

The Silence of Corruption

Identifying Underreporting of Business Corruption through Randomized Response Techniques

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Abstract

Research on the economic consequences of corruption has been hampered by the inability to directly measure corruption. Using an innovative methodology that allows respondents to report individual experiences with corruption while minimizing self-incrimination and an objective diagnostic to evaluate lying (false responses), this paper explores the extent of business corruption

in Bangladesh. The analysis shows that traditional measures of corruption underreport the extent of business corruption in Bangladesh and existing strategies to evaluate and elicit truthful responses have limited effectiveness. The authors identify the types of firms that are associated with false responses and nonresponses to survey questions on corruption.

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**The Silence of Corruption:
Identifying Underreporting of Business Corruption through Randomized Response
Techniques¹**

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1. Introduction

The relationship between corruption and business activity has long been a contentious area of research. Corruption can impose a tax on business, which is not only costly to individuals and firms—it can be arbitrary and unpredictable. It can also affect the incentives of firms and investors, increasing rent seeking activity. Yet, corruption can also increase economic efficiency, where it greases the wheels of business, either as a collusion between public officials and firms, or simply a mechanism that increases the efficiency of business by using informal mechanisms to overcome formal barriers to economic activities.

In this paper we examine the extent of business corruption in a survey of firms in Bangladesh. Isolating our study to a single country allows us to sidestep many of the difficult cross-national comparisons of individual responses to survey questions. Yet our research project is confronted with the same empirical research design issue as literally decades of scholarship: the measurement of corruption.

The most serious problem with corruption research is the ability to directly measure corruption. Corruption often entails illegal and unethical activities where one or all parties have incentives to conceal corrupt acts. Thus one response to this measurement problem is to rely on the opinions of experts on the levels of corruption. Unfortunately, this fails to uncover the vast differences in experiences with corruption across firms, and still suffers from the same measurement problem. If these experts aren't directly observing "corruption" what information are they using to evaluate the level of corruption?

Thus recent research on corruption has shifted from expert opinion on the overall level of corruption to firm-level surveys on individual experiences with corruption. This allows for directly measuring corruption and leaves room for variation across firms. Unfortunately, this firm level analysis requires us to rely on self-assessments of firms. If these questions are politically sensitive, personally embarrassing, or could lead to criminal sanctions, we should be dubious about the incentives of firms to provide truthful answers.

One strategy used within surveys is to ask the enumerator to evaluate the level of truthfulness of the respondent. This strategy has the strength of allowing enumerators, often during face to face interviews, evaluate the truthfulness of respondents. Yet these are based on perception that can be biased, and they are based on overall evaluations of truthfulness, and not linked to specific questions. We directly illustrate the limits of this approach within our survey.

To evaluate the extent of truthfulness we utilize a randomized response technique (RRT). This strategy is simply to have respondents flip a coin for each question we ask. If the coin turns up heads, the respondent automatically responds as “yes”, and is instructed to answer truthfully if the coin turns up tails. If respondents are answering questions truthfully, at least half of the response should be “yes” (since 50% of the coin flips should be heads). If we find that responses to corruption questions answer “no” more than half of the time, there is systematic false responses on the survey. Our survey results do indeed show systematic false responses on politically sensitive questions such as levels of corruption and the extent of tax evasion. We find that the same types of firms

that have a propensity to provide false responses to our RRT are also the firms that are likely to provide nonresponses to direct questions on corruption.

Our paper proceeds as follows. In section two we provide a brief overview of the relationship between corruption and investment. In section 3 we provide an overview of our research design and data and present our results. In section 4 we provide a descriptive discussion of patterns of nonresponse and potential false responses. Section 5 concludes.

2. Corruption and Firm Investment

There is a large body of literature exploring the relationship between business corruption and economic outcomes. At a minimum, corruption is a tax on business (Vernon 1971, 1977; Wells 1977; Ackerman 1975a, 1975b, 1999) that increases the costs of firm operations. Yet the cost of corruption can be much greater than the direct costs. First, corruption can disadvantage the international investments from firms headquartered in countries with strong anti-corruption laws (Cuervo-Cazurra 2006). For example, the passage of the 1977 U.S. Foreign Corrupt Practices Act, (e.g., Graham 1984; Kim and Barone 1981) led to a decrease in U.S. investment in countries with higher levels of corruption. This can advantage firms from countries with weaker anti-corruption laws. Second, its negative impact is greater than a transparent tax because illegality requires secrecy (Schleifer and Vishny 1993). Third, corruption can increase rent-seeking, distorting economic decisions (Kreuger 1974; Bhagwati 1982; Murphy et al 1995).

