

## **Internet Appendix**

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### ***Bribe Payments and Innovation in Developing Countries: Are Innovating Firms Disproportionately Affected?***

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## Web Appendix A: Accuracy of Firm Illegality Data from ES Surveys

Questions on bribes and tax evasion were phrased indirectly in the ES surveys. Consistent with established and approved survey methods, the firms were asked about the behavior of a typical firm rather than the firm itself, to avoid implicating the respondent firm with illegal activity. This type of indirect questioning where subjects are asked about likely responses of a “typical subject” has been used extensively in other fields such as psychology, marketing, and criminology to counter social desirability bias where respondents over-report good behavior and underreport bad behavior. Other corruption studies (e.g. Azfar and Murrell, 2009 and Clausen, Kraay, and Murrell, 2010) have shown that respondent reticence is less of a factor with indirect questioning where the respondent is not implicated in personal wrongdoing.<sup>1</sup> Overall, the mean response rate in the Enterprise Surveys is over 50% which is superior to most other survey based studies in finance that typically report response rates between 7% - 9%.<sup>2</sup>

Other established survey methods were also used to increase data accuracy. Corruption-related questions were asked at the end of the interview when the interviewers had presumably established credibility and trust with the respondent and multiple questions were asked on bribe payments. In addition, we performed survey reliability tests by examining answers to the questions across two different points in time or across an equivalent set of firms. Specifically, for a smaller sample of countries (the BEEPS sample which is discussed in detail in the following section) we have additional variables on bribe payments and responses from surveys implemented in 2002 and 2005. We find the responses to be highly correlated across the two

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<sup>1</sup> Fisher (1993) and Johansson-Stenman and Martinsson (2006) show that indirect questions elicit more honest responses to normative statements than direct questions. Other studies show that indirect questioning yields a better reflection of what people actually did when they were not being scrutinized by an interviewer (e.g. Lusk and Norwood, 2009a; 2009b) and that people’s predictions of others were a significantly more accurate predictor of actual future behavior than people’s statements about themselves (Epley and Dunning, 2000).

<sup>2</sup> See, for example, Graham and Harvey (2001), Brav, Graham, Harvey and Michaely (2005), Graham, Harvey, and Rajgopal (2005), and Lins, Servaes, and Tufano (2010), and Campello, Giambona, Graham, and Harvey (2011).

years for the various variables. Similar data has been used by several papers including Svensson (2005) and Fisman and Svensson (2007). Hallward-Driemeier and Aterido (2009) examine how well firm responses on questions related to obstacles in the business environment in the ES surveys correspond to other data sources and find a high degree of correlation between firm responses and measured objective outcomes from external data sources.<sup>3</sup>

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

### **References:**

Azfar, Omar and Peter Murrell, 2009, Identifying Reticent Respondents: Assessing the quality of Survey Data on Corruption and Values, *Economic Development and Cultural Change*, 57 (2), 387 –411.

Brav, A., John R. Graham, Campbell Harvey, Roni Michaely, 2005, Payout Policy in the 21<sup>st</sup> Century, *Journal of Financial Economics* 77(3), 483-527.

Campello, M., Erasmo Giambona, John R. Graham, and Campbell R. Harvey, 2011, Liquidity Management and Corporate Investment During a Financial Crisis, *Review of Financial Studies* 24(6): 1944-1979.

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<sup>3</sup> As a validity check, we find that the survey data on bribe payments vary across country income groups in a similar fashion as other cross-country indicators of corruption such as Transparency International's (TI) Corruption Perception Index and the World Bank's Control of Corruption Index described in Kaufmann, Kraay, and Mastruzzi (2009) do.

