which measures the degree of corruption firms face, is the unofficial payments as a percentage of revenue. As discussed above, it is a categorical variable, which we linearise by using the middle of each category. We estimate two versions of the reduced form estimate, one using the linearised variable and one using an ordered probit specification that allows the regression to determine the precise cardinalisation of each of the categories. The results in column (3) show that the coefficient for $\log(Employ_{p^- jt})$ is −1.203, and significant at the 5% level. Column (4) reports the results from an ordered probit specification. The coefficient is again negative and significant at the 5% level. The ordered probit results suggest that the negative relationship shown is not merely driven by the linear functional form.

To interpret magnitudes, note that column (1) implies that a doubling of total employment in the industry is associated with a 1.2 percentage point reduction in informal payments, or about 35% of the mean level. Translated into an elasticity, this suggests an elasticity of the informal payment rate (i.e. the share of revenues devoted to informal payments) with respect to predicted firm size of about −0.5. Since this elasticity is substantially less than 1 in absolute value, it implies that while the share of firm revenues paid in bribes declines as A increases, total unofficial payments, which is the bribe rate multiplied by revenues, increase. While the bribe rate is the key parameter that determines aggregate distortions due to corruption, it is worth noting that given this elasticity, the amount of corruption in absolute dollar terms actually increases even though the rate does not.

The fact the estimates imply that bribes as a percentage of revenue fall, but that the total magnitude of bribes rises, suggests that bribes are indeed responding to changes in firm size – we can reject both the null that bribes are constant in levels (i.e. each firm pays a fixed bribe regardless of size), and also the null that bribes as a percentage of revenue are constant or reported to be constant (i.e. bribes as a share of revenue is falling). The fact that bribes as a share of revenue falls, but the absolute level of bribes rises, is consistent with the theoretical model presented in online Appendix C and discussed briefly in Section 4.

The results in panel (*b*) using the China instrument are similar to the those in panel (*a*), though as discussed above, the single-instrument version of the Chinese IV version is less precisely estimated. The single-IV estimate, reported in column (1), is −1.509, similar in magnitude to the within-Vietnam analogue, though the coefficient is not statistically significant. Column (2) of panel (*b*) uses multiple IVs, and the coefficient is −1.149 and significant at the 5% level. Both the point estimate and precision are remarkably similar across the Vietnam and China specifications.

The point estimate for China of −1.149 in column (2) implies that a 10% increase in employment leads to a −0.115 percentage point decline in bribe rate, or a doubling of employment leads to a 0.8 percentage point decrease in the bribe rate, which is 23.5% of the mean level. The implied elasticity of the informal payment rate with respect to predicted firm size is −0.34, similar though slightly smaller than the elasticity of −0.5 we estimate using the single within-Vietnam IV. The reduced form OLS and ordered probit results reported in columns (3) and (4) are negative but insignificant.

To recap, across our different IV specifications – using industry employment elsewhere in Vietnam, or alternatively industry employment in China as predictors of firm size – we find that growth has a negative effect on the degree of government officials' bribe extraction from firms.

4. Inter-jurisdictional Competition as a Mechanism

One mechanism that could generate the finding in the previous Section is competition among jurisdictions to retain or attract firms. Consider a model in which governments choose how much to extract from firms to maximise their bribe revenue. We develop and solve such a model, and it generates the prediction that bribes as a fraction of revenues decrease with firm growth under reasonable assumptions. This model is not the only explanation for the empirical fact presented in the previous section, but is one

possible explanation. Moreover, the model has other testable predictions which we will investigate empirically in the next Section.

The full model is available in online Appendix C, but here we describe the intuition and results in a bit more detail. The government in each province sets a bribe rate, which is the percentage of a firm's revenues that it must pay in bribes. Next, firms in each province choose whether to stay in the province or relocate to the other province. Finally, firms choose their factors of production, they produce, and the government collects bribes.

The firm will choose to stay in its current province if and only if profits there are greater than its profits in a new province, less moving costs. One can consider shocks to productivity that generate firm growth. With a positive shock to firm productivity and hence firm size, if moving costs scale up less than one-for-one with firm size, then firm growth will lead to a decrease in the equilibrium bribe rate (Prediction 1). When a firm grows, a given bribe rate imposes a larger cost on the firm, making it more prone to leave for a lower-corruption locale. This force drives down the equilibrium bribe rate due to inter-regional competition. However, at the same time, the cost of moving rises as firms expand in size to take advantage of the higher productivity. This instead drives up the equilibrium bribe rate. If moving costs do not scale up too steeply, then the first effect dominates and growth decreases the bribe rate.

