CORRUPTION IN DEVELOPING COUNTRIES

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ABSTRACT

Recent years have seen a remarkable expansion in economists' ability to measure corruption. This, in turn, has led to a new generation of well-identified, microeconomic studies. We review the evidence on corruption in developing countries in light of these recent advances, focusing on three questions: how much corruption is there, what are the efficiency consequences of corruption, and what determines the level of corruption. We find robust evidence that corruption responds to standard economic incentive theory, but also that effects of anti-corruption policies often attenuate as officials find alternate strategies to pursue rents.

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1. Introduction

The last decade has seen a very significant increase in the international policy community's interest in corruption. From 1998 to present 38 countries have ratified the OECD Anti-Bribery Convention. At the end of 2005 the UN convention against corruption, the most comprehensive corruption convention to date, entered into force. In 2007 The World Bank launched its Strengthening World Bank Group Engagement on Governance and Anticorruption (GAC) strategy. In recent years the US Department of Justice and Security and Exchange Commission have dramatically increased their enforcements under the Foreign Corrupt Practices Action. [1] Alongside, several international aid agencies including the Millennium Challenge Corporation have made aid disbursements to low-income countries conditional on a country's corruption record.

These initiatives reflect a growing academic and policy consensus that corruption is high in developing countries, and is costly. The growing policy activism that conditions international assistance on corruption outcome, in turn, reflects a belief that given the right incentives politicians, bureaucrats and civil society in these countries can reduce corruption.

In this article, we review three literatures relevant to evaluating these claims. We begin by examining the most basic question: how prevalent is corruption? Since virtually all corrupt activity is illegal, measurement is a challenge, but there have been substantial advances made on this question over the past decade. We then turn to the costs of corruption, to evaluate whether corruption actually is harmful . Finally, we examine why corruption exists, and how incentives and market forces influence the observed levels of corruption.

In writing this review, several themes emerged. First, while there has been a revolution in the measurement of corruption over the past few years, estimated levels of corruption are remarkably heterogeneous, so there remains little consensus about the magnitude of corruption. Second, for anti-corruption policies, we find fairly robust evidence for a few general economic principles: corrupt officials respond to monitoring and punishments as one would expect from basic incentive theory, and standard market forces influence the level of bribes. Third, the ability of

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[1] In 2005 alone, the average number of new DOJ prosecutions exceeded four-fold the average for the prior five years.

corrupt officials to substitute to alternate forms of corruption and to otherwise adapt to policy changes, either in the short run or the long run, suggests that applications of these principles can be tricky in practice.

In the end we were left with two very different senses. On the one hand, there has been a revolution in the measurement of corruption and this has, in turn, led to a blossoming of the academic literature on corruption. On the other hand, if we were asked by a politician seeking to make his or her country eligible for Millennium Challenge aid or the head of an anti-corruption agency what guidance the economic literature could give them about how to tackle the problem, we realized that, beyond a few core economic principles, we had more questions to pose than concrete answers. Throughout this review, we have therefore sought to identify not just what is known to date, but what we view as the key open questions in the area.

Our review, especially the discussion of how to measure corruption, is related to recent survey articles, prominent among which are Zitzewitz (forthcoming) and Banerjee et al (2009). We compliment these reviews by providing a summary of the different estimates of corruption magnitudes and discussing proving an assessment of how corrupt officials respond to incentives and market forces.

The remainder of this article proceeds as follows. Section 2 begins by reviewing the evidence to date on the magnitudes and efficiency costs of corruption. Section 3 examines the determinants of corruption. Section 4 concludes by examining how corruption adapts to anti-corruption policies.

2. Magnitudes and Efficiency Costs

Anecdotal and survey evidence suggests that corruption is rampant in the developing world and more prevalent in developing countries than in rich ones (for a summary of the survey evidence on this, see Svensson (2005). Yet, as we show in Section 2.1 there are remarkably few reliable estimates of the actual magnitude of corruption and those that exist reveal a high level of heterogeneity.

Just knowing the magnitude of corruption does not tell us how serious the problem is. After all, it is at least theoretically possible that corruption represents a transfer from one party (say, the government) to another party (say, bureaucrats), with little efficiency cost. In fact, if

bureaucrats' official salaries were less than their market wage in expectation of the corrupt rents they would obtain—and there is evidence that this is indeed exactly what happens—there could be no net costs of corruption at all. In practice, however, the evidence we review in Section 2.2 suggests that the efficiency costs of corruption can be quite severe, as corruption may raise the marginal tax rate of firms, decrease business activity, raise the marginal costs of public funds, make certain government projects economically unviable, and undo the government's ability to correct externalities, leading to inefficient outcomes.

2.1. Estimating the Magnitude of Corruption

2.1.1. Perceptions

Until very recently, most estimates of corruption were based on surveys of perception. These perception surveys have the advantage of good coverage—it is much easier to ask someone's perceptions of corruption than to actually measure corruption directly. As such, they still form the basis of most cross-country corruption indices, such as Transparency International's Annual Corruption Perception Index (CPI) and the World Bank's Control of Corruption Index.[2] Perception-based measures were also used in some of the first empirical work in economics on corruption, such as Mauro's (1995) cross-country study of the relationship between corruption and growth.