- Chaiken, Jan M., and Marcia R. Chaiken, 1982, *Varieties of Criminal Behavior*. Santa Monica, California: Rand Corporation
- Clausen, Bianca, Aart Kraay, and Peter Murrell. 2010. Does Respondent Reticence Affect the Results of Corruption Surveys? *World Bank Policy Research Working Paper # 5415*.
- Epley, N., & Dunning, D., 2000, Feeling 'holier than thou': Are self-serving assessments produced by errors in self- or social prediction? *Journal of Personality and Social Psychology*, 79, 861–875.
- Fisher, R. J. (1993). Social desirability bias and the validity of indirect questioning. *The Journal of Consumer Research*, 20, 303–315.
- Fisman, R. and J. Svensson, 2007, Are Corruption and Taxation Really Harmful to Growth? Firm Level Evidence, *Journal of Development Economics Vol. 83, No. 1*, 63-75.
- Graham, John R., and Campbell Harvey, 2001, The Theory and Practice of Corporate Finance: Evidence from the Field, *Journal of Financial Economics* 60, 187-243
- Graham, John R., Campbell Harvey, and Shiva Rajgopal, 2005, The Economic Implications of Corporate Financial Reporting, *Journal of Accounting and Economics* 40, 3-73.
- Hallward-Driemeier, Mary and Reyes Aterido, 2009, Comparing Apples with...Apples: How to Make (More) Sense of Subjective Rankings of Constraints to Business. *World Bank Policy Research Working Paper Series No. 5054*
- Homey, J., and I. Haen Marshall, 1991, Measuring Lambda through Self- Reports, *Criminology* 29:471-95.
- Johansson-Stenman, O., & Martinsson, P. (2006). Honestly, what are you driving a BMW? *Journal of Economic Behavior & Organization*, 60, 129–146.
- Johnson, S., D. Kaufmann and P. Zoido-Lobaton, 1998, Regulatory Discretion and Corruption, *American Economic Review (Papers and Proceedings)*, 88(2), 387–92.
- Junger-Tas, J. and Ineke H. Marshall, 1999, The Self-Report Methodology in Crime Research, *Crime and Justice* 25: 291–367.
- Kaufmann, D., A. Kraay, and M. Mastruzzi, 2009, Governance Matters VIII: Aggregate and Individual Governance Indicators, 1996-2008, *World Bank Policy Research Working Paper 4978*.
- Lins, Karl V. & Servaes, Henri & Tufano, Peter, 2010, What drives corporate liquidity? An international survey of cash holdings and lines of credit, *Journal of Financial Economics* 98(1), 160-176.

Lusk, J. L., & Norwood, F. B. (2009a). Direct versus Indirect Questioning: An Application to the Well-Being of Farm Animals, *Social Indicators Research*

Lusk, J. L., & Norwood, F. B. (2009b). Bridging the gap between laboratory experiments and naturally occurring markets: An inferred valuation method. *Journal of Environmental Economics and Management*.

Mande, Mary J., and Kim English, 1987, *Individual Crime Rates of Colorado Prisoners*. Denver: Colorado Department of Public Safety.

Marquis, K. H. and Patricia A. Ebener, 1981, *Quality of Prisoner Self-Reports: Arrest and Conviction Response Errors*, Santa Monica, California: Rand Corporation.

Svenson, J., 2005, "Eight Questions about Corruption", *Journal of Economic Perspectives*, 19, No.3, 19–42.

## Web Appendix B: Corruption as a tax on Innovation – Alternate Innovation Indicators

The regression model estimated is the same as in Col. 2 of Table 2.  $Bribes = \alpha + \beta_1 \text{Innovator} + \beta_2 \text{Capacity Utilization} + \beta_3 \text{Firm Size dummies} + \beta_4 \text{Family Owned dummy} + \beta_5 \text{Legal Status dummies} + \beta_6 \text{Age} + \beta_7 \text{Foreign Ownership dummy} + \beta_8 \text{Exporter dummy} + \beta_9 \text{Industry Sector Dummies} + \beta_{10} \text{Year Dummies} + \beta_{11} \text{Country Dummies} + e$ . Bribes is the percent of annual sales value that a typical firm spends on gifts or informal payments to public officials to “get things done” with regard to customs, taxes, licenses, regulations, services etc. Innovation is one of the following variables: *Developed a major new product line*, *Upgraded an existing product line*, *Introduced new technology that has substantially changed the way that the main product is produced*, *Opened a new plant*, *Agreed to a new joint venture with foreign partner*, *Obtained a new licensing agreement*, *Outsourced a major production activity that was previously conducted in-house* and *Brought in-house a major production activity that was previously outsourced* are all dummy variables that take the value 1 if the firm undertook the corresponding innovation and 0 otherwise; Aggregate Innovation Index is an aggregate measure that is formed by adding 1 if the firm has undertaken any of the eight different innovative activities described above; Core Innovation is an aggregate measure of innovation that is formed by adding 1 if the firm has *Developed a new product line*, *Upgraded an existing product line*, or *Introduced a new technology*. Capacity Utilization is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm’s existing machinery and equipment and regular shifts. Firm Size dummies take values 1 to 3 for Small firms (1-19 employees), Medium firms (20-99 employees), and Large firms ( $\geq 100$  employees). Family Owned dummy takes the value 1 if the largest shareholder is an individual or family. Legal Status Dummies consist of dummy variables for the following legal forms - Corporation, Partnership, Cooperative, Sole Proprietorship (omitted category), and Other Legal Status. Firm age is the year of the survey -year established. Foreign Ownership is a dummy variable that takes the value 1 if the firm is foreign owned and 0 otherwise. Exporter is a dummy variable that takes the value 1 if the firm is an exporter and 0 if it is a non-exporter. The regressions are estimated using ordinary least squares with standard errors clustered at the country level.