In practice, there are likely to be some fixed costs of moving, so it seems reasonable that total moving costs are indeed concave in firm size. Prediction 1 then matches the key result of the article shown in the previous Section.

It is worth noting that another prediction is that the total amount of bribes extracted from the firm will increase with a positive productivity shock. To see this, note that the firm's moving decision is a tradeoff between its total moving costs and its total bribes. When a firm grows, the firm's moving costs increase, and thus the government can retain the same firms even with a higher total bribe extraction. This prediction also holds in the data, as discussed in the previous Section.

Next, we consider how the effect of a productivity shock on bribes varies across firms with different observable-to-the-bureaucrat moving costs. We will focus on the firm's property right status or multi-province operations as determinants of its moving costs in the empirical analysis in the next section. The model prediction is that the bribe rate falls more after a positive shock to productivity for firms with low observable moving costs (Prediction 2). The intuition is that the fraction of such firms who are on the margin of moving is larger, so a given change in bribes will induce a larger number of them to leave.

Before turning to the empirical test of Prediction 2, it is worth noting the analogy between bribes and taxes. For firms, a bribe is an additional payment to government, analogous to a tax. Our model is therefore similar to models of inter-regional tax competition. The key distinction of our results compared to the previous literature is that we focus not just on the equilibrium level of taxes/bribes, but also examine how the level of bribes changes with productivity shocks. It is this comparative static that generates predictions about how growth affects the amount of corruption in the economy. Our result on how the relationship between productivity shocks and the equilibrium bribe rate varies based on the firm's ease of relocating to another jurisdiction is also novel in the literature, to the best of our knowledge.

Also worth noting is that to the extent that taxes follow similar patterns to bribes, another implication of the model is that taxes on firms should also be lower in rich countries than in poor countries. There is suggestive evidence along these lines: Gordon and Li (2009) show that for poor countries (with *per capita* GDP below $745), corporate income taxes represent 7.5% of GDP, whereas for rich countries (with *per capita* GDP above $9,200), corporate income taxes represent only 4.5% of GDP, although they suggest a different explanation than the one proposed here.

Finally, we discuss the exclusion restriction of our two instrumental variable strategies in light of the model. Results 1 and 2 consider the effect of a common shock to all jurisdictions (provinces). To the extent that the rest-of-Vietnam employment (summed across all other regions) reflects the common component, it is a valid instrument for testing the effect of an aggregate shock (i.e. the two predictions of the model). However, the rest-of-Vietnam instrument could also reflect shocks idiosyncratic to all other provinces, but not a province itself. One could imagine that shocks to other provinces can affect the bribe setting in a province (if that information is public), with officials reacting to the changed desirability of other provinces. This is particularly so for shocks to places where firms are likely to move to. Conversely, a shock to bribes in one province could affect employment in other provinces through firm relocation. Either of these channels would be a problem for the excludability of employment in other provinces as an instrument for employment in province p in (3).

To address this concern, we perform an additional robustness check by constructing the rest-of-Vietnam IV using total employment in the same industry in other regions instead of other provinces. To the extent that firms are more likely to move within their own region, this additional analysis helps to alleviate the concern of the above-mentioned bribe setting responses which would violate the exclusion restriction – provincial governments are less likely to respond to idiosyncratic shocks in other regions since incumbent firms are less likely move there; therefore the alternative instrumental variable strategy seeks to capture the effect of aggregate industry-year shocks which affect the equilibrium bribe rate as in our model. The result shown in online Appendix Table A7 is qualitatively similar to Table 3.[10] Moreover, as long as firms are less mobile across national boundaries, which seems highly plausible, the China instrumental variable strategy also helps to address these concerns.