These negative impacts, both direct and indirect, of corruption may deter domestic and foreign investment (Habib and Zurawicki 2002; Knack and Keefer 1995;

Lambsdorff 2003; Mauro 1995, 1998; Wei 2000).² This impact can be heightened when corruption is unpredictable (Campos, Lien, and Pradhan 1999; Malesky and Samphantharak 2008). Finally, the structure of corruption, specifically if there is a single agency demanding rents or if multiple agents all have opportunities for corruption, affects both the level and the impact of corruption (Olken and Barron 2009).

Unfortunately, measuring corruption requires novel research design strategies for a number of reasons. First, firm managers may be generally reluctant to answer politically sensitive questions (Lensvelt-Mulders et al. 2005; Azfar and Murrell 2009). This reluctance can stem from social factors, where firm managers may be hesitant to express personal beliefs that are considered taboo.³ Second, and more relevant for this paper, the political environment can affect responses to firm level surveys. Jensen, Li, and Rahman (2010) analyze cross-national firm-level *Productivity and Investment Climate Surveys* (PICS) administered by the World Bank. They find evidence for nonresponse and false response on corruption questions in the PICS survey. Specifically, in countries with lower levels of Press Freedom and Political Freedom, a larger percentage of firms tend to provide false response to the corruption questions and a large number of responses fit patterns of false response. They find that in countries with lower levels of press and political freedom, firm-level survey data tends to underreport levels of corruption.

In this paper we take seriously the potential for nonresponse and false responses in the firm level surveys. In fact, we design a survey methodology to examine patterns of nonresponse and false response on survey questions on corruption. Our methodology

² Corruption can also affect firm entry strategies (Henisz 2000; Rodriguez et al. 2005; Uhlenbruck et al. 2006) or alter other aspects of their operations (Kwok and Tadesse 2006; Luo 2006).

³ For example, see Berinsky (1999) for work on public opinion and school integration in the United States.

helps to identify and correct for these responses, whether they are generated by social or political factors.

3. Research Design, Data and Analysis

To explore the relationship between investment and corruption, we utilize the Bangladesh Business Confidence Survey from the 4th Quarter of 2009. This business confidence survey was conducted on a quarterly basis from the first quarter of 2009 to the first quarter of 2010 by the Bangladesh Investment Climate Fund involving leading Bangladeshi survey research firms⁴. The objective of the survey is to read the pulse of the economy and the mood of the business community on a quarterly basis. Typically, the owners or the managers of the firms were surveyed in a nationally representative sample of firms covering all the six divisions of the country. In the survey, business owners or managers report on their current business situation compared to the immediate past and anticipate business conditions for the near future in terms of investment, employment, and profitability. Jointly with one of more leading business chambers, BICF disseminate the survey findings in a high profile national workshop in the presence of key policy makers of the government such as the Commerce Minister, Prime Minister's advisers, leading economists and development practitioners, private sector leaders, business community, and representatives from relevant government organizations, which captures the extensive print and electronic media coverage. The role of government officials in the dissemination of the survey isn't unique Bangladesh Business Confidence Survey,

⁴ The Bangladesh Investment Climate Fund (BICF) provides advisory services aimed at improving business operating environment in Bangladesh. BICF is managed by IFC, in partnership with the U.K Department for International Development and the European Union. BICF administered the first two quarterly surveys jointly with the Bangladesh Enterprise Institute and the subsequent rounds with the OrgQuest Research Limited.

and that this government involvement can cause nonresponse and false responses on politically sensitive questions.⁵ This is especially important since the survey includes a set of questions on the operations of firms, firms' experience in dealing with different government authorities, and the effects of different government policies on firm investment. Later in this paper we outline our strategy to deal with potential nonresponse and false response by including list of randomized experiment questions for our analytical purposes.

Our survey wave includes a total of 1,417 owners or managers spread across all of the six administrative divisions, although the largest percentage of firms (45.07%) are located around the capital, Dhaka, the center of most of the economic activities of the country. The nationally representative firms in this survey, mirroring the universe of firms in Bangladesh, tend to be small, with over half of the firms employing less than 10 workers, and less than 7% employing more than 50 workers. This includes a mix of newer and older firms, where slightly more than 50% of the firms were established before 1999. Finally, the firms in the survey are almost evenly split between firms in urban areas and rural areas (51.67% to 48.33% respectively).

The largest number of these firms are located in the manufacturing sector (33.61%) followed by wholesale and retail trade (21.94%), finance (13.82%), and hotel and restaurant (10.83%). The vast majority of these manufacturing firms are in the textile industry engaging in the production of garments, leather goods, or other textiles.⁶

Unfortunately, Bangladesh's low levels of development and limited success in attracting foreign investment doesn't allow for sufficient variation in ownership structure

⁵ Jensen, Li, and Rahman (2010).

⁶ This sector accounts for 23.82% of the firms in our sample, and over 70% of the manufacturing firms.

for us to make comparisons across owners. Only 5.14% of the firms in our survey are publicly listed and over 67% are sole proprietorships. Only 8 observations are foreign owned firms and 26 observations are government owned enterprises. This lack of variation in ownership type limits our ability to analyze how different ownership types affect firm's experiences with corruption.