The challenge with perception-based measures is that they may not measure corruption accurately. To examine the reliability of villagers' perceptions of the level of corruption in a local road building project Olken (2009) obtained villager assessments of the likelihood of corruption in the road project. At the same time, he developed a much more detailed measure of the amount of corruption that was actually present in the road project by comparing the amount the village government spent on the road to the amount independent engineers estimated the road would actually cost to build (for details, see Section 2.1.4). While villagers' perceptions do reflect actual corruption in the road project, the magnitude is quite weak: increasing the actual missing expenditures in the road project by 10 percent increases the probability a villager reports any corruption in the road project by just 0.8 percent.

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[2] The latter incorporates a variety of different aspects of corruption, ranging from the frequency with which firms make "additional payments to get things done," to the effects of corruption on the business environment, to measuring "grand corruption" in the political arena.

Moreover, villagers' perceptions appear to be biased in two ways. First, villagers are much better at detecting marked up prices (i.e., overcharging for cement) than inflated quantities (i.e., billing for 1000 m3 of rocks but only delivering 800 m3)—and given this, it is not surprising that most of the corruption occurs by inflating quantities. This may account for the relatively low correlation between perceptions and actual corruption, since people must make an inference about the aspects of corruption they cannot perceive—which end up being where the bulk of corruption is usually hidden. Second, Olken shows that individual characteristics, such as one's education, have much more power in predicting perceived corruption than actual corruption itself. If a perception survey has different compositions of respondents evaluating different projects (or countries), this could create systematic biases in the use of perception.

One response is to use expert surveys. Banerjee and Pande (2009) estimate political corruption among candidates for political office by surveying journalists who covered that election and politicians who stood for election in neighboring jurisdictions. They then correlate the reported outcomes (such as whether the candidate faced criminal charges) with actual data on the same and find a high correlation. The constraint on such surveys, however, remains researchers' ability to identify the correct expert pool, and of course, in other settings it is possible that even experts' perceptions may be biased.

These types of biases could create problems in macro-level perception indices as well. For example, after the fall of Soeharto in 1998, many commentators perceived that corruption in Indonesia became worse. The commonly stated view was that any players at both the local and the national level started demanding bribes, and their failure to coordinate their bribe-taking behavior resulted in a higher total level of bribes. The worsening of perceptions of corruption was captured by the Transparency International Index—measured on a scale from 0 (highly corrupt) to 10 (highly clean)—which fell from a value of 2.0 in 1998 to 1.7 in 1999, and stayed at the same level in 2000. This may well have been the case, but another explanation is that the fall of Soeharto's dictatorship resulted in a much freer press which was newly able to report on allegations of corruption, which it did. It is therefore possible that perceptions of corruption rose even though actual corruption fell. For these types of reasons, economists have been moving to more direct measures of corruption whenever possible.

2.1.2. Survey Estimates of Bribes

Perhaps the most direct way of measuring bribery is through the use of surveys of bribe-payers. In most contexts, there is relatively little stigma associated with paying bribes, and so in many cases bribery can be measured using surveys of firms or households. One notable example of this is Svensson (2003), who surveyed firms in Uganda and examined how much they paid in bribes. On average, firms in the survey report bribe payments of about 88 USD per worker, or about 8 percent of their total costs.

Since this type of survey-based measure of bribes is the most easily replicable, it is one of the only areas where consistent measurement is now being carried out across countries and over time. One key dataset is the International Crime Victim Surveys (ICVS) from 49 countries, in which individuals are asked whether any government official in that country has asked them or expected them to pay a bribe for his services during the previous year. Using this data, Mocan (2008), for example, finds that income and education of the individual have positive impacts on the likelihood of being asked for a bribe in developing, but not developed, countries. For firms, the World Bank Enterprise Surveys (WBES)[3] have asked comparable questions about firms' informal gifts or payments in obtaining water, electricity, telephone connection, operating and import licenses, or obtaining construction-related contracts, meeting with tax officials, securing government contracts, and more generally "getting things done" for many low- and middle-income economies. As this type of data becomes more available we will be able to produce more reliable estimates of bribery over time and across countries.

2.1.3. Estimates from Direct Observation

The best way to measure corruption is often to observe it directly. Needless to say, this is difficult, since officials rarely will let corrupt behavior be observed. Nevertheless, there are several notable examples of direct observation of corrupt activity. One such example is the case of Montesinos in Peru, documented by McMillan and Zoido (2004). Montesinos, who was secret-police chief under President Alberto Fujimori in Peru, bribed judges, politicians and the news media to support the Fujimori regime. Remarkably, he kept detailed records, with signed contracts from those he bribed and videotapes of them accepting the bribes and these became

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[3] See https://www.enterprisesurveys.org for exact details on the number of countries and years available for each type of survey.

public after the fall of the Fujimori regime. McMillan and Zoido use them to estimate the cost of bribing various types of government officials. On average, politicians received bribes ranging from 3,000 - 50,000 USD per month, depending on whether the politician was in the opposition party (higher) or Fujimori's party (lower), with judges receiving bribes of the same order of magnitude. The bribes to control the media were orders of magnitude larger—as much as USD 1.5 million per month for one television station's support.