5. Heterogeneous Effects by Firms' Moving Costs

We presented evidence in Section 3 that economic growth (specifically, an increase in firm employment) reduces the rate of bribe extraction. The inter-jurisdictional competition idea described in the previous Section generates this prediction, but is not the only explanation for why an increase in employment reduces bribes. For example, it is possible that bureaucrats simply have diminishing marginal utility of income relative to the risk of being caught and going to jail, so that as it becomes easier to extract revenues, they

[10] We also investigated the extent to which these results would still hold even with mild violations of the exclusion restriction, using the 'plausibly exogenous' methodology of Conley *et al.* (2012), in which they allow the instrument Z to affect the outcome directly through the equation $Y = X\beta + Z\gamma + \varepsilon$ for a range of γ values. The results are reported in online Appendix Table A8. We find that the IV estimates of the effect of firm growth on bribes remain negative even if we allow for reasonably sized violations of the exclusion restriction (i.e. up to γ as large as β.)

reduce rates. However, a key prediction of inter-jurisdictional competition, as opposed to potential alternative explanations, is that the effect of an increase in firm productivity on the bribe rate should be greater in magnitude when firms are more mobile.[11]

We test that prediction with the following estimating equation:

$$Bribes_{ipjt} = \alpha + \beta A_{ipjt} + \gamma A_{ipjt} \times MovingCost_{ipjt} + \delta MovingCost_{ipjt} + \nu_{pj} + \mu_t + \epsilon_{ipjt}. \tag{6}$$

The prediction is that γ in (6) is positive, so that the reduction in bribes as firm growth increases is smaller for firms with higher moving costs. Again, we estimate the equation using both of our IV strategies.

As measures of *MovingCost*, we use two firm characteristics. First, we use variation across firms in their property rights over the land they operate on, and, second, we use variation in whether the firm is based in one province or multiple provinces.

5.1. *Property Rights*

In Vietnam, firms can have three types of tenure over the land on which they operate: renting, owning the land with official land use rights, and owning the land without official land use rights.[12] Specifically, for firms that have purchased their land, they may or may not have a LURC. Firms, intending to strengthen their property rights, submit the LURC application and related documents, such as map of the area and business plan, to the provincial Land Use Right Registration Office. Conditional on having purchased land, having an LURC makes it easier for the firm to move, because the firm can sell or trade its certificate if it decides to relocate to another province, whereas land without an LURC can easily be expropriated by local authorities (Do and Iyer, 2003; Kim, 2004), making it harder to sell.

It is not obvious *ex ante* whether firms that rent face higher or lower relocation costs than those that own. For example, renters cannot recoup the value of any improvements they made to the property and may be locked into hard-to-renegotiate long-term leases, but they do not face transaction costs from having to sell property. What is clear though is that conditional on owning, transaction costs are lower for those with an LURC. We therefore examine heterogeneity across these different levels of moving costs: firms that rent land *versus* purchase land, and conditional on having purchased land, firms that have LURCs *versus* those that do not.

We estimate a model that interacts $\log(Employ_{pjt})$ with these measures of property rights. In general, since we have a repeated cross-section of firms, not a panel, there is a potential endogeneity problem if we use θ at the firm level (e.g. firms could adjust their θ in response to a shock in A). For the LURC variable, we know the year the firm acquired the certificate, so we can also use lagged values of LURC ownership to address this concern.[13] In addition to interacting these measures of movings costs with

[11] The idea that firms that are less mobile are treated differently by local officials in Vietnam is consistent with Rand and Tarp (2012), who show using different data that firms that appear less mobile pay higher bribes.

[12] Note that while we use the term 'own', the more precise term would be 'purchased' since in Vietnam, firms can purchase land, but in a technical sense, the state still owns all of the land.

[13] Unfortunately, we do not know the year the firm purchased its land, so we cannot do the analogous exercise for land ownership. In online Appendix Table A9, we show the results using contemporaneous LURC.

$\log(Employ_{pjt})$, we also show the results controlling for the interaction of $\log(Employ_{pjt})$ with average firm size in the industry to isolate the effects of land ownership status from other general industry characteristics, in case land ownership and LURC status are correlated with firm size. We also examine a host of other controls below, all interacted with $\log(Employ_{pjt})$, to capture the fact that having an LURC is not randomly assigned (e.g. LURC firms may be more willing to pay bribes to obtain permits, are older, etc).

The first two columns of Table 4 use a single IV and compare firms that own land and have an LURC against the omitted category of all other firms, both those that are renting and those that own land without an LURC. In panel (*a*), the coefficient on the interaction with $\log(Employ_{pjt})$ in column (1) is −0.292 and significant at the 5% level, suggesting that indeed firms with LURCs have the largest reduction in bribe rates as predicted employment increases.

