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Does Respondent Reticence Affect the Results of Corruption Surveys?

Evidence from the World Bank Enterprise Survey for Nigeria

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Abstract

A potential concern with survey-based data on corruption is that respondents may not be fully candid in their responses to sensitive questions. If reticent respondents are less likely to admit to involvement in corrupt acts, and if the proportion of reticent respondents varies across groups of interest, comparisons of reported corruption across those groups can be misleading. This paper implements a variant on random response techniques that allows for identification of reticent respondents in the World Bank's Enterprise Survey for Nigeria fielded in 2008 and 2009. The authors find that 13.1 percent of respondents are highly likely to be reticent, and that these reticent respondents admit to sensitive acts at a significantly lower rate than possibly candid respondents when survey questions are worded in a way that implies personal wrongdoing on the part of the respondent.

This paper—a product of the Macroeconomics and Growth Team, Development Research Group—is part of a larger effort in the department to study the causes and consequences of good governance. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at akraay@worldbank.org.

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1. Introduction

Arbitron, the radio ratings company, recently switched from surveys to 'Portable People Meters', an electronic device that directly records the listening habits of their large sample of listeners.[1] The move from self-reports to electronic recording resulted in a 10.7% drop in the estimate of the market share of classical music. Men proved to be listening to soft-rock much more than they had previously reported. Evidently when self-image is involved, survey respondents are less than candid in their responses and candor differs across groups. This anecdote alone should sensitize researchers to the problems arising when surveying value-laden activities such as corruption. At the very least, if the proportion of candid respondents varies across groups, comparisons of responses to corruption questions across groups can be misleading. Cross-country comparisons will be similarly affected.

The purpose of the present paper is to examine the prevalence and consequences of such problems by using the responses from the World Bank sponsored Nigeria Enterprise Survey. This survey was fielded in two waves in 2008 and 2009, covering a total of 5422 firms. The survey posed questions on a wide range of aspects of business operations, such as financing, organization of production, economic performance, reactions to regulation, and obstacles to current operations. A significant number of questions focused on corruption, but these questions were by no means dominant in the survey. It seems unlikely that any respondent would have concluded that this was a corruption survey, *per se*.

The obvious difficulty in assessing respondent candor is that there is nothing analogous to the 'Portable People Meters' for corrupt activities. What is needed is a technology that identifies those who are not candid and that relies solely on survey responses. This has been a long-sought element of the methodology of surveyors. Recently, Azfar and Murrell (2009) (AM) proposed such a methodology, which in a

[1] "Never Listen to Céline? Radio Meter Begs to Differ" By Stephanie Clifford. *New York Times*, December 16th, 2009.

Romanian application clearly identified a set of respondents who are reticent in answering survey questions.[2] AM define a reticent respondent as one who gives knowingly false answers with a nonzero probability when honest answers to a specific set of survey questions could lead to the inference that the respondent might have committed a sensitive act. Because their methodology cannot identify all reticent respondents, AM are only able to split their sample into 'reticent' and 'possibly candid' groups, the latter a mixture of candid and reticent respondents.

The AM methodology uses random response questions, which were developed in other contexts as a tool for encouraging more candid responses to sensitive questions, but which have been less than fully successful. In a random response question, a sensitive question is posed—for example, 'have you ever given a bribe?' But the respondent is instructed to privately toss a coin before answering and always answer 'yes' if the coin came up heads, while answering the sensitive question truthfully if the coin came up tails. The conventional rationale for random response questions is that they should encourage respondent candor because nobody but the respondent knows in any specific instance whether the answer reflects the sensitive activity or the coin toss. However, given a fair coin and a large sample, and assuming that respondents are candid and follow the protocol of the random response question, it is trivial to estimate the population percentage committing the sensitive act as [2*(percentage answering 'yes' – 50)]%.

Note that if everybody is candid, 50% is a lower bound for those answering 'yes'. But many applications of random response, including most reported below, result in fewer than 50%, which means that there is an implausible number of answers implying that a tails was obtained in the coin-toss. The AM procedure leverages this observation by asking a series of random response questions.[3] If a single respondent answers 'no' repeatedly, then the respondent must be reticent with a very high probability. In an application to Romanian businesses, AM showed that respondents identified as reticent typically had different response patterns to sensitive questions posed elsewhere in the

[2] Azfar, Omar and Peter Murrell (2009): Identifying Reticent Respondents: Assessing the Quality of Survey Data on Corruption and Values, *Economic Development and Cultural Change*, University of Chicago Press, Vol. 57(2), 387-411.
[3] See section 2 for further details of the Nigerian implementation.

survey, typically admitting to sensitive acts at a lower rate than did the respondents not so identified, the possibly candid group.