Olken and Barron (2009) provide direct data on actual bribes in a more prosaic setting: the bribes truck drivers pay to police on their routes to and from the Indonesian province of Aceh. Over a nine month period, enumerators accompanied truck drivers on their regular routes, dressed as truck drivers' assistants, and simply noted the amounts that truck drivers paid each time they were stopped at a police checkpoint or weigh station. On over 300 trips, they observed more than 6,000 illegal payments. Usually each payment was small—averaging USD0.50 to USD1, sometimes in cash and sometimes in kind (such as a pack or two of cigarettes). In total, the illegal payments represented 13 percent of the marginal cost of the trip. By comparison, the salary of the truck driver was only 10 percent of the marginal cost of the trip.[4]

Sequeira and Djankov (2010) use a similar methodology in Mozambique and South Africa, shadowing clearing agents who process customs for cargo as it passes through the ports. Specifically, they estimate the economic costs and distortions associated to corruption acts at two ports in Mozambique and South Africa by directly observing bribe payments to port and border post officials for a random sample of 1,300 shipments. They find that, on average, bribes represent 14 percent of the shipping costs for a standard container passing through the port of Maputo, Mozambique, and 4 percent of shipping costs for a standard container passing through Durban, South Africa.

2.1.4. Graft Estimation by Subtraction

The most common method for estimating graft (ie., the theft of government funds) is what we term estimation by subtraction. In this method, one obtains two measures of the same

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[4] The authors also compared directly observed bribes to reported bribes from a survey of comparable trips, and found that reported bribes were about double actually observed bribes. One potential explanation is that drivers have an incentive to over report bribes in general, since they are reimbursed by trucking firms on the basis of the average amount of bribes they need to pay.

quantity, one measure before corruption takes place and one measure after corruption takes place. The estimate of corruption is the difference between the two measures.

One of the first estimates using this technique is the pioneering study by Reinikka and Svennson (2004). Using what they term a Public Expenditure Tracking Survey (PETS), they compare the amount of a special education block grant sent down from the central government in Uganda with the amount of the block grant received by schools. They estimate a leakage rate of 87 percent. Once the results were publicized, a subsequent study found that the leakage rate fell to less than 20 percent. An important question in such an approach is the quality of recordkeeping: if schools have poor records, some of the money might not show up on the books even though it may have been received. Studying the importance of recordkeeping quality in PETS is an important issue for the replicability of this technique. Subsequent to this work, similar PETS studies have been carried out, largely by the World Bank, in a variety of contexts; for a brief review see Olken and Pande (2011).

Using a similar approach, Fisman and Wei (2004) measured tax evasion by comparing Hong Kong's reported exports and China's reported imports of the same products. They differentiate three different aspects of tax evasion: underreporting of unit value, underreporting of taxable quantities, and mislabeling of higher-taxed products as lower-taxed products. These calculations are then used to estimate the effect of tax rates in tax evasion. They found that higher-taxed products were associated with a forty percent higher median evasion rate.

Olken (2007) implements a related exercise in the case of rural road projects. He compares the official amount spent on the road to an independent engineering estimate of what the road actually cost to build, where engineers dug core samples of the roads to estimate materials quantities, did price surveys to estimate local prices, and interviewed villagers to estimate actual wages paid. Importantly, since some amount of materials naturally disappears during construction, Olken built several small "test roads" where he knew there was no corruption so that he could calibrate the metric so it would show zero corruption when, in fact, corruption was zero. Olken estimated that "missing expenditures"—the difference between what the village claimed the road cost and what the engineers estimated it actually cost—averaged about 24 percent of the total cost of the road.

An alternative approach is to compare administrative data to a generally administered household survey. Olken (2006) uses this approach to estimate theft of rice from a program that distributed subsidized rice in Indonesia. He estimates that, on average, at least 18 percent of the rice cannot be accounted for, with greater amounts in ethnically heterogeneous and sparsely populated areas. In a similar vein, Niehaus and Sukhtankar (2010) compare administrative and survey data to measure corruption as the gap between official and actual quantities—including over-reporting of days and under-payment of wages in the Indian National Rural Employment Guarantee Act.

When examining corruption through price manipulations, one can compare an official price to the market price and use the difference as a measure of price manipulation. Hsieh and Moretti (2006) do this for a very famous case: corruption under the Iraqi Oil-For-Food program administered by the United Nations. Specifically, they compare the price received by Iraq for its oil to the going price for comparable oil on the world spot market and use a model of the market for oil trading to infer what share of that under-pricing was likely received by Saddam Hussein's regime. While the total amount of corruption they estimate is enormous—approximately USD 1.3 billion—it amounts to only about 2 percent of the total volume of oil sold. Of course, not all price markups are corruption—they could simply reflect incompetence or a lack of incentives in obtaining good prices for the government (see, for instance, Bandiera et al (2009)).

2.1.5. Estimates from Market Inference

In some cases one can use the theory of market equilibrium, combined with data on market activity, to estimate the amount of corruption. In a pioneering study, Fisman (2001) applied this approach to estimate the value of political connections to Indonesian president Soeharto. Specifically, he obtained an estimate from a Jakarta consulting firm of how much each publicly traded firm was "connected" to Soeharto, on a scale of 0-4. He then estimated how much each firm's price moved when Soeharto fell ill to estimate the stock market assessment of the value of those political connections. If the efficient markets hypothesis holds, then the change in stock market value surrounding these events captures the value of the political connection to the firm. Since investment bankers in Jakarta estimated that the total market would fall by 20 percent if Soeharto died, he can calibrate these estimates to estimate the total "value" of the connections to

Soeharto. On net, for the most connected firms he estimates that about 23 percent of their value was due to Soeharto's connections.

The Fisman market approach is replicable in any case where one has data on firms' connections to prominent politicians and when the politician experiences health shocks. For example, Fisman et al (2006) has replicated the same approach for the United States, looking at the value of connections to former U.S. Vice President Dick Cheney, using shocks while he was a candidate and while he was in office. In a marked contrast with the Soeharto paper, he finds zero effect of Cheney's heart attacks on the value of Cheney-connected stocks.