While the limited variation in the types of firms operating in Bangladesh constrains our ability to examine certain questions, such as the differences in foreign versus domestic firm experiences with corruption, Bangladesh has other advantages for the study of how corruption affects firm activities. Bangladesh ranks 134 out of 178 in 2010 Transparency International Corruption Perception Index and is thus one of the most corrupt countries in the world. Bangladesh ranks in the bottom third in global governance indices such as the Doing Business rankings, the World Bank Institute (WBI) indicators for government effectiveness, rule of law, and control of corruption. Reviews of the country's governance, most notably by Bangladeshi experts such as BRAC University's State of Governance Reports, have noted entrenched problems in many key public institutions (IGS 2009).

Our research on corruption and investment in Bangladesh complements existing cross-national and single country studies of corruption. Researchers attempting to measure firm level corruption have the options of directly asking respondents on the level of corruption, or ask firms about their overall perceptions of corruption. The first strategy requires firms to potentially incriminate themselves, while the second strategy requires meaningful subjective assessments.⁷

⁷ Olken (2009) finds that individual perceptions of corruption, while containing some information, is highly noisy and subject to bias.

The first question we explore is a routinely asked question in the Bangladesh survey on changes in the level of corruption. The question asks about increases or decreases in the level of corruption over the last quarter. The exact wording of this question is presented in the Appendix.

In Table 1, we present the responses from 1,417 firms surveyed. These results indicate a general stability in the level of corruption, with a slightly higher percentage of managers (21.81%) indicating a decrease in corruption compared with that who indicates an increase in corruption (13.83%). These results provide some insights into changing levels of corruption over time, one of the important drivers in changes in business activities (investment, sales, etc). These general questions on corruption mask important differences in firm managers' personal experiences with corruption. General levels of corruption may have a low correlation with actual firm experiences with corruption.

Table 1: Evaluations of Changes in Corruption

	Number	Percent
No Response	230	16.23%
Much Lower	54	3.81%
Somewhat Lower	309	21.81%
About the Same	582	41.07%
Somewhat Higher	196	13.83%
Much Higher	46	3.25%
Total	1,417	100%

An alternative approach is to directly ask firms about their evaluation of the role of corruption in affecting business activity. The second question that we explore is a question on the relationship between a number of different factors and business activity. Along with a number of questions related to economic factors affecting business, one

question includes an evaluation of corruption (Question J). We present the exact wording of this questions and potential responses in the Appendix.

Table 2: Evaluations of Impact of Corruption on Business Activity

	Number	Percent
Very negative	37	2.61%
Moderately negative	370	26.11%
No impact	865	61.04%
Moderately positive	127	8.96%
Very positive	18	1.27%
Total	1,417	100%

As presented in Table 2, the majority of firms respond that corruption has no impact on their business. Unfortunately, the collection of the survey data doesn't allow us to differentiate "No impact" from the responses providing nonresponses and are thus coded as no impact. The sizeable minority of firms claiming corruption has a moderately negative impact (26.11%) is important, and has clear policy relevance. But do these levels of corruption distort investment decisions and ultimately have a negative impact on economic performance?

Unfortunately, these two corruption questions presented may suffer from a number of problems. The first question asks a general subjective assessment of the level of corruption, while the second asks a specific question on how corruption affects the business environment. Broad questions on corruption may not inform us about firm experiences with corruption, with firm specific question on experiences with corruption may lead managers to use nonresponse and false responses to minimize any legal or political repercussions (Jensen, Li, and Rahman 2010).

Our approach is to utilize a series of questions based on a "coin flip" method of randomization of questions, often called a randomized response technique (RRT) that we

included on the 4th Quarter Bangladesh Business Confidence Survey. We ask a series of ten questions of varying political sensitivity. This ranges from questions about underpaying taxes and paying bribes to using the office phone for personal use. The method and structure of these questions comes from Azfar and Murrell (2009) and Clausen et al (2010). While we build on this existing method, we use this approach to both to identify the types of firms that are likely providing false responses to corruption questions.

The instructions provided to the survey administer for our coin flip strategy are:

[Instructions: Respondents are given a coin. If they flip heads, the respondent should answer “yes.” Otherwise the respondent should respond to the questions. The enumerator shouldn’t observe the toss.]

We present the exact questions in the Appendix (Question 3). We include politically non-sensitive questions such as if the respondent has ever lied in their own self-interest or used a work phone for a personal call. Other questions are designed to be highly sensitive, such as if the respondent pays less in taxes than they should in taxes. Our main question on corruption focuses on a very specific form of corruption relevant for starting and expanding business. Our question is, “Did your business have to pay a bribe to get permits to start a business?”