In this paper we describe the results of implementing this same method for identifying reticent respondents in the Nigeria Enterprise Survey, and we document the extent to which reticence matters in this context. We identify 13.1 percent of respondents as reticent with a very high probability. These reticent respondents answer sensitive questions elsewhere in the questionnaire differently from possibly candid respondents. These differences are most pronounced when sensitive questions are asked in a very direct way referring to the respondent's own business. For sensitive questions that are worded in a way that implies personal wrongdoing on the part of the respondent, we find that reticent respondents admit to sensitive acts at a significantly lower rate than possibly candid respondents.

The rest of this paper proceeds as follows. In Section 2 we give a detailed description of the coin-toss procedure and document the prevalence of reticence based on estimates derived from this procedure. In Section 3, we examine how the characteristics of reticent respondents are different from those of other respondents. In Section 4 we document how these reticent respondents differ in their responses to other sensitive questions in the survey and show that reticent respondents are less likely to implicate themselves in sensitive acts. In Section 5, we examine whether reticence matters for regional rankings of corruption. Section 6 draws together the lessons from this paper.

2. Identifying Reticent Respondents Using the Coin-Toss Question

The coin-toss methodology presents survey participants with a series of ten sensitive questions, which are listed in Table 1. As indicated above, respondents privately toss a coin before answering each question and are instructed to answer 'yes' if the coin comes up heads. If the coin comes up tails, they are instructed to answer the sensitive question truthfully. The series of ten random response questions includes three that ask about less sensitive acts. In the process of identifying reticent respondents, answers to

these three less sensitive questions are dropped from the analysis and a respondent is classified as reticent if the answers to the remaining seven truly sensitive questions are all 'no'. The purpose of the three less sensitive questions is to give sophisticated respondents who understood the improbability of obtaining ten tails in a row the chance to answer 'yes' occasionally even if they are reticent. The seven more-sensitive questions used in the analysis are identified in bold in Table 1, but were not so highlighted in the questionnaire itself.

After administration of the full questionnaire, the interviewer answered a series of questions to determine whether, in the interviewer's judgment, the respondents had understood the randomized response instructions. Fourteen percent (781) of respondents were identified by the interviewers as not understanding the mechanics of the randomized response questions. The most common misunderstanding apparently was of the instruction to answer 'yes' if the coin came up heads regardless of whether the respondent had engaged in the sensitive activity. Respondents identified as not having understood the question had very high rates of answering 'no' to most or all questions. As we do not want to falsely categorize as reticent these respondents who apparently misunderstood the instructions, we discard them from the sample. This leaves us with a reduced sample of 4641 respondents, which we use for the rest of the analysis. [4]

Table 1 reports the percentage of respondents answering 'yes' to each of the ten random response questions. Note that if all respondents correctly followed the instructions, we should expect percentages of 50 or above for each question. However, we find that for all seven sensitive questions the shares of 'yes' answers are below 50 percent and even below 40 percent for a number of questions. This already suggests a considerable degree of reticence. For example, the 34.8% for 'have you ever unfairly dismissed an employee for personal reasons' implies that at least an estimated 15.2% of

[4] However, we do realize that we might have dropped a number of respondents who are actually reticent instead of just confused and that this might weaken the results. Therefore, we repeated the empirical exercises of the paper for a newly created group of reticent respondents that does not drop the seemingly refused respondents from the sample. The results are similar to those presented below. While we find significant differences between the groups in answers to two additional sensitive questions, we chose to err on the side of caution and continue to drop refused respondents from the sample.

respondents said no when they tossed a head and therefore should have said 'yes'.[5] Since those who tossed a head would be approximately half of the sample, this implies an estimate of at least 30.4% for reticent respondents. This estimate is a lower bound, since it is based on the assumption that nobody had unfairly dismissed an employee. If 20% of respondents had unfairly dismissed an employee, then the estimate is that 50.4% are reticent. In sum, the results in Table 1 give an estimated lower bound of 30.4% for the percentage of reticent respondents.

Although examination of responses to individual questions provides some insight into the overall proportion of reticent respondents in the sample, it reveals little about individual respondents. To identify which specific individuals are reticent, it is necessary to examine a respondent's answers on all seven sensitive questions. AM identify as reticent respondents who answer 'no' to all seven sensitive random response questions, an improbably high number. If the coin toss protocol is properly followed, answering 'no' is only an option if the coin comes up tails, and so has a probability of at most 50 percent (i.e. a 50 percent probability of the coin coming up tails, multiplied by the unknown probability that the respondent has in fact not done the sensitive behavior). Thus the probability of observing seven 'no' responses to the sensitive questions is at most 0.0078.

In our sample, 13.1 percent (610 out of 4641) of respondents answer 'no' to all seven sensitive questions. These respondents are thus very likely to be reticent. It is also likely that some respondents who answered yes only once or twice are also reticent. However, we do not include them in our reticent sample. This means in turn that the possibly candid subgroup will contain a number of reticent respondents.[6] This source of misclassification impacts our results in so far as it makes it more difficult to obtain significant results when comparing answers of both groups to sensitive questions that appear elsewhere on the questionnaire.