Faccio (2006) pursues a similar approach using a large sample of countries—she examines political connections to 20,202 publicly traded firms in 47 countries. For each of these firms, she defines the firm as having a political connection if a board member or large shareholder is a politician (e.g., Member of Parliament or minister). She focuses on corporations where a previous board member and large shareholder becomes a politician. She finds that, on average, having a member of your board or large shareholder become a politician is associated with a 2.29 percent increase in the company's share value. Echoing the contrast between Soeharto in Indonesia and Cheney in the United States, when she splits the sample into countries with below and above average corruption levels (as measured by the World Bank perceptions index), she finds that the impact comes entirely from high corruption countries: in above median corruption countries, having a board member or large shareholder become a politician increases stock market value by 4.32 percent, but in below median corruption countries, having a board member or large shareholder become a politician has no impact on stock value.

Another approach to measuring corruption uses equilibrium conditions in the labor market. Specifically, one can use the fact that people in the public sector must, on the margin, be indifferent between their public sector job and alternative jobs in the private sector. If, controlling for their job opportunities, pay is lower in the public sector, the result could simply reflect a compensating wage differential. But if pay in the public sector is lower but consumption levels are the same, one could infer that the difference between pay and consumption in the public sector relative to the same difference in the private sector tells us something about how much those in the public sector are likely receiving in the form of bribes. Gorodnichenko and Peter (2007) perform this exercise using a household survey in Ukraine. They find that,

controlling for education, hours of work, job security, fringe benefits, job satisfaction, and secondary employment, public sector workers received 24-32 percent less income than their private sector counterparts. Crucially, however, they have the same level of consumption and assets, suggesting that a large part of the gap must be made up in bribes. Aggregating across the economy they estimate that the total amount of the gap (and hence bribery) is between USD 460 million – USD 580 million, or about 1 percent of GDP.

2.1.6. Other approaches

While we have discussed the main approaches used in the literature, this is not an exhaustive list. For instance, Ferraz and Finan (2008, 2010a) and Brollo et al (2010) use official audits of municipal governments in Brazil to identify instances of corruption. These audits were directly summarized and made available to the media. The summary provided a short description of each of the irregularities in the municipality. The challenge with audit data is that it represents a combination of both actual corruption and the inability to hide it from auditors, so this data needs to be used with care.

Asking whether, conditional on observables (which measure eligibility for public programs) public officials are more likely to benefit from publicly provided private transfers provides another measure of corruption. Besley et al (2011) show that controlling for asset-based eligibility, holding political office increases the likelihood that a villager in India has a Below the Poverty Line Card by 10%. A similar approach (and findings) are reported in Olken (2007) and Atanassova et al (2011).

Shirking by government employees can also be considered a form of corruption, with the idea that it employees stealing time from the government, rather than money. A number of recent papers estimate absenteeism of health workers and school teachers. We refer the interested readers to Chaudury et al (2006) and Banerjee et al (2009) for a comprehensive review.

2.1.7. So How Much Corruption Is There, Really?

Table 1 presents the magnitude of corruption estimated from all of the studies reviewed above, separated into estimates of graft (theft of government funds) and estimates of bribes.[5] The table shows the dramatic range. It also shows that, while a number of credible estimates have emerged, in some sense there is relatively little hard data when compared with other development indicators.

The magnitudes of corruption raise several important questions. First, a striking correlation that comes up in a variety of datasets—from the perception indices to the Faccio (2006) and Fisman (2001) studies of the value of political connections to the Sequeira and Djankov (2010) comparison between ports in South Africa and Mozambique—is the strong negative relationship between income and corruption: as best we can measure it, richer countries appear less corrupt. The causality potentially runs in both directions. It is easy to see how low corruption could cause countries to become rich if corruption hinders economic activity (Mauro 1995). However, the relationship in the other direction—that richer countries become less corrupt—is less obvious. On the one hand, certain types of income shocks, such as natural resource shocks, may lead to there being more rents to be expropriated and more corruption. For example, Caselli and Michaels (2009) present the case of oil revenues distributed to municipalities in Brazil, as a result of the large increase in Brazil's off-shore oil production in Brazil, and argue that this led to an increase in corruption.[6] There is, however, some evidence that these rents dissipate in the medium-run possibly because voters become more aware about total resources (Monteiro and Ferraz 2010). On the other hand, more complex business relationships may lead to demand for better government, and higher incomes may mean that countries have more resources to invest in cleaning up corruption (Triesman (2000)).

Second, even among countries at similar income levels, and even within countries, there is marked heterogeneity in corruption levels, as shown in Table 1. Once one starts examining why

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[5] We include estimates of the value of political connections in the graft category, under the idea that the value of those connections comes from the firm's ability to appropriate rents from the government due their connections, although one could easily categorize them separately instead.

[7] Although the level of this effect seems enormous, it is worth recalling that the bribe and tax rates are expressed as fractions of sales, not profits. Since profits are much smaller than sales, the implied bribe and tax rates on profits are much higher than those on sales, so the estimated impact of a 1 percentage point increase in a tax on profits would be substantially smaller than what they estimate.

corruption emerges it becomes clear that there is no reason to expect magnitudes of corruption to be similar across settings.