This randomized response technique (RRT) can help mitigate a number of problems with potential false responses to surveys. First, it allows respondents deniability for any illegal or unethical answers given in the survey. For example, one question asks if the manager’s firm pays less than they should in taxes. Firms responding “yes” to this question can credibly claim that their “yes” response was driven by randomization, rather than an admission of guilt. Second, this question is a specific,

objective question about corruption. Thus there is less concern about subjective evaluations or anchoring problems affecting responses. Third, we can explore the pattern of responses to examine if there is underreporting of specific events, or if specific respondents answer in a pattern that is consistent with false responses.

A more formal way to present this is if we have no false responses or underreporting of corruption we can interpret the probabilities as:

$$P[\text{Yes}] = q + (1-q) * (0.5)$$

The probability of a respondent of answering yes is a function of the probability of the respondent paying a bribe (q) and the probability of observing heads in the coin flip (0.5). For example, if 60% of respondents have paid a bribe, we should expect to observe 80% of respondents answering yes to our question. If no firms pay bribes we should observe 50% of respondents answering yes to our question.

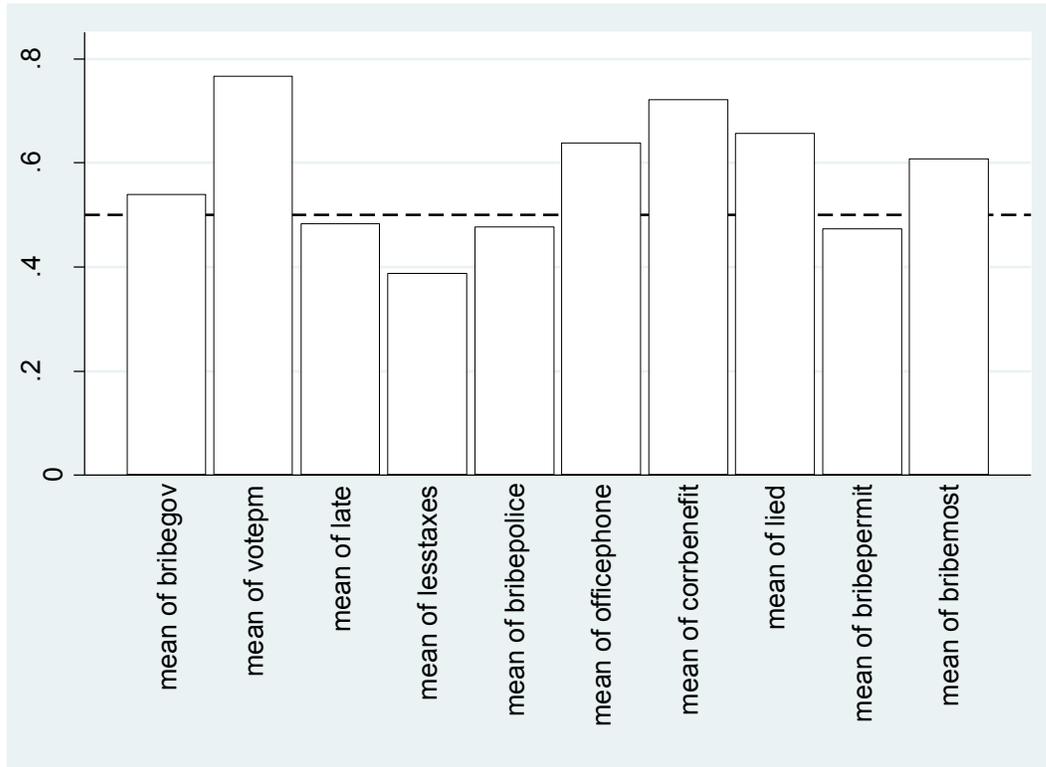
Let us include a term, p , for respondents that are unwilling to answer yes to the random response questions.

$$P[\text{Yes}] = (1-p)q + (1-p)(1-q)(0.5)$$

To use the examples from above, if 60% of respondents have paid a bribe, but 10% of the managers are unwilling to answer “yes” on our survey, 72% of respondents will answer yes. If there is no corruption and 10% are still reluctant to answer “yes”, we should observe 45% of respondents answering yes.

In Figure 1 we present data on the percentage of yes responses. For six of the questions, respondents answered higher than 0.5, providing no prima facie evidence of systematic false responses.

Figure 1: Frequency of “Yes” Responses



For four of the questions, responses are less than 0.5, including three politically sensitive questions on taxes, bribing police, and our main question on bribing to obtain business permits. For the question on tax evasion the mean response is 0.3811, indicating that at least 23% of firms are providing false responses to this questions. Turning the questions on bribing the police and paying bribes for permits, at least 6% of respondents are providing false responses. This is assuming zero tax evasion and bribery (a very bold assumption that contradicts other measures of corruption in Bangladesh). If we assume that at least 50% of firms paid some sort of bribe, as much as 35% of firms are providing false responses.