[5] Note that given the large sample size, standard errors for these estimates are very small and therefore sampling variation can be safely ignored.

[6] In an illustrative calculation, AM estimate that their procedure identifies only one-third of the respondents who are actually reticent. In that case, approximately 10% of their sample is correctly identified as reticent, 70% is correctly identified as candid, and 20% is reticent but misclassified as candid.

Following the logic described above, we consequently split our sample into two subgroups: the 610 (13.1 percent) respondents whom we classify as reticent with a high probability and the remaining 4031 (86.9 percent) respondents that are possibly candid. This rate of respondent reticence is slightly higher than the 10.5 percent rate found by AM in Romania.

3. Who Is Reticent?

Having identified reticent respondents, we next relate reticence to respondent and firm characteristics. In particular, we consider the following potential correlates of reticence: respondent's gender, age, and level of education as well as firm size, industry (retail, manufacturing, etc.) and geographical region (north versus south of the capital district of Abuja). We estimate a probit regression of reticence on a set of these respondent and firm characteristics and report marginal coefficients in Table 2. These coefficients show the effect of a change in dummy variable from 0 to 1.

Respondents that have an education at or above the secondary level are significantly more likely to be reticent while age or gender is not related to reticence. At the firm level, the retail sector has higher shares of reticent respondents but firm size does not make a difference in the share of reticent respondents.[7] There are significant region and survey wave effects. We find that respondents in Nigeria's southern states (south of Abuja) have a 0.05 higher probability of being reticent, an effect that is highly significant and large compared to the baseline probability of being reticent of 0.13.

Respondents in the second wave have a 0.1 higher probability of being reticent than those in the first wave, an effect that is highly significant. There are two possible reasons for this effect. First, one of the criteria used to choose states for the first wave was the state's readiness for reform based on its track record of governance. Thus it is possible that this result reflects the fact that jurisdictions with better governance have

[7] Small firms are those with fewer than 20 employees, and large firms are those with more than 100 employees.

lower levels of reticence. If this is so, reticence is likely to lead to a lessening of reported differences in sensitive activities between regions with better and worse governance.

Second, the questionnaires were slightly different in the two waves. In the second wave in contrast to the first, participants had already participated in a different random response exercise before they came to the coin toss question. It may be that respondents were therefore more suspicious when they participated in the coin-toss in the second wave than in the first. In that case, more reticence could result.

In Table 3 we investigate in more detail regional differences in reticence. We first report the number and proportion of reticent respondents by state. We distinguish between states covered in the first and second waves of the survey (top and bottom panels), and also between Northern and Southern states (the latter are in bold). For each state, we test whether the state-level reticence rate is significantly different from the national mean, and find significant differences in 20 out of 37 states. We also test whether state-level means differ significantly from their corresponding wave averages and find significant differences from wave means for 22 out of 37 states. These findings suggest considerable state-level heterogeneity in reticence.

We also carry out at the state level the procedure described in Section 2, which uses one of the reticence questions to estimate a lower bound for the proportion of reticent respondents. We use the same question as in Section 2: 'have you ever unfairly dismissed an employee for personal reasons'.[8] The estimates are listed in the last column of Table 3.[9] On average, they are more than twice the proportions found when we use all seven questions to identify reticent individuals. Not surprisingly the two sets of estimates are highly correlated (0.83). Given that these estimates are still lower bounds on the

[8] Since standard errors for state level estimates are much larger, it is important that the choice of question not reflect the particular results for each state, but rather to base that choice on country-level data.

[9] When the estimate of the lower bound is negative, a zero is placed in the last column of Table 3. This happens in two cases, for two states with lower levels of reticence estimated by the coin-toss method.

proportion reticent, it is notable that four states have estimates of more than 50% and more than half of the states have estimates of over 25%.

4. Do Reticent Respondents Answer Sensitive Questions Differently?

The main purpose of identifying reticent respondents is to determine in what way and by how much respondent reticence distorts responses to other questions in the survey. In Romania, AM found that reticent respondents typically report lower incidences of corruption and other sensitive acts compared to possibly candid respondents. Our analysis for Nigeria confirms this finding, but with one caveat: the extent that reticence matters appears to depend importantly on the wording of the sensitive questions. In particular, reticent respondents admit to sensitive acts at lower rates primarily when asked questions that are personal in nature or refer to the respondent's own business, when the answers to questions are most likely to imply personal misbehavior on the part of respondents themselves.[10]

We therefore structure the rest of this analysis according to how personally the sensitive questions in the Nigerian survey are worded. We organize a number of potentially sensitive questions from the survey into four groups, contained in Tables 4-7, and also examine some placebo questions in Table 8. In each table, we regress responses to the questions on the same set of control variables included in Table 2, and then a dummy taking the value one if the respondent is reticent, and zero otherwise, using OLS. For reasons of space we do not report the coefficients of the controls in the tables. Sensitive questions used in the analysis below have all been oriented the same way, so that a higher value of the dependent variable indicates admission to acts of a sensitive nature. To the extent that reticence effects are important, we should therefore expect