Third, virtually all of these "hard" estimates of corruption may suffer from selection bias in both directions. To the extent that measures of corruption depend on voluntary disclosure, such as surveys of bribery or disclosing links to politicians sitting on corporate boards, corruption may be understated, as places where corruption is most severe might be less likely to disclose it. To the extent that researchers purposively choose cases to study, corruption may be overstated, as researchers may hone in on situations where they expect to find corruption. Developing careful, rigorous metrics of corruption that are not subject to these types of selection bias is an important area for future research.

2.2. Does Corruption Matter?

Although the previous section has shown that corruption is substantial in magnitude—whether in the form of bribes given to civil servants or graft from public expenditures—this does not necessarily answer the question of whether corruption actually has a negative impact on economic activity.

For example, Gorodnichenko and Peter (2007) showed that, on average, public employees in Ukraine have the same consumption levels as their private sector counterparts, even though their salaries are 24-32 percent lower. Corruption does not seem to be providing extra income to these public employees, as what the government pays them is reduced exactly to offset the amount they receive in bribes. In this case the economic efficiency losses (or gains) from corruption depend on whether the deadweight loss imposed by the bribes they collect is greater than (or smaller than) the equivalent deadweight loss from taxation that would be needed to raise the revenue to pay the equivalent amount of money in salaries were corruption was eliminated. More generally, corruption could have either efficiency costs or lead to efficiency gains.

This section lays out the evidence thus far on the ways in which corruption may have aggregate efficiency costs: the costs imposed on firms, the costs imposed on government activity, and the costs imposed through the government's lack of ability to correct externalities. The endogenous nature of corruption makes finding credible instruments for corruption at the macro level difficult. We therefore restrict attention to micro evidence.

2.2.1. Impact on Firms

To estimate the efficiency cost of corruption on firm behavior, ideally one must know several things. First, how does corruption change the effective marginal tax rate faced by firms? To the extent that bribery is used to reduce tax liabilities (e.g., bribing tax officials to reduce tax payments), the marginal bribe rate should be below the official marginal tax rate, so corruption reduces effective tax rates. On the other hand, if bribes are charged for other types of government activities, this could increase the effective marginal tax rate faced by firms. Second, conditional on knowing the effective marginal tax rate after corruption, for a given effective marginal tax rate are taxes affected by corruption are more distortionary than de jure taxes?

Svensson's (2003) study of bribe-paying behavior in Uganda provides some clues that while there is a positive relationship between bribes and firm profits, it is very flat. Specifically, he estimates that that each USD 1.00 in firm profits per employee leads to about USD 0.004 in additional bribes paid, for a "marginal bribe rate" of 0.4 percent on profits. He also finds that each USD 1.00 in capital stock per employee leads to an additional USD 0.004 in additional bribes paid, representing an additional 0.4 percent "marginal bribe rate" on capital stock. Note that these are marginal rates: the average level of bribes is substantially higher, but bribes increase relatively weakly with profits and capital stock. If the only impact of corruption was to impose a tax of 0.4 percent on profits and 0.4 percent on capital, one might expect that a modest impact of corruption on firm activity. By way of comparison, the marginal tax rate on corporate profits for large corporations in the United States is 35 percent.

The Svensson study establishes effective corruption tax rates but does not tell us the impact of corruption on firms. There may be other ways in which corruption affects firm behavior beyond the marginal tax rate. For example, many have argued that the uncertainty surrounding corruption makes it more costly than an equivalently-sized tax. Wei (2000) makes this argument looking at foreign direct investment and measuring uncertainty through perceptions-based metrics. More recently, Malesky and Samphantharak (2008) use survey data to show that changes in governors in Cambodia are associated with increases in uncertainty about corruption, but reductions in actual corruption levels and decreased firm-level investment.

In section 2.1.3 we described Sequeira and Djankov (2010) who examined a different type of distortion: changes in the firm's production choices designed to avoid corruption. Their estimates

suggest that about 46 percent of South African firms located in regions in which overland costs to the port of Maputo are 57 percent lower go the long way around to Durban to avoid higher bribe payments. This represents a real efficiency loss: firms are willing to pay higher (real) trucking costs to avoid having to pay bribes in Mozambique.

Given that corruption could have both direct effects (through changing the effective marginal tax rate) as well as indirect effects (through uncertainty or other channels), it is necessary to directly examine the net impact of corruption on firm decisions. Fisman and Svensson (2007), using the same dataset as in Svensson (2003), calculate bribes and tax payments in Uganda as a function of total firm sales. They regress firm growth over a two-year period on the bribe and tax rate, instrumenting for the bribe and tax rate with industry-by-location averages. A 1 percentage point increase in bribes reduces annual firm growth by three percentage points. By comparison, a 1 percentage point increase in taxes reduces annual firm growth by 1 percentage point, so bribes have three times the negative impact of taxes on firm performance. They interpret the findings as showing that the negative impacts of bribes on firm activity are higher than the corresponding impacts of taxation—with substantially large magnitudes for both.[7]

2.2.2. Impact on Government Provision of Goods and Services

Corruption can have efficiency consequences through impacts on government provisions of goods and services. First, if it increases the cost of government goods and services, this could have an effect similar to raising the price of these goods and services. The efficiency loss would arise if projects that would be cost effective at the true costs are no longer cost effective once the costs of corruption are included, and hence are not done. Second, corruption could create additional efficiency costs through distortions. Corrupt officials usually cannot steal cash directly, as that would be easily detected; instead, they need to go through a variety of more convoluted procedures to extract rents. These convoluted procedures themselves may induce inefficiencies, which could potentially be larger than the direct cost of corruption itself. We explore both of these issues in turn.