4. The Determinants of Non-Responses and Potential False Responses

In the previous section we showed that there is a significant underreporting of political sensitive acts, including corruption. Unfortunately, this underreporting makes it impossible for us to know the true extend of corruption in Bangladesh, or to directly evaluate the impact of corruption on business activities. But these systematic false responses to our RRT questions does allow us to evaluate the types of firms that provide potential false responses, and how these firms answer direct questions on corruption.

One quick evaluation we can make in our context is the determinants of nonresponse bias. As noted, firms often fail to answer direct questions on corruption, leading to potential nonresponse bias. To evaluate this bias we compare our corruption question using a RRT, and compare it to the direct questions about corruption (Question 1 in the Appendix). The first obvious point is that while 226 firms (16%) failed to answer the direct question about corruption, we had a 0% response rate using our coin-flip strategy. This is important as Jensen, Li, and Rahman (2010) show that even relatively low levels of nonresponse can lead to major biases in empirical analyses. This is especially problematic if there are systematic differences in either firm-level or country level attributes that lead to nonresponse. For example, Jensen, Li, and Rahman (2010) find that nonresponse rates lead to a dramatic underreporting of corruption in countries with less media freedom.

What types of firms are likely to provide nonresponses to direct questions on corruption? We find no systematic difference on perceptions of their future firm performance, whether the firm was located in an urban and rural area. While we did find

some differences across regions, this was mostly driven by a very low nonresponse rate of 3.8% in one of the smaller administrative regions (Barisal).

One strong relationship we find in the data is how the types of firms that failed to answer direct questions on corruption, and firm answers on the RRT questions on paying bribes. We find that a large number of firms that failed to answer the direct corruption question, when answering the RRT, indicated no incidence of bribery. Our data shows that firms that indicated bribes were used to obtain permits in the randomized response question had a 6% lower nonresponse rate (13%) than firms that indicated bribery wasn't used to obtain permits (19%) in the direct corruption questions.⁸ Or, put another way, the managers that answered the direct question on corruption had a much higher rate of answer "yes" on the using bribes to obtain permits (61.7%) relative to firms that failed to respond to the corruption question (50.1%).

This result could fly in the face of the idea that the firms failing to respond to corruption questions are more likely to engage in corruption. This descriptive data suggests that firms that fail to answer direct questions on corruption are *less* likely to have engaged in bribes. What explains this pattern? One possibility is that the firms that fail to answer direct questions on corruption are also likely to underreport corruption in the RRT. In short, firms providing nonresponses to some sets of politically sensitive questions could be the same firms providing false responses to other questions.

How do we evaluate potential false responses? One strategy commonly employed in surveys is to instruct enumerators to evaluate the perceived truthfulness of the respondent. In our survey of firms, enumerators were instructed to classify respondents as "very truthful", "somewhat truthful" or "somewhat untruthful" or "very untruthful" at

⁸ The exact difference is .0588 with a standard deviation of .0196.

the end of the interview. In our data of 1,417 respondents, 46 enumerators classified 1,071 respondents (75.51%) as “very truthful”, 341 (24.06%) “somewhat truthful” and 6 “somewhat untruthful” (0.42%). On the surface, these subjective evaluations provide us the ability to identify potentially untruthful respondents.

Unfortunately, this strategy is subjective to measurement error. In our data, we find that that the vast majority of cases of “somewhat truthful” or “somewhat untruthful” are concentrated in one region, Chittagong. While this region contains an important port city which could lead to higher levels of corruption, we find that across the region and across industries within Chittagong, firms are much more likely to be rated as less than very truthful. This stark regional pattern could lead researchers to infer that the region, or the type of firms in the region, are more prone to false response.

Our survey, like many firm level surveys, is organized by region. Thus teams of enumerators, supervised by a single individual, are assigned to survey firms within a single region. Chittagong’s team surveyed 264 firms, where each of the six enumerators individually surveyed between 33-52 firms. While the other five teams evaluated 75%-100% of firms as “very truthful” the Chittagong team only evaluated 17.80% as very truthful, and 81.06% as “somewhat truthful” and the remaining 1.14% as “somewhat untruthful.”

Given the lack of theoretical reasons to suspect such high levels of systematic lying in this one region we suspect that this subjective perception suffers from serious anchoring problems. The Chittagong team is likely to evaluate firms as “somewhat truthful” while the other teams are more likely to evaluate firms “very truthful.” Thus the

major variation within this data is likely driven by different interpretations of “truthfulness” or other biases that affect the subjective evaluation of truthfulness.

Given the difficulty in identifying false response with the subjective evaluations, how do we evaluate the level of false responses? Using a randomized response technique can also identify the questions that are most likely to elicit false responses and some indirect evidence on the exact firms providing false response. Imagine a situation where there is no corruption in Bangladesh (no bribes paid to the police or for business permits) and firms always pay the full amount of taxes owed. Our coin-flip strategy would assure that for these three questions, the mean answer for each of these questions should be 0.5 (half the respondents flip heads and answer yes, the other half answer truthful “no”). Thus, for an individual question on bribes, we should expect a mean of at least 50% “yes” responses.