To interpret the magnitudes, recall that the average effect of increasing employment on reduced corruption from Table 3 is −1.704. The results in column (1) suggest that the impact is about 17% (= 0.292/1.704) larger in magnitude for firms with an LURC than those without one.

As shown in column (2), the coefficient on the LURC interaction is insensitive to whether we control for industry average firm size interacted with $\log(Employ_{pjt})$,[14] suggesting that the land ownership and LURC variables are really picking up something about the firm's property rights rather than industries with larger or smaller firms.

Columns (3) and (4) also include the interaction between the firm owning land and $\log(Employ_{pjt})$. The coefficient on the interaction of the firm owning land and having an LURC and $\log(Employ_{pjt})$ is now the additional impact of owning an LURC conditional on owning land, i.e. comparing firms that own land and have an LURC with those that own land and do not have an LURC. The LURC interaction term in this specification is the most direct test of the theoretical prediction. The interaction coefficient of −0.12 is negative (column (4)), consistent with the prediction, but quite noisily estimated.[15]

Columns (5)–(8) repeat columns (1)–(4), but using multiple IVs for Vietnam, and the estimates are broadly similar. Panel (*b*) then presents the results using the Chinese IV. It is reassuring that the results are similar using different IV strategies and are robust to controlling for firm size. Nonetheless, possessing an LURC is not randomly assigned, and could be correlated with other firm characteristics. Possessing an LURC is indeed correlated with a variety of other firm characteristics (online Appendix Table A11), but, reassuringly, the findings are robust to controlling one-by-one for the interaction of these possible correlates of property rights with $\log(Employ_{pjt})$, as well as controlling for the interaction of propensity scores for having an LURC and owning land with $\log(Employ_{pjt})$ (online Appendix Tables A12 and A13).

[14] The industry average firm size is computed as the average employment (with the categorical variable recoded using the GSO data to calculate the within-category mean, as detailed in online Appendix D) among PCI firms in the same industry pooled over all years.

[15] We have also estimated ordered probit reduced form specifications with broadly similar results; see online Appendix Table A10.

Table 4

Heterogeneous Effects Based on Firms' Property Rights

Dependent variable: firm's bribe payment as percentage of revenue								
	Single IV				Multiple IV			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel (*a*): rest-of-Vietnam IV								
Log Vietnamese employment in industry-year (in own province)	−1.986**	0.978	−2.116**	0.978	−1.127	0.00315	−1.431**	−0.0553
	(0.843)	(2.696)	(0.902)	(2.775)	(0.688)	(2.006)	(0.645)	(2.016)
Firm owns its land × log Vietnamese employment in industry year (in own province)			−0.331*	−0.340*			−0.318**	−0.317**
			(0.180)	(0.187)			(0.125)	(0.126)
Firm owns land and has LURC × log Vietnamese employment in industry year (in own province)	−0.292**	−0.314**	−0.101	−0.119	−0.262***	−0.264***	−0.0882	−0.0915
	(0.116)	(0.128)	(0.124)	(0.133)	(0.0900)	(0.0911)	(0.117)	(0.119)
Observations	9,535	9,535	9,535	9,535	9,535	9,535	9,535	9,535
Panel (*b*): China IV								
Log Vietnamese employment in industry-year (in own province)	−1.321	1.182	−1.098	0.744	−0.889	0.881	−1.174**	0.879
	(1.376)	(2.839)	(1.305)	(2.638)	(0.606)	(1.945)	(0.560)	(1.921)
Firm owns its land × log Vietnamese employment in industry year (in own province)			−0.542***	−0.562***			−0.223*	−0.223*
			(0.165)	(0.163)			(0.132)	(0.133)
Firm owns land and has LURC × log Vietnamese employment in industry year (in own province)	−0.404***	−0.423***	−0.102	−0.104	−0.252**	−0.257**	−0.120	−0.126
	(0.135)	(0.151)	(0.150)	(0.152)	(0.105)	(0.107)	(0.116)	(0.119)
Observations	9,535	9,535	9,535	9,535	9,535	9,535	9,535	9,535
Control for average firm size × log Vietnamese employment in industry-year (in own province)	No	Yes	No	Yes	No	Yes	No	Yes
Province-industry and year fixed effects	√	√	√	√	√	√	√	√