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[7] Although the level of this effect seems enormous, it is worth recalling that the bribe and tax rates are expressed as fractions of sales, not profits. Since profits are much smaller than sales, the implied bribe and tax rates on profits are much higher than those on sales, so the estimated impact of a 1 percentage point increase in a tax on profits would be substantially smaller than what they estimate.

(i)   Price Effects

One way corruption may matter is if theft of government resources increases the cost of government activity, so that otherwise worthwhile government projects—such as redistribution schemes or public works projects—become non-cost effective. Olken (2006) examines this possibility in the context of a large Indonesian anti-poverty program that distributed subsidized rice to poor households. As described above, by comparing survey data to administrative data, Olken estimates that at least 18 percent of the rice was lost from the program. He also performs a welfare calculation of the benefits of the program, both as it was implemented and using a counterfactual with the same targeting of beneficiaries but without corruption. The estimates imply that the welfare losses from this "missing rice" may have been large enough to offset the potential welfare gains from the redistributive intent of the program, so that the program without corruption might have been cost effective but, in the presence of corruption, it likely was not.

In this particular case, the government implemented the program anyway, so in a sense the efficiency costs from lost redistribution were not realized. An open question, however, is whether governments endogenously adjust their composition of expenditures in response to the higher prices imposed by corruption. We regard this question—of whether governments indeed optimize taking the price effects of corruption into account—as important for future research.

(ii)   Distortions

Since corrupt officials need to hide their activity, they may introduce two types of distortions into the procurement of government activity. First, since corruption is secret, the government may not anticipate the amounts lost to corruption (in some ways, this is the countervailing force to the price effects discussed above). It may then effectively underfund some activities relative to its preferences, once the losses due to corruption are taken into account. Second, the need to keep corrupt activity secret could also introduce distortions, as procurement officials may substitute the types of goods that make hiding corruption easier. We discuss the evidence for both of these types of corruption in turn.

The first type of efficiency impact is the effective under-provision of government activities, since the government does not fully anticipate the impact of the losses due to corruption. As described above, Olken (2007) and Olken (2009) provide evidence for this type of efficiency loss in studies of perceptions vs. reality for rural roads in Indonesia. Since villagers are better able to

detect corruption where prices are marked up (where there would only be a price effect), village officials instead hide their corruption by deflating quantities, i.e., they claim to procure enough rock, sand, and gravel to make a road that is 20cm thick but instead build a road that is only 15cm thick. Since the roads they build are thinner than official engineering guidelines, they will not last nearly as long, and will need to be replaced sooner. Although Olken was not able to directly detect this quicker rate of decay in the timeframe of his study, engineers estimate that the impact of the thinner-than-design roads on road lifespan is substantial enough to cause significant efficiency losses.

Ferraz, Finan, and Moreira (2010) provide direct evidence of the efficiency costs. They show that students in Brazilian municipalities where corruption was detected in education have test scores that are 0.35 standard deviations lower than those without corruption, as well as higher dropout and failure rates. Moreover, higher corruption translates into lower quantities received: teachers in corrupt municipalities are 10.7 percentage points less likely to receive pedagogical training and less likely to have a computer or science lab. The study does not discuss the composition of school budgets, so it is hard to know if what the authors are picking up is price effects (there is less spending on schools because the government anticipates corruption) or distortions from corruption. One challenge in the study is that the level of corruption may be endogenous: while the authors control for other municipal characteristics, as well as corruption in other sectors and some indicators for school management practices, the level of corruption could be correlated with unobservable variables related to the quality of the school.

Another direct estimate of the efficiency costs due to distortion is the allocation of capital from state banks. Khwaja and Mian (2005) show that politically connected firms, defined as those with a politician on their boards, receive 45 percent larger loans from government banks in spite of having a 50 percent higher default rates on these loans. Privately owned banks, on the other hand, show no such political bias. According to estimates, and assuming the default rates are equivalent to transfers from taxpayers, the deadweight loss due to corrupt lending is between 0.15 percent and 0.30 percent of GDP. When the effect of inefficient investment of politically connected firms is considered, an additional 1.6 percent of GDP is estimated to be lost each year due to preferential lending.

2.2.3. Impact on Correcting Externalities

A third way in which corruption may lead to inefficiency is if it lessens the government's ability to correct an externality. For example, if someone can bribe a police officer or judge instead of paying an official fine, the marginal cost of breaking the law is reduced from the official fine to the amount of the bribe. Even worse, if the police officer extracts the same bribe regardless of whether the person has broken the law, the marginal cost of breaking the law falls to zero and the law ceases to have a disincentive effect altogether.

Olken and Barron (2009) examined this possibility in the context of trucks stopping at weigh stations in Aceh, Indonesia. Overweight trucks are a classic example of an externality: the benefits to a trucker from loading on additional weight are concave, whereas the damage the truck does to the road rises to the 4th power with the truck's weight. They found that almost all trucks were substantially over the weight limits—and 42 percent of trucks were more than 50 percent over the legal weight limit. The data suggest that corruption at weight stations is the likely culprit. Whereas according to the law all trucks more than 5 percent over the legal weight limit are supposed to be ticketed, immediately unload their excess cargo, and appear in court to face a fine, in fact virtually none received an official ticket. Instead, almost all paid a bribe. While more overweight trucks did pay higher bribes, this relationship was very flat, and even those trucks that were not overweight had to pay a bribe. Corruption thus dramatically reduced the marginal cost of driving overweight, leading to more overweight trucks.