[10] One possible reason for the difference between the Romanian and Nigerian results might be that the Romanian survey was specifically focused on corruption whereas the Nigerian survey had only a small proportion of questions on corruption. Romanian respondents might have had heightened sensitivities because of the nature of the survey in general.

negative and significant coefficients on the reticent respondent dummy variable.[11] In particular, since the regressions are estimated by OLS, the slope coefficient on the reticent respondent dummy can be interpreted as the mean difference in responses between reticent respondents and all respondents, conditional on all of the other control variables. To assess effect size, these can be compared to unconditional mean responses, which we also report for each question.

We begin in Table 4 with questions that are most likely to be interpreted as focusing on personal misbehavior on the part of the respondent. These are the ones that specifically ask about the personal experiences of the respondent. Along these lines, there are a number of questions in the survey that ask respondents whether they were required to make an informal payment or give a gift when being visited by tax officials or when requesting public services (e.g. water or electrical connection). Reticent respondents are significantly less likely to state that they had been visited or inspected by a tax official and that during that inspection they had been asked to make an informal payment. For example, in the first regression of Table 4, looking at all 4641 respondents, 81.3 percent admitted to having been visited by tax officials. But the 610 reticent respondents admitted to this at a 12.2 percentage point lower rate (conditional on the other control variables), and this difference is highly significant. We find a similar but less strong pattern among those respondents who also answered the follow-up question of whether a bribe was expected—reticent respondents are also less likely to admit to this.

The first two regressions of Table 4 highlight an important aspect of reticence within surveys—respondents often have a choice of how to hide sensitive activities from surveyors. They can deny involvement in the sensitive acts themselves, or if the structure of the questionnaire permits, they can deny ever being in a situation where sensitive acts are possible. In the present case, if respondents answered 'no' to the dependent variable on line 1 of Table 4, they were not asked the question that forms the dependent variable on line 2 of Table 4. Therefore, the results on line 2 might be weaker simply because

[11] Numbers in the tables are marked in bold if the coefficient is negative and statistically significant. In contrast, we mark them in italics if they have a counterintuitive positive and statistically significant coefficient.

reticence is correlated with the regression's error term via sample selection. Where questionnaires have such a design, an appropriate accommodation is to run a regression for the full sample, treating those respondent firms that said they not been visited by a tax official exactly the same as those that said they had been visited but had not been expected to make an informal payment. The resultant reticence effect, captured in regression 3, is much more statistically significant and much larger than in line 2, especially in relation to its unconditional mean.

Regressions 4-21 of Table 4 follow the same methodology as those in lines 1-3, examining requests for public services and informal payments in the subsequent interactions. For requests of services (lines 4-9), five of six reticence coefficients are negative but only one is statistically significant. In the regressions examining informal payment interactions by those requesting public services (lines 10-15), four out of six coefficients are statistically significant.[12] All six are negative, implying that reticent respondents are less likely to state that they had been asked to pay a bribe. Lines 16-21 present regressions where the dependent variables treat respondent firms that had not requested a service the same as those who had requested the service but had not been expected to make an informal payment. In general, these have higher levels of statistical significance than the immediately preceding regressions, and effect sizes compared to unconditional means are larger.

In the twenty-one regressions discussed so far, twenty coefficients have signs indicating that reticent respondents are less willing to admit to sensitive acts.[13] Twelve coefficients are statistically significant. Of course, some of the lack of statistical precision reflects measurement error that is unavoidably high in survey data. The last two regressions in Table 4 combine data from the preceding regressions, with the hope that averaging reduces the effects of measurement error. The dependent variable in regression 22 is a scale from 0-7 indicating the number of interactions with either tax

[12] Sample sizes vary widely in this list of services given that the question only refers to those respondents that have actually requested the specific service. Not surprisingly, the level of statistical significance of the reticence effect is strongly related to sample size.

[13] Of course, these regressions are not all independent.

authorities or service providers. The dependent variable in regression 23 is a scale from 0-7 indicating the number of times a firm was asked to make an informal payment. The reticence effects are highly significant, both statistically and substantively. The coefficient estimate on the last line of the table implies that reticent respondents admit to sensitive acts at only 61% of the rate of the possibly candid group.

In Table 5, we turn to a series of questions that do not ask about personal experiences with corruption but rather about whether corruption presents an obstacle to the operations of the respondent's own business. This type of question does not necessarily inquire into personal misbehavior of the respondent but the fact that answers are based on personal opinions could make the respondent feel the questions are sensitive in nature. We find that reticent respondents are less likely to state that corruption presents an obstacle to their business, but the effect is not statistically significant.