By evaluating patterns of answers to politically sensitive questions allows us to examine the potential for false responses. We identify three politically sensitive questions (bribing police, paying bribes for permits, and paying less taxes than legally owed) that are most likely to elicit false responses from managers. Only for managers that flip tails three times in a row (predicted as 12.5% of respondents) should we observe answers of “no” for all three of questions. Again, this is making the very conservative assumption of no bribery and no tax evasion.

A total of 321 firms, or 22.65% of the sample, answered no to all three of these questions. Thus if there is no bribery and full tax payments, there is still at least 10% of the sample is providing false responses. Interestingly, the subjective evaluations of enumerators does a very poor job in identifying these firms, where enumerators evaluated

80.37% of firms in our sample of potential false responses as “very truthful” relatively to 74.09% “very truthful” in the rest of the sample. Consistent with our explanation earlier, enumerator’s subjective evaluations are more likely capturing differences in individual enumerator perceptions than real differences in false responses across firms.

While our strategy doesn’t allow us to definitively identify which firms are lying, we can compare the attributes of firms that are likely to having provided false responses (answering no to all three politically sensitive questions) to other firms in the sample. What do the firms providing potential false responses look like relative to other firms?

Comparing the 321 firms that answered no to all three politically sensitive questions to the rest of the sample, we find a few descriptive aspects of these firms different. Firms coded as providing potential false responses are more likely to be in the service sector. The capital region and largest city (Dhaka) has a higher incidence of potential false responses than the rest of the country (27.29% to 18.90%).

Our sample consists of almost all domestically owned, small firms and only 23 of 1,417 firms are government owned. Interestingly, 19 of 23 of these firms did not respond to the direct questions on corruption, and 13 of 23 answered “no” too all three of our politically sensitive coin flip questions. While this small sample size makes us skeptical that we can draw any definite conclusions, this pattern is at least suggestive that ownership structure could be on potential driver of nonresponse and false response bias.

Finally, the most dramatic difference we find is related to our earlier points on nonresponse bias. The firms we identify as giving potential false responses to the RRT questions are actually much more likely to provide nonresponses to direct questions on corruption than other firms in the sample (21.18% to 14.78%). This suggests that

nonresponse bias and false responses are generated by the same type of firms. Firms that fail to answer questions about corruption are also the most likely to exhibit patterns of answers consistent with false responses. Thus, while our randomized response technique helps provide anonymity for firms answering politically sensitive questions, there's still a subset of firms that most likely systematically underreport corruption.

We formally examine the determinants of nonresponse to the corruption question in Table 3. In Model 1 we present a probit regression on the determinants of nonresponse bias using our indicator for potential false responses as the dependent variable. If nonresponse is random, we should expect no significant relationship between our covariates and nonresponse rates. Our dependent variable is a dichotomous variable coded as 1 if the manager failed to answer the direct question on corruption. Our probit regression includes dummy variables for the different regions, and a dummy variable for manufacturing firms (*Manufacturing*).

The first three models examine the relationship between responses to questions on the three politically sensitive questions (*Bribe Permits*, *Bribe Police*, *Less Taxes*) and nonresponse to the direct question on corruption. For all three questions, firms that answered “yes” questions on bribery or tax evasion (coded as 1 in our data) were more likely to answer the direct question on corruption (coded as a 0 for the nonresponse variable). The final variable, (*False Response*), is a dummy variable for firms that answered no to the three politically sensitive questions.

Table 3: Determinants of Nonresponse

	Model 1	Model 2	Model 3	Model 4
Location: Dhaka	0.968*** (0.270)	1.004*** (0.269)	0.995*** (0.272)	0.975*** (0.270)
Location: Chittagong	0.687** (0.281)	0.701** (0.279)	0.679** (0.283)	0.682** (0.281)
Location: Rajshahi	0.912*** (0.279)	0.951*** (0.277)	0.952*** (0.280)	0.916*** (0.279)
Location: Khulna	0.582* (0.305)	0.586* (0.303)	0.583* (0.304)	0.551* (0.305)
Location: Sylhet	0.817*** (0.298)	0.841*** (0.298)	0.838*** (0.301)	0.808*** (0.299)
Location: Barisal	-0.141 (0.089)	-0.145 (0.088)	-0.141 (0.089)	-0.138 (0.088)
Manufacturing	0.172* (0.089)	0.173* (0.089)	0.169* (0.089)	0.167* (0.089)
Bribe for Permits	-0.196** (0.082)			
Bribe Police		-0.190** (0.082)		
Less Taxes			-0.186** (0.084)	
False Response				0.225** (0.098)
Constant	-1.724*** (0.267)	-1.752*** (0.266)	-1.763*** (0.265)	-1.861*** (0.265)
Observations	1,417	1,417	1,417	1,417
R-squared	0.03	0.03	0.03	0.03
Chi-squared	33.53	35.67	33.08	33.55

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Our empirical analysis confirms the descriptive patterns highlighted earlier. Firms that we identify as providing potential false responses RRT questions are more likely to fail to respond to the direct question on corruption. This impact is statistically significant and substantially large. Firms that we identify as providing potential false responses using by looking at the number of “no” answers to the randomized response questions are 11.51% more likely to fail to respond to direct questions on corruption.⁹ Given that 16.2% of managers failed to respond to direct questions on corruption, this is a sizeable impact.