Bertrand et al (2007) examined a similar question in the context of drivers' licenses in India. They randomly allocated applicants for driving licenses into three groups. The first group received a bonus if they obtained a driver's license quickly, the second group received free driving lessons and the third group served as the comparison group. The findings confirm an efficiency loss: many people who were completely unable to drive were able to obtain licenses by paying a fee to an agent–and, in fact, the fee charged by the agent was unrelated to one's ability to drive. This efficiency loss effect was greater among the group that received the bonus for quickly obtaining a driving license since they faced a higher incentive to bypass the official procedures. On the other hand, those who were randomly allocated to the driver's license training class and who were better drivers were able to obtain their license with lower payments on average, mostly because they avoided using agents and instead used the official channel.

The Bertrand et al (2007) and the Olken and Barron (2009) studies have very similar findings: in both cases, those who are doing the activity the government wishes to discourage (getting a license if you can't drive or having a truck that is overweight) do pay a higher cost that those who obey the laws. However, the marginal cost of breaking the law is much lower with corruption than it would be without corruption, so the net impact of corruption is to decrease the marginal cost of breaking the law and, thus, to decrease the effectiveness of the law.

These studies raise an important question: given that corruption exists, how should the government structure the official laws so that the net of corruption marginal cost faced by citizens matches the government's true objective function? Understanding how corruption maps de jure marginal costs imposed by laws into de facto marginal bribe payments (and hence the de facto marginal costs faced by individuals) is an important next step in thinking about how to more effectively write laws in the presence of corruption.

2.2.4. Impact on Individuals

A final question is how corruption affects individuals directly. Hunt (2007) shows the negative distributional impact of corruption not by arguing that poor people expend a higher proportion of their income on bribes, but by stating that corruption can be an additional cost on the victims of misfortune—particularly crime victims. The study relies on an individual survey in Peru to show that misfortune increases victims' demand for public services, raising bribery indirectly. However, the study also shows that in many situations crime victims bribe more than other users who are not victims.

2.2.5. Some Concluding Thoughts on Efficiency

One common theme that has emerged is that we know little about how governments respond endogenously to the presence of corruption. For example, if there are higher or lower rates of corruption in certain types of government spending, does it re-optimize spending as theory would predict, and does this re-optimization mitigate the efficiency costs of corruption? Or given that government rules to correct externalities are partially (but not completely) undone by corruption, does the government set official fines higher than they really want, knowing the official fines will not be implemented exactly?

An issue on the flip side of this is the degree to which governments create regulations to maximize opportunities for corruption. A classic example of this is red tape. We refer the interested reader to Banerjee et al (2011) who develop a theoretical framework for understanding how red tape itself may be endogenously created as a way to maximize the corrupt rents captured by bureaucrats, as suggested by Banerjee (1997) and review the existing empirical literature. It is clear that understanding whether the red tape itself is an endogenous response is another form of inefficiency that merits further study.

Similar issues apply to the costs of corruption for firms. While the Fisman and Svensson (2007) study suggested that bribes were more costly for firms than equivalent amounts of taxes, the tax rate could also be endogenous to the level of corruption. Gordon and Li (2009), for example, suggest that the tax code of developing countries is endogenously shaped by the presence of tax evasion, as governments reallocate tax systems towards those areas that are less prone to corruption. However, whether marginal tax rates on firms are higher or lower in corrupt countries and therefore whether the net distortions taxes imply for firms is higher or lower in corrupt countries, is an open question for future research.

3. What Determines Corruption

This section examines what we know about why corruption exists, and related to this, what can be done with it.

To organize ideas, we provide a simple framework that models the perspective of an individual bureaucrat, following the ideas of Becker and Stigler (1974). This framework treats the gains from corruption (the bribe) as fixed and asks when honesty will be preferable to honesty. We then examine what happens when the optimal bribe is determined by the bureaucrat taking into account market forces, following the ideas of Shleifer and Vishny (1993). The subsequent sections discuss the empirical evidence along the dimensions suggested by the simple theoretical framework.

3.1. The Incentives Bureaucrats Face

Suppose that the bureaucrat receives a wage w from the government and, if fired, can receive an outside option v. The bureaucrat can decide to be corrupt or honest. If corrupt, he is detected with probability p, is fired, and receives outside option v. If he is undetected, he receives his

wage w plus the bribe b, less a dishonesty cost d. In equilibrium, he will be corrupt if and only if

$$w - v < \frac{1-p}{p}(b - d).$$

This framework suggests several avenues for reducing corruption. One could increase the returns to staying on the job (w), or, equivalently in this context, one could decrease the outside option (v) by increasing punishments. One could also increase the probability of detection (p).

One implication is that if there is heterogeneity in d among potential bureaucrats, there can be selection where those who are most likely to be corrupt (those who have the lowest dishonesty costs d) will self-select to be more likely to become bureaucrats. Suppose that d in the population is distributed uniformly from 0 to $\bar{d}$. If $w - v > \frac{1-p}{p}(b)$, then nobody will be corrupt, regardless of their level d, and there is no reason that the distribution of d among bureaucrats will be different than the distribution of d in the population.

If, however, the above inequality does not hold, then people with low d will have a higher utility from becoming bureaucrats than those with high d, since they will be relatively more efficient at corruption, so depending on how the government allocates jobs we might expect to have more low d people among bureaucrats than in the population. This implies that corruption may be harder to combat since a corrupt system may attract bureaucrats who are more prone to corruption. It also implies that the effect of a given anti-corruption policy (i.e., a vector (w,p)) will depend on past levels of anti-corruption policies, since those past policies will influence the selection of bureaucrats.