In the survey question used for the second dependent variable in Table 5, respondents were presented with a list of twenty institutions and issues and were asked which of these presented the most, second most, and third most serious obstacle to the operations of their business. The dummy dependent variable takes the value 1 if the respondent stated that corruption is an obstacle, regardless of whether it is the most, second most, or third most serious. We find that reticent respondents are significantly more likely to name corruption as an obstacle than are other respondents, a result that is the opposite of those that have been reviewed up to now.

In Table 6 we take another step back from personally worded questions and analyze responses to questions that ask about sensitive acts by 'establishments like this one'. While not asking about the respondent's own business, this wording suggests that the answers could well apply to the operations of the respondent's business as well. Reticent respondents report virtually no difference in the percentage of sales that are paid to public officials. They do report lower levels of the percentage of the value of government contracts that are paid as bribes to officials, but the effect is non-significant.

Table 7 examines questions with the least degree of personal reference. These questions ask about behaviors of 'typical establishments in this line of business' or 'establishments in your sector of activity'. While the respondent's company could obviously be included in the term 'in this line of business', he could just as well argue that he does not represent what 'typically' happens in his sector and might therefore have a way of excluding himself from the group he answers about. Thus he might not feel his answers are personally incriminating. Regression results in this category of questions do not lend any support to the hypothesis that reticent respondents tend to deny sensitive acts more strongly than their possibly candid counterparts. In fact in the cases in which we obtain a statistically significant coefficient, we find a (counterintuitive) positive effect, which would imply that reticent respondents give answers that indicate more involvement in sensitive acts than do possibly candid respondents.

Finally, in Table 8 we confirm that reticence effects are *not* present when looking at responses to *nonsensitive* questions. For this confirmatory exercise we focused on the set of 35 yes/no questions in the survey that we had not previously identified as sensitive in Tables 4-7. We then randomly selected a subset of five of them as placebo questions (by choosing every 7^{th} question), and performed the same analysis as in Tables 4-7. With one exception we find no significant differences in the responses of reticent and possibly candid respondents to these questions. The one exception is the question on ISO certification where we find that reticent respondents are significantly more likely to claim their firms are ISO-certified.

The ISO-certification result could reflect reticence working in the opposite direction—respondents who are not fully candid might claim positive attributes that are in fact exaggerations. This is something that AM found in Romania, where reticent respondents claimed higher moral values when faced with a set of questions taken from the World Values Survey. For example, AM found that reticent respondents were much more likely to answer that 'Lying in your own interest' was unacceptable. We find a similar result for Nigeria. Respondents were asked to name the three most important skills for a successful entrepreneur and given twenty to choose between. One of these was 'demonstrate high moral standards', which reticent respondents named 33% more

often than possibly candid respondents, an effect significant at the 99% level when derived from a regression whose structure matches those in Tables 4-8.

5. Does Reticence Matter for Regional Rankings?

We have seen that the prevalence of reticence varies across regions, and that reticent and possibly candid respondents answer sensitive questions throughout the survey differently. The combination of these two effects may result in cross-regional comparisons of responses to sensitive questions that are misleading due to reticence effects. To investigate this we rank all 37 regions according to the prevalence of corruption, as captured in the dependent variable used in the last line of Table 4, the number of times a firm reported that it was expected or requested to make an informal payment.[14] We then compare the regional ranking based on the possibly candid subgroup to the regional ranking based on the answers of all respondents. Figure 1 compares the regional ranking for both groups. The upper panel ranks the unconditional responses and the lower panel ranks responses of both groups conditional on our set of respondent and firm-level control variables.

It is apparent that for a majority of the regions, the ranking changes once we eliminate reticent respondents from the sample. The regions that are marked on the 45 degree line and thus did not experience a change of rank are mostly the ones with a low proportion of reticent respondents. Overall the correlation between the rankings with and without reticent respondents is high, and the rank of most regions changes by four or less. However, there are also several extreme cases. Kogi for example is ranked 16th on the conditional responses for all respondents. However, after adjusting for reticence its rank changes to 26th in the sample of possibly candid respondents. This reflects the fact that Kogi stands out in Table 3 as having a very high proportion of reticent respondents (45 percent, as compared with the national average of 13.1 percent). Adjusting for reticence response bias results in a much higher rank in terms of prevalence of corruption. Other examples of large rank changes are the states of Imo, Ekiti, Gombe and Plateau.

[14] A rank of 37 is the region with the most reported corruption.

We conclude from this exercise that the presence of reticent respondents in the survey potentially matters for rankings of questions about sensitive behaviors. Regional comparisons may therefore be misleading without adjusting the sample for the share of reticent respondents.

6. Conclusion

We apply the Azfar and Murrell (2009) method of detecting reticent respondents to a large survey of businesses in Nigeria. Whereas AM's implementation in Romania was in the context of a survey wholly focused on corruption, the Nigerian survey was focused more broadly on business operations, in which corruption questions were a small part of the questionnaire. The results of the current paper therefore provide insights into the effectiveness of AM's method when applied in a more general context. While our results are broadly similar to those of AM, they also provide new insights into ways in which respondents identified as reticent answer survey questions differently from those classified as possibly candid.