Notes. This Table shows the IV results for heterogeneous effects based on firms' property rights. The interaction term is the product of log Vietnamese employment in industry-year in own province and firm-level property rights variables. Columns (1)–(4) use single instrument, and columns (5)–(8) use multiple instruments. Panel (*a*) shows the results using rest-of-Vietnam IV, and panel (*b*) shows results using China IV. All regressions control for the main effects of the property right variables, but only the interaction coefficients are reported in this Table. The even columns control for average firm size in the industry interacted with the endogenous variable. The sample contains firms with 10 or more lagged employees reported for the year before the survey. (The results for the full sample is shown in online Appendix Table A5.) All regressions control for province-industry and year fixed effects. Standard errors are two-way clustered at the province and industry-year level. *** implies significance at 0.01 level, ** 0.5, * 0.1.

5.2. *Firms Operating in Multiple Provinces*

The PCI data provide a second proxy for firm mobility that we can use to test for heterogeneous effects: having operations in multiple provinces. Of the firms in the sample, 31.4% have operations in at least two provinces. These firms with some of their operations elsewhere likely have a more credible threat to wholly move to another province or simply focus their expansion plans elsewhere, making them more observably mobile to provincial officials. Of course, these may be different on other dimensions as well, but this nevertheless provides another way of testing the idea that bribes are more elastic with respect to firm size for these plausibly more mobile firms.

Table 5 examines heterogeneity based on multi-province operations. The proxy for *Moving Cost* is a dummy for operating in at least one other province besides the province where the firm is headquartered. The interaction coefficients are both −0.26 in columns (1) and (2) (significant at the 1% level). The main effect of $\log(Employ_{pjt})$ in column (1) is −1.704, so the interaction coefficient implies that having multi-province operations increases the negative effect of growth on the bribe rate by 15%.

We find similar results, reported in panel (*b*), using the Chinese IV. Focusing on the multiple-IV results in columns (3) and (4), the effect of growth on bribery is stronger for mobile firms, with the result significant at the 1% level.

Table 5

Heterogeneous Effects Based on Firms' Operation Locations

Dependent variable: firm's bribe payment as percentage of revenue				
	Single IV		Multiple IV	
	(1)	(2)	(3)	(4)
Panel (*a*): rest-of-Vietnam IV				
Log Vietnamese employment in industry-year (in own province)	−1.469**	0.206	−0.981	−0.378
	(0.642)	(1.884)	(0.674)	(1.649)
Firm currently operates in more than one province × log Vietnamese employment in industry-year (in own province)	−0.265***	−0.263***	−0.219**	−0.220**
	(0.0967)	(0.0926)	(0.103)	(0.103)
Observations	10,901	10,901	10,901	10,901
Panel (*b*): China IV				
Log Vietnamese employment in industry-year (in own province)	−1.108	0.782	−0.728	0.448
	(0.979)	(1.932)	(0.529)	(1.668)
Firm currently operates in more than one province × logVietnamese employment inindustry-year (in own province)	−0.361**	−0.344**	−0.239***	−0.241***
	(0.154)	(0.150)	(0.0904)	(0.0904)
Observations	10,901	10,901	10,901	10,901
Control for average firm size × log Vietnamese employment in industry-year (in own province)	No	Yes	No	Yes
Province-industry and year fixed effects	√	√	√	√

Notes. This Table shows the IV results for heterogeneous effects based on firms' operation locations. The sample contains firms with 10 or more lagged employees reported for the year before the survey. (The results for the full sample is shown in online Appendix Table A6.) All specifications are the same as in Table 4. Standard errors are two-way clustered at the province and industry-year level. *** implies significance at 0.01 level, ** 0.5, * 0.1.

Online Appendix Tables A14 and A15 present the battery of robustness checks. For the preferred specifications of the single-IV Vietnam approach and the multiple-IV China approach, the results are essentially similar.

To summarise our main empirical results, first, we showed in Section 3 that positive productivity shocks for firms reduce corruption. Second, in this Section we presented evidence that corruption falls more in response to positive shocks when firms are more elastic in their location choices. This second finding is seen both when using firms' property rights over their land as a proxy for their relocation costs and when using multi-province operations as a proxy for the ability to relocate.