What are the implications of this research for the understanding of corruption? One important question is how corruption is related to firm’s investment decisions. The relationship between firm investment and levels of corruption are inconclusive using data on the respondent evaluations of the changes in corruption over time and how corruption affects the firm’s business.

In Table 4 we present a series of probit regressions on the determinants of firm investment. Our dependent variable is an indicator coded as one if the firm has invested in fixed capital in the last three months and zero otherwise.¹⁰ First we include a vector of control variables for the manager, including a dummy variable if this is the managers first business (*First Business*), a count of the number of years the manger has experience in this line of business (*Manager Experience*). For robustness we also included variable on manager education and gender. We also include a number of control variables at the level of the firm, including dummy variables for the size of the business (*Medium* and *Large*

⁹ This predicted probability was calculated using Clarify. See Tomz et al 2003.

¹⁰ We have no reason to believe that firms would provide false responses to this question.

Table 4: Determinants of Firm Investment

	Model 5	Model 6	Model 7	Model 8
Firm Age	-0.009** (0.004)	-0.008** (0.003)	-0.008** (0.003)	-0.008** (0.003)
First Business	0.00165 (0.079)	0.01 (0.073)	0.0107 (0.073)	0.00897 (0.073)
Manager Experience	-0.00279 (0.005)	0.000783 (0.004)	0.000737 (0.004)	0.000471 (0.004)
Large Firm	0.280* (0.152)	0.274* (0.146)	0.283* (0.146)	0.293** (0.146)
Medium Sized Firm	0.256*** (0.081)	0.240*** (0.074)	0.245*** (0.074)	0.238*** (0.074)
Urban	0.213*** (0.083)	0.200*** (0.075)	0.203*** (0.075)	0.205*** (0.075)
Location: Dhaka	1.212*** (0.197)	1.254*** (0.188)	1.250*** (0.189)	1.231*** (0.189)
Location: Chittagong	0.988*** (0.204)	0.930*** (0.197)	0.933*** (0.195)	0.941*** (0.195)
Location: Rajshahi	0.891*** (0.210)	0.790*** (0.200)	0.790*** (0.199)	0.753*** (0.200)
Location: Khulna	0.652*** (0.233)	0.562** (0.223)	0.564** (0.223)	0.514** (0.224)
Location: Sylhet	1.140*** (0.229)	0.985*** (0.216)	0.981*** (0.216)	0.958*** (0.216)
Location: Barisal	-0.206** (0.087)	-0.256*** (0.079)	-0.259*** (0.078)	-0.251*** (0.079)
Corruption Change	0.0416 (0.054)			
Corruption Effect		-0.0155 (0.061)		
Nonresponse			0.0416 (0.097)	
False Response				0.227** (0.091)
Constant	-0.980*** (0.211)	-0.935*** (0.206)	-0.956*** (0.196)	-0.968*** (0.196)
Observations	1,155	1,378	1,378	1,378
R-squared	0.08	0.09	0.09	0.09
Chi-squared	132	167.1	167.2	173.2

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Firms), the age of the business (*Firm Age*), and dummy variables for firms located in urban areas (*Urban*), and region dummy variables.

In models 5 and 6 we include the standard measures of corruption, where *Corruption Change* is an ordinal variable from 0 to 2 variable for if the manger's perceives corruption having increased (2), stayed the same (1) or decreased (0) in the last quarter. *Corruption Effect* is a 0 to 2 ordinal variable on how corruption has affected the manger's firm, which includes categories of corruption having a positive effect on the firms (2), no effect (1) or a negative effect on the firm (0). In both models (and alternative specifications), reported corruption has no relationship with firm investment.

As noted, we have a sizeable nonresponse rate on corruption questions in our survey. In model 3 we include a dummy variable for *Nonresponse*. We find that firms that do not respond to the direct question on corruption are no more or no less likely to have invested in the third quarter. This simple descriptive statistic may suggest that nonresponse bias, has little impact on our understanding of firm investment decision.

Yet, as we note, a sizeable number of firms failing to respond to these questions are also the same set of firms that answered "no" to all three of our politically sensitive questions. Using our variable of *False Response* from our regressions in Table 3, we use this as an independent variable. Our findings suggest that firms that have a high likelihood of providing false responses to the corruption are firms that are *more* likely to have invested in the third quarter.