We are able to identify 13.1% of respondents as reticent in Nigeria. Those so identified are only a subset of all reticent respondents, which we estimate to be more than 30% of the sample, probably considerably more. The most important individual-level correlate of reticence is education, with the more educated being more likely to be more reticent. Firms in the retail sector are more likely to be reticent. Regional variation is very important with some regions having very small amounts of reticence while in other regions identified reticent respondents are in a majority. We show that this matters for regional rankings of responses to sensitive questions.

When examining how reticent respondents respond differently from other respondents, we find that the reticent are less likely to admit having done sensitive acts, when it is clear that the survey questions specifically implicate the reticent respondents. Hence, the coin-toss question originally proposed by AM in Romania is an effective tool for identifying reticence. However, as the phrasing of the survey questions becomes more general, with inferences less likely to indict the respondent, the answers of the reticent and possibly candid populations become more similar. Indeed, for one set of

questions, where several layers of phrasing separate the respondent from the subject of the question, reticent respondents report that sensitive acts are committed more often than do other respondents. One interpretation of this result is that those respondents identified as reticent do have something to hide and therefore assess the prevalence of sensitive acts as being higher than do other respondents. Once these respondents feel protected from inference by the wording of the question, they give an unbiased (but higher) estimate of that prevalence.

AM did not find the variation of the size and significance of the reticence effect that we find for Nigeria, where the effect of reticence is much weaker for questions that refer less directly to the respondent. One possible reason for this difference is that AM's survey in Romania was directly focused on corruption and every respondent must have felt that answers to every question could provide inferences about the respondent's own conduct. The Nigerian survey was much more general and probably did not create this impression. Hence, surveys focused on corruption might in fact provide less accurate information on corruption than more general purpose surveys that have a few questions on corruption.

Our results suggest that there is a fundamental tradeoff in survey design. On the one hand, respondent reticence is more of a factor in responses to questions that are worded in more personal and specific ways, questions that most likely imply personal misbehavior of the respondent and those asking about direct personal experiences with sensitive acts. On the other hand, because such questions refer to direct personal experience, they should in principle provide better measures of firms' actual experiences. The results here suggest that there might be at least a partial way out of this tradeoff, which is to try to identify and correct for reticence biases using methods like those in this paper.

TABLES AND FIGURES

Table 1: Series of Randomized Response Questions

Interviewer: Hand the respondent a coin. Say "Please toss this coin before each question without letting me see the results. Always answer YES if the coin comes up HEADS. Answer the question TRUTHFULLY if the coin comes up TAILS (i.e. answer YES if you have done this behavior; Answer NO if you have never done this behavior)."

	Percentage answering YES (coin came up heads or respondent had done this behavior)
1. Have you ever paid less in personal taxes than you should have under the law?	49.5
2. Have you ever paid less in business taxes than you should have under the law?	42.0
3. Have you ever made a misstatement on a job application?	41.2
4. Have you ever used the office telephone for personal businesses?	49.9
5. Have you ever inappropriately promoted an employee for personal reasons?	39.2
6. Have you ever deliberately not given you supplier or clients what was due to them?	35.7
7. Have you ever lied in your own self-interest?	50.8
8. Have you ever inappropriately hired a staff member for personal reasons?	39.7
9. Have you ever been purposely late for work?	47.0
10. Have you ever unfairly dismissed an employee for personal reasons?	34.8
Proportion of respondents answering "NO" to all seven sensitive questions (in bold; %)	13.1

Table 2: Probit regression showing determinants of reticence

Dependent variable: reticent by coin toss	
Gender: male	-0.017 (-1.33)
Age: Under 30	-0.017 (-1.12)
Age: 31-45	-0.016 (-1.36)
Age: Over 55	-0.026 (-1.61)
Education: secondary	0.038*** (2.82)
Education: tertiary	0.024* (1.69)
Industry: manufacturing	0.020 (1.64)
Industry: retail	0.033** (2.28)
Firm size: medium	0.015 (1.17)
Firm size: large	-0.018 (-0.60)
Geographic: SOUTH	0.050*** (4.99)
Wave 2 dummy	0.101*** (9.76)
_cons	-1.721*** (-16.97)
N	4641
Pseudo R^2	0.037