	1	2	3	4	5	6	7	8	9	10
	Bribes	Bribes	Bribes	Bribes	Bribes	Bribes	Bribes	Bribes	Bribes	Bribes
New Product Innovation	0.366 <sup>a</sup> (0.072)									
Upgraded Product Line		0.323 <sup>a</sup> (0.070)								
New Technology			0.205 <sup>a</sup> (0.058)							
Opened new plant				0.209 (0.153)						
New Joint Ventures					0.309 <sup>c</sup> (0.171)					
New Licensing						0.402 <sup>a</sup> (0.079)				
Outsourced							0.159 (0.111)			
Bring in-house a previously outsourced activity								0.233 (0.196)		
Core Innovation									0.185 <sup>a</sup> (0.028)	
Aggregate Innovation Index										0.143 <sup>a</sup> (0.020)
# of Firms	25761	26084	26098	9497	25226	24155	25231	21361	26243	26254
# of Countries	57	58	59	43	54	55	54	50	59	59
Adjusted R-Sq	0.056	0.056	0.055	0.056	0.057	0.061	0.057	0.078	0.056	0.056

<sup>a</sup>, <sup>b</sup>, and <sup>c</sup> represent significance at 1%, 5%, and 10% respectively

### Web Appendix C: Corruption as a tax on Innovation – Additional Robustness

The regression model in cols. 1-5 is  $Bribes = \alpha + \beta_1 \text{ Innovator} + \beta_2 \text{ Capacity Utilization} + \beta_3 \text{ Firm Size dummies} + \beta_4 \text{ Family Owned dummy} + \beta_5 \text{ Legal Status dummies} + \beta_6 \text{ Age} + \beta_7 \text{ Foreign Ownership dummy} + \beta_8 \text{ Exporter dummy} + \beta_9 \text{ Industry Sector Dummies} + \beta_{10} \text{ Year Dummies} + \beta_{11} \text{ Country Dummies} + \beta_{12} \text{ Firm Location (or \% of sales to large domestic firms)} + e$ . In Cols. 1, 2, 4, and 5, Bribes is the percent of annual sales value that a typical firm spends on gifts or informal payments to public officials to “get things done” with regard to customs, taxes, licenses, regulations, services etc. In Col. 3, Bribes in Government Contracts is the percentage of the contract value when firms do business with the government that is typically expected in gifts or informal payments to secure the contract. Innovator is a dummy variable which takes the value 1 if the firm developed a new product line and 0 otherwise. Capacity Utilization is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm’s existing machinery and equipment and regular shifts. Firm Size dummies take values 1 to 3 for Small firms (1-19 employees), Medium firms (20-99 employees), and Large firms ( $\geq 100$  employees). Family Owned dummy takes the value 1 if the largest shareholder is an individual or family. Legal Status Dummies consist of dummy variables for the following legal forms - Corporation, Partnership, Cooperative, Sole Proprietorship (omitted category), and Other Legal Status. Firm age is the year of the survey -year established. Foreign Ownership is a dummy variable that takes the value 1 if the firm is foreign owned and 0 otherwise. Exporter is a dummy variable that takes the value 1 if the firm is an exporter and 0 if it is a non-exporter. Firm Location is one of five dummy variables for Capital City (reference category), Other city of over 1 million population, City of 250,000-1million, City of 50,000-250,000 and Town or Location with less than 50,000 population. In cols 1-3, we use OLS, in col. 4, we use logit estimation and in col.5 we use two-limit tobit specification. All standard errors are clustered at the country level.