Simple descriptive statistics paint the same picture. Of the managers that were coded 0 on our *False Response* variable, 50.7% of their firms had invested in the previous quarter. This contrasts the firms that were coded as providing potential false responses. 58.06%

of these firms had invested in the previous. Not only is this 7.36% difference statistically significant at the 0.05 level, it is substantially large.

These results indicate a positive relationship between the level of firm investment and the firm's providing potentially false responses to corruption questions.

Unfortunately there are numerous interpretations of this result since our results do not speak to the causal relationship between corruption and investment. Firms that have invested in the past more may be more exposed to corruption (and thus be more prone to lie about corruption) or may simply be more sensitive to answering politically sensitive questions. Alternatively, the firms that have benefited the most from corruption may also be the firms that are most concerned with providing answers to corruption related questions.

While we can not definitely tell which of these theories explains this relationship, or results, at a minimum, lead to caution in the design of surveys measuring corruption and the interpretation on the relationship between corruption and investment. Firm level surveys are plagued by both nonresponse and false response bias that can have a dramatic impact on our empirical results and our substantive understanding of corruption.

6. Conclusion

Understanding how corruption affects the business environment has important academic and public policy implications. Unfortunately, much of what we know about corruption is either through subjective evaluations of country experts or through the use of firm-level surveys that are plagued by nonresponse and possibly nonresponse bias. Using a firm-level survey of the business environment in Bangladesh, we include a series

of traditional questions on corruption, along with a set of randomized response questions to evaluate these problems.

Our analysis suggests that there is a large underreporting of corruption in firm-level surveys. One mechanism driving these erroneous results is through the systematic pattern of nonresponse rates by firms. We also show evidence that firms providing nonresponses are also the types of firms exhibiting patterns of answers consistent with false responses.

Unfortunately, our paper shows that RRT clearly is not a panacea for solving problems for biased responses. Even with the anonymity provided with this technique, we observe systematic patterns that suggest at least 10% of the sample is providing false responses to survey questions. Yet this technique does allow researchers to ex post evaluate systematic problems with nonresponse and potential false responses in survey research. Perhaps most importantly, it allows us to examine the types of firms (or managers) that provide false responses to politically sensitive questions.

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Appendix

Question 1: Corruption Question

How has the level of corruption been when interacting with officials from public institutions been over the period July to September 2009, when compared to the previous period of April to June 2009:

a)	Much lower	-2
b)	Somewhat lower	-1
c)	About the same	0
d)	Somewhat higher	1
e)	Much higher	2
f)	Not applicable	-7

Question 2: Factors Affecting Business

To what extent did the following factors affect your business over the period October to December 2009?

(There is only one answer in each line. Please circle the appropriate answer. Scale: very negative = -2, moderately negative = -1, no impact = 0, moderately positive = 1, very positive = 2, and not applicable=-7)

	Reason	Scale					
		-2	-1	0	1	2	-7
A	Interest rate	-2	-1	0	1	2	-7
B	Exchange rate*	-2	-1	0	1	2	-7
C	Banking credit	-2	-1	0	1	2	-7
D	Inflation	-2	-1	0	1	2	-7
E	Tax rate	-2	-1	0	1	2	-7
F	Energy price (electricity, oil and gas)	-2	-1	0	1	2	-7
G	Transport cost	-2	-1	0	1	2	-7
H	Political Situation	-2	-1	0	1	2	-7
I	Policy uncertainty	-2	-1	0	1	2	-7
J	Corruption	-2	-1	0	1	2	-7
K	Extortion	-2	-1	0	1	2	-7
L	Energy supply (electricity, gas, etc.)	-2	-1	0	1	2	-7
M	Shortage of skilled labor	-2	-1	0	1	2	-7
N	Labor relation/unrest	-2	-1	0	1	2	-7
O	Wage rate	-2	-1	0	1	2	-7
P	Shortage of raw materials/inadequate input supply	-2	-1	0	1	2	-7
Q	Possible Repercussions of the Financial Crisis	-2	-1	0	1	2	-7

Question 3: Coin Flip Questions

[Instructions: Respondents are given a coin. If they flip heads, the respondent should answer “yes.” Otherwise the respondent should respond to the questions. The enumerator shouldn’t observe the toss.]

- a. Have you personally paid a bribe to a government official in the past twelve months?
- b. Did you vote for the Prime Minister’s party in the last national election?
- c. Have you ever been purposely late for work?
- d. Does your business pay less in business taxes than is required by current tax law?
- e. Have you personally paid a bribe to police officer in the last twelve months?
- f. Have you ever used the office phone for personal business?
- g. Do you believe that corruption benefits the ruling party in Bangladesh?
- h. Have you ever lied in your own self-interest?
- i. Did your business have to pay a bribe to get permits to start a business?
- j. Do most firms have to pay bribes to get permits to start a business?