t statistics in parentheses
* p<0.10, ** p<0.05. *** p<0.01

Table 3: Regional Differences in Reticence

	Region	N	N Identified as Reticent	Proportion Identified as Reticent	Regional mean different from national mean? z-statistic	Regional mean different from wave mean? z-statistic	Estimate of lower bound of proportion reticent
Wave 1	**Abia**	115	7	0.06	-2.24	-0.63	0.11
	Abuja	132	6	0.05	-2.92	-1.34	0.17
	Anambra	133	21	0.16	0.90	3.53	0.31
	Bauchi	123	1	0.01	-4.05	-2.85	0.04
	Cross River	175	21	0.12	-0.45	2.16	0.30
	Enugu	165	14	0.08	-1.77	0.40	0.42
	Kaduna	159	6	0.04	-3.50	-1.84	0.37
	Kano	221	4	0.02	-4.99	-3.27	0.15
	Lagos	297	31	0.10	-1.38	1.81	0.14
	Ogun	224	29	0.13	-0.09	2.98	0.53
	Sokoto	99	1	0.01	-3.57	-2.49	0.15
Wave 2	Adamawa	114	14	0.12	-0.27	-1.28	0.25
	Akwa Ibom	110	31	0.28	4.67	3.21	0.40
	Bayelsa	118	15	0.13	-0.14	-1.18	0.31
	Benue	110	10	0.09	-1.26	-2.15	0.13
	Borno	112	14	0.13	-0.20	-1.21	0.27
	Delta	75	3	0.04	-2.34	-2.96	0.15
	Ebonyi	115	15	0.13	-0.03	-1.07	0.29
	Edu	85	15	0.18	1.23	0.22	0.26
	Ekiti	108	65	0.60	14.47	12.08	0.74
	Gombe	118	15	0.13	-0.14	-1.18	0.31
	Imo	114	21	0.18	1.67	0.47	0.33
	Jigawa	112	14	0.13	-0.20	-1.21	0.34
	Katsina	111	7	0.06	-2.13	-2.95	0.00
	Kebbi	113	2	0.02	-3.58	-4.27	0.04
	Kogi	114	51	0.45	9.98	8.00	0.70
	Kwara	119	7	0.06	-2.34	-3.18	0.34
	Nasawara	112	58	0.52	12.10	9.92	0.66
	Niger	113	4	0.04	-3.02	-3.76	0.13
	Ondo	116	6	0.05	-2.54	-3.34	0.12
	Osun	108	7	0.06	-2.05	-2.86	0.11
	Oyo	147	23	0.16	0.90	-0.36	0.37
	Plateau	117	50	0.43	9.47	7.52	0.56
	Rivers	32	0	0.00	-2.20	-2.54	0.00
	Taraba	84	6	0.07	-1.63	-2.36	0.33
	Yobe	108	11	0.10	-0.91	-1.83	0.29
	Zamfara	114	5	0.04	-2.77	-3.54	0.12
	National mean	**4641**	**610**	**0.13**			
	Wave 1 mean	**1843**	**141**	**0.08**			
	Wave 2 mean	**2798**	**469**	**0.17**			

Table 4: Questions about Personal Experiences with Informal Payments

	Dependent Variable	Sample	N	N Reticent	Coefficient Reticence Dummy	t-statistic	Uncond. Mean
1	**Over the last 12 months, was <u>this establishment</u> visited by, inspected by, or required to meet with tax officials? (0 = no; 1 = yes)**	All firms	4640	610	**-0.122*** **	**(-6.85)**	0.813
2	**In any of these visits, inspections or meetings, was a gift or informal payment expected/requested? (0 = no; 1 = yes)**	Those visited by tax officials	3773	411	**-0.0403***	**(-1.67)**	0.278
3	**Firm was visited by tax officials and an informal payment expected. (0 = not visited or no payment expected; 1=informal payment expected)**	All firms	4641	610	**-0.071*** **	**(-3.71)**	0.226
	For each of the following, did <u>you</u> request the service in the last 2 years? (0 = no; 1 = yes)						
4	A mainline telephone connection	All firms	4641	610	**-0.048*** **	**(-2.76)**	0.183
5	An electrical connection	All firms	4641	610	0.008	(0.37)	0.401
6	A water connection	All firms	4640	610	-0.008	(-0.47)	0.145
7	A construction-related permit	All firms	4640	610	-0.022	(-1.64)	0.096
8	An import license	All firms	4639	610	-0.002	(-0.28)	0.032
9	An operating license	All firms	4640	610	-0.025	(-1.28)	0.249
	If <u>you</u> requested the following service in the last 2 years, was a gift or informal payment ever expected/requested? (0 = no; 1 = yes)						
10	A mainline telephone connection	Firms requesting service	846	78	**-0.113** **	**(-2.14)**	0.267
11	An electrical connection	Firms requesting service	1861	235	**-0.153*** **	**(-4.25)**	0.456
12	A water connection	Firms requesting service	673	85	-0.073	(-1.26)	0.322
13	A construction-related permit	Firms requesting service	447	43	**-0.176** **	**(-2.17)**	0.512
14	An import license	Firms requesting service	146	18	-0.070	(-0.47)	0.39
15	An operating license	Firms requesting service	1152	140	**-0.113** **	**(-2.46)**	0.425
	If <u>you</u> requested the following service in the last 2 years, was a gift or informal payment ever expected/requested? (0 = no; 1 = yes)						
16	A mainline telephone connection	All firms	4641	610	**-0.030*** **	**(-2.95)**	0.049
17	An electrical connection	All firms	4641	610	**-0.062*** **	**(-3.48)**	0.183
18	A water connection	All firms	4640	610	-0.014	(-1.49)	0.047
19	A construction-related permit	All firms	4640	610	**-0.023** **	**(-2.23)**	0.049
20	An import license	All firms	4639	610	-0.005	(-1.04)	0.012
21	An operating license	All firms	4640	610	**-0.038*** **	**(-2.65)**	0.106
22	**Number of times firm requested services or was visited by tax officials. Simple sum of variables above on lines 1 and 4-9. Scale with values from 0 to 7.**	All firms	4641	610	**-0.219*** **	**(-3.62)**	1.92
23	**Number of times firm was expected or requested to make an informal payment. Simple sum of variables above on lines 3 and 16-21 Scale with values from 0 to 7.**	All firms	4641	610	**-0.240*** **	**(-4.95)**	0.672