	1	2	3	4	5
	OLS	OLS	OLS	Logit	2-limit Tobit
	Full Sample	Full Sample	Full Sample	Full Sample	Full Sample
	Bribes	Bribes	Bribes in Government Contracts	Bribes Dummy	Bribes
Innovator	0.362 <sup>a</sup> (0.075)	0.370 <sup>a</sup> (0.076)	0.419 (0.101)	0.310 <sup>a</sup> (0.036)	1.313 <sup>a</sup> (0.133)
City with over 1million population	-0.226 (0.155)				
City with 250000-1million population	-0.434 <sup>a</sup> (0.152)				
City of 50000-250000 population	-0.437 <sup>a</sup> (0.129)				
Town with <50000 population	-0.394 <sup>a</sup> (0.107)				
% of domestic sales to large domestic firms (300+ workers)		0.004 (0.002)			
# of Firms	24325	24561	23987	25761	25761
# of Countries	55	56	57	57	57
Adjusted R-sq	0.063	0.058	0.177		

<sup>a</sup>, <sup>b</sup>, and <sup>c</sup> represent significance at 1%, 5%, and 10% respectively

## Web Appendix D: Variable Descriptions and Sources

Variable	Definition	Source
<b><i>Firm-level Variables</i></b>		
Bribes	Percentage of annual sales value that a typical firm spends on gifts or informal payments to public officials to “get things done” with regard to customs, taxes, licenses, regulations, services etc.	Enterprise Surveys
Tax Evasion	Percent of annual sales that a typical firm under-reports for tax purposes.	Enterprise Surveys
Protection Payments	Percent of total sales used to buy protection (e.g. to organized crime to prevent violence).	Enterprise Surveys
Innovator	Dummy variable which takes the value 1 if the firm developed a new product line and 0 otherwise.	Enterprise Surveys
Capacity Utilization	Amount of output actually produced relative to the maximum amount that could be produced with the firm’s existing machinery and equipment and regular shifts.	Enterprise Surveys
Labor Productivity	Ratio of labor productivity of the firm to the mean labor productivity in its country where labor productivity is defined as (Total Sales-Raw Material Costs)/Total Number of Workers in the previous year	Enterprise Surveys
Sales Growth	Percentage increase in sales over the past year	Enterprise Surveys
Profit Margin	Margin by which sales price exceeds operating costs.	BEEPS Sample
Firm Size Dummies	Firm Size dummies take values 1 to 3 for Small firms (1-19 employees), Medium firms (20-99 employees), and Large firms ( $\geq 100$ employees).	Enterprise Surveys
Corporation	Dummy variable that takes the value 1 if the firm is a Corporation and 0 otherwise.	Enterprise Surveys
Partnership	Dummy variable that takes the value 1 if the firm is a Partnership and 0 otherwise.	Enterprise Surveys
Cooperative	Dummy variable that takes the value 1 if the firm is a Cooperative and 0 otherwise.	Enterprise Surveys
Sole Proprietorship	Dummy variable that takes the value 1 if the firm is a Sole Proprietorship and 0 otherwise.	Enterprise Surveys
Other Legal Status	Dummy variable that takes the value 1 if the firm is Other Legal Status and 0 otherwise.	Enterprise Surveys
Age	Year of the survey - year the firm was established.	Enterprise Surveys
Sector Dummies	Sector Dummies are 5 industry sector dummies for Agroindustry, Manufacturing, Construction, Services, and Other.	Enterprise Surveys
Foreign Ownership Dummies	Dummy variable that takes the value 1 if the firm is foreign owned and 0 otherwise.	Enterprise Surveys
Exporter Dummy	Dummy variable that takes the value 1 if the firm is an exporter and 0 if it is a non-exporter.	Enterprise Surveys
<b><i>Country-level Variables</i></b>		
Bureaucratic Regulation	Number of procedures required to start a business averaged over 2004-2005.	World Bank Doing Business Indicators



<b>Variable</b>	<b>Definition</b>	<b>Source</b>
GDP	Logarithm of GDP in constant 2000 US\$.	World Development Indicators (WDI)
GDP/Capita	Logarithm of GDP/Capita in constant 2000 US\$.	World Development Indicators (WDI)
GDP Growth	Annual % growth in GDP	World Development Indicators (WDI)
Inflation	Annual % growth in GDP deflator.	World Development Indicators (WDI)
Number of Procedures	Number of procedures required to register a firm.	World Bank Doing Business Indicators
Government Effectiveness	Captures perceptions of the quality of public services, quality of civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation and the credibility of the government's commitment to such policies. Averaged from 2002-2005.	World Bank Governance Indicators (Kaufmann, Kraay, and Mastruzzi, 2009).
Regulatory Quality	Captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Averaged from 2002-2005.	World Bank Governance Indicators (Kaufmann, Kraay, and Mastruzzi, 2009).
Rule of Law	Captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Averaged from 2002-2005.	World Bank Governance Indicators (Kaufmann, Kraay, and Mastruzzi, 2009).
Control of Corruption	Captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Averaged from 2002-2005.	World Bank Governance Indicators (Kaufmann, Kraay, and Mastruzzi, 2009).