5.3. *Alternative Models*

There are other potential models that predict a negative correlation of growth and the bribe rate besides inter-jurisdictional competition. The first and most direct way to distinguish between the inter-jurisdictional model and these other models is that we find that the relationship between growth and bribery is diminished for firms that are less likely to relocate outside their province. This is a direct prediction of inter-jurisdictional competition, but is not predicted by most other models. For example, if some bribes are fixed fees (say, those bribes paid at an office, where the inspector does not observe firm size) and some bribes are a fixed proportion of revenue (say, those paid in response to inspections of the plant), this would generate the pattern that the share of revenue paid in bribes would fall as firms grow. Such a simple model, however, predicts that this elasticity would be larger for more mobile firms.

Online Appendix E directly considers several other explanations for the finding that growth reduces bribes, specifically:

(*i*) growth increases product-market competition;
(*ii*) industry-specific crackdowns on bribery;
(*iii*) economies of scale in rooting out bribery; and
(*iv*) diminishing returns to bureaucrats from income from bribes.

The results are shown in online Appendix Table A16. To the extent we can examine quantitative and qualitative predictions of these alternative models, we do not find that they are able to explain the empirical patterns.

These other mechanisms could well be in operation too, explaining some of the overall effect of growth on bribery. But, the positive evidence in support of inter-jurisdictional competition and the limited evidence in support of other models suggests that the mechanism we highlight is an important factor in why economic growth reduces corruption in Vietnam.

6. Conclusion

This article examines whether firm growth leads to lower corruption, using firm-level data from Vietnam, and establishes two empirical facts. First, industry-level growth reduces the proportion of firm revenues extracted by government officials as bribes. Second, this reduction in corruption is larger for firms that can more easily relocate.

These facts map to the two main contributions of the article. The first is an important empirical contribution: Despite much interest in the relationship between corruption and growth, we provide some of the first rigorous causal evidence on the effect of growth on corruption. We do so by applying an often-used identification strategy that uses shocks outside of a subnational region (either in other regions, or in a neighbouring country) as a source of exogenous variation in the region. This strategy is applicable to Vietnam because previous work shows that corruption is decentralised in Vietnam, and provincial governments independently determine the level of bribes extracted from firms in their jurisdiction. The general framework that we have developed in this article can also be applied in other countries where corruption activities are highly localised, such as China.

Our second contribution is to lay out a mechanism through which productivity growth reduces corruption that operates through firm size: Competition among provinces to retain or attract firms. If a firm is more able to relocate, a government will be more cautious about extracting bribes from it. Less obvious is how a change in economic activity affects corruption in this environment. There are offsetting forces, but under plausible assumptions, growth leads to a decline in bribe extraction. We also derive the prediction that this decline is larger for more mobile firms, consistent with our second empirical fact described above.

Our results have several implications for understanding the determinants of corruption in developing countries. The finding that firm growth reduces bribery suggests that some aspects of corruption might decline naturally as a country grows even without explicit anti-corruption efforts, at least if overall economic growth entails growth in firm size. Moreover, the mechanism of inter-jurisdictional competition offers several ways that national governments might expedite the decline in corruption. One option involves focused improvements in governance in one region, as suggested by Wei (1999*b*) and Fisman and Werker (2010); the competitive pressure that we discuss would lead these improvements to spill over to other regions. More directly tied to our empirical findings, strengthening property rights so that firms can more easily recoup the value of their land if they move would strengthen the competition among jurisdictions and hence the corruption-reducing effect of growth. More generally, reducing any barriers to firm mobility, for example related to business registration, would amplify the negative effect of growth on corruption.

While we have implemented the idea of firm growth and firm mobility as forces for reducing corruption within a country, similar factors could be at play across countries. For example, multinationals face a choice of which countries to locate in or to source their products from. As they grow, it becomes more worthwhile to pay a cost to move to a country with lower corruption, which could lead countries to reduce bribe rates to prevent too many firms from leaving. This effect will be larger in industries with low switching costs across countries, like textiles, than in industries with high switching costs, such as mining. We leave exploration of these issues for future work.

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Additional Supporting Information may be found in the online version of this article:

Appendix A. Additional Tables.
Appendix B. Validation of Matching Between PCI and GSO.
Appendix C. Model.
Appendix D. Description of Key Variables.
Appendix E. Testing Alternative Models.
Data S1.

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