t statistics in parentheses; * p<0.10, ** p<0.05. *** p<0.01

Table 5: Questions about Subjective Perceptions about Corruption

	N	N Reticent	Coefficient Reticence Dummy	t-statistic	Uncond. Mean
Do you think that corruption presents any obstacle to the current operations of <u>your establishment</u>? (scale 0-4; 0: no obstacle; 4: very severe obstacle)	4641	610	-0.0965	(-1.62)	1.79
Indicate if corruption constitutes the most, second most, or third most serious obstacle [to the current operations of your establishment]. (Respondent provided with a list of 20 possibilities) (0=corruption not named; 1: respondent names corruption as on of top three obstacles)	4641	610	*0.0432***	*(2.73)*	0.139

t statistics in parentheses

* p<0.10, ** p<0.05. *** p<0.01

Table 6: Indirect Questions about Informal Payments referring to "establishments like this one"

	N	N Reticent	Coefficient Reticence Dummy	t-statistic	Uncond. Mean
We've heard that establishments are sometimes required to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. On average, what percentage of total annual sales do establishments like this one pay in informal payments/gifts to public officials for this purpose? (0= 0% of sales for bribes; 1= more than 0% of sales for bribes)	4641	610	0.001	(0.05)	0.566
When establishments like this one do business with the government, what percentage of the contract value would typically be paid in informal payments/gifts to secure the contract? (0= 0% of contracts for bribes; 1= more than 0% of contract for bribes)	4641	610	-0.024	(-1.08)	0.521

t statistics in parentheses

* p<0.10, ** p<0.05. *** p<0.01

Table 7: Indirect Questions about Informal Payments and other Sensitive Acts referring to "establishments in this line of business"

	N	N Reticent	Coefficient Reticence Dummy	t-statistic	Uncond. Mean
To what extent do you **agree or disagree** with the following statements?					
It is common for establishments in this line of business to have to pay informal payments/gifts to get things done with regard to customs, taxes, licenses, regulations, etc. (scale 1-4; 1= strongly disagree to 4= strongly agree)	4640	610	-0.052	(-1.20)	2.228
Establishments in this line of business know in advance about how much this informal payment/gift is to get things done. (scale 1-4; 1=strongly disagree to 4=strongly agree)	4638	610	0.007	(0.16)	2.113
What percentage of total annual sales would you estimate a typical establishment in your sector of activity reports for tax purposes? (0=more than median; 1= less than median)	4641	610	*0.053***	*(2.39)*	0.440
What percentage of total workforce would you estimate the typical establishment in your line of business declares for tax purposes? (0=more than median; 1= less than median)	4641	610	*0.124****	*(5.55)*	0.476

t statistics in parentheses

* p<0.10, ** p<0.05. *** p<0.01

Table 8: Non-Sensitive Questions

	N	N Reticent	Coefficient Reticence Dummy	t-statistic	Uncond. Mean
Does this establishment have an internationally-recognized quality certification (ISO 9000, 9002 1400, etc.)?	3853	526	0.0354***	(3.01)	0.0635
In 2008, did your establishment use its own transport to make shipments to customers?	2751	359	-0.0099	(-0.36)	0.414
In 2008, did labor regulations affect your decision about hiring or firing permanent employees in a significant way?	4641	610	0.0016	(0.28)	0.0153
In the past 24 months, has your workforce been affected in any way by high absenteeism among workers who need to care for family members or friends due to HIV/AIDS?	4639	610	-0.0105	(-1.60)	0.0198
In 2008, did this establishment apply for loans or lines of credit?	4639	610	-0.0076	(-0.48)	0.1468
(for all 5 questions: 0=no; 1=yes)					

t statistics in parentheses

* p<0.10, ** p<0.05. *** p<0.01

Figure 1: Regional Ranking for Aggregate Corruption Experiences
(Based upon the ranking of all 37 regions according to the prevalence of corruption, as captured by the dependent variable used in the last line of Table 4)