The simple framework thus far has treated the amount of the bribe, b as exogenous. In practice, however, the bribe may be set by the bureaucrat to maximize his profits. Specifically, conditional on deciding to be corrupt, the bureaucrat will set his bribes to maximize his profits, which are the number of bribes he receives multiplied by the price, i.e. $q_i b_i$.[8] The key insight of Shleifer and Vishny (1993) is that the optimal solution depends on what other bureaucrats are doing and how they set prices. If a person needs permits from two different bureaucrats to complete a transaction, and both set prices independently, then each bureaucrat solves $\max_{b_i} Q(b_i + b_{-i})b_i$, taking the other bureaucrat's bribe

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[8] To simplify the analysis, we will assume that conditional on being caught, the probability of being caught does not depend on the amount of the bribes or the quantity of bribes, though one could easily generalize the model to include these effects.

b_{-i} as given. In such a case, the total amount of the bribes ($b_1 + b_2$) will be higher than if there had only been a single bureaucrat, and the total quantity will be lower. Conversely, if a consumer needs a single permit which can be obtained from either bureaucrat, they will compete against each other and reduce the bribe beyond what a single, monopolistic bureaucrat would charge. The key insight is that the bribes themselves may be a function of the structure of the bureaucracy, and that changing the nature of the organization may have important implications for the level of corruption.

This framework, while stylized, highlights the important role that both the incentive structure faced by individual bureaucrats (be it compensation, monitoring, selection, or other incentives) as well as the bureaucratic organization may play in influencing the amount of corrupt behavior. This section discusses the evidence to date on each of these factors in turn.

3.1.1. The Bureaucrat's Decision Problem: the Role of Compensation, Selection, and Other Incentives

(i)   Compensation

Despite the attention often given to civil service wages, there is relatively little evidence on their impact. Several cross-country studies find that higher public wages are associated with lower corruption, though these studies are essentially cross-sectional in nature. For instance, in a cross-section of 31 low-income countries, Van Rijkenghem and Weder (2001) find that a doubling of government relative to manufacturing wages is associated with only 0.5 point reduction in ICRG corruption index measured on a scale from 0 to 6. Meanwhile, Rauch and Evans (2000) find that the level of bureaucratic wages are significant in explaining only one of the five measures of bureaucratic performance, namely that a 1 standard deviation increase in salary is associated with an improvement of 0.5 standard deviation in the bureaucratic delay index measured on a range from 1 to 4.

With regard to more micro evidence, Di Tella and Schargrodsky (2004) test the efficiency wage idea by looking at a corruption crackdown in Buenos Aires hospitals' procurement departments. They examine the impact of increasing the probability of detection and examine heterogeneous impacts on the prices paid for basic inputs based on the level of wages. Prices paid by hospitals for basic, homogeneous inputs decrease by 15 percent during the first 9 months

of the crackdown, and following period prices increase, but remain 10 percent lower than those prevailing before the crackdown. During the first phase of the crack-down, when audit intensity can be expected to be maximal, higher wages have no effect on inducing lower input prices. Meanwhile, higher wages do have a negative effect in the last phase of the crackdown, when audit intensity can be expected to take intermediate values -the wage elasticity of input prices exceeds 0.2.

Niehaus and Sukhtankar (2010) examine the idea that the rents from keeping one's job can deter corruption today in order to preserve tomorrow's opportunities. The rents they examine come from corruption, not wages. They can identify the effect of future rents on the level of corruption today because the program features two types of projects; some projects pay fixed daily wages, while others pay piece rates. They examine how corruption in the two types of projects varies with anticipated rent-extraction opportunities using an exogenous increase in the wage rate for daily wage projects. Their results show an 80 percent reduction in the daily theft on piece rate projects in the period post-wage increase. Hence, when the opportunities for theft from daily wage projects increase, theft on piece rate projects goes down. In addition, they find reduced over-reporting of days worked on daily wage projects in areas where the proportion of future daily wage projects is higher.

(ii)   Monitoring and Punishments

One would expect from the above framework that increasing monitoring would reduce corruption. In practice, however, the very individuals tasked with monitoring and enforcing punishments may themselves be corruptible, so increasing monitoring may simply increase transfers from low-level officials to auditors. Moreover, just because people are audited does not necessarily mean that auditors will find enough evidence to actually impose a punishment, even if corruption was taking place. Understanding the degree to which additional monitoring can reduce corrupt behavior is thus an important area for empirical research.

Olken (2007), in the study of roads in Indonesia, examines this question by conducting a randomized experiment on auditing. Before villages began building road projects, some villages were randomly selected for a high audit intensity group, where they faced an audit by the government agency with 100 percent probability, as opposed to a 4 percent probability in the control group. Olken found substantial effects of the government audits, reducing corruption by

8 percentage points or about 30 percent from the baseline level. Interestingly, the audits revealed substitution among alternative forms of corruption: although audits reduced missing expenditures, they increased nepotism (i.e., the hiring of family members of the project leader or village officials to work on the project). One reason that the audits did not reduce corruption to zero was that, even though audits found problems in 90 percent of the villages they audited, the findings were typically administrative failures, such as improper receipts or a failure to receive the required number of competitive bids, rather than the direct evidence of corruption that would be needed for a criminal prosecution. Put another way, just because the probability of an audit was 100 percent does not imply that the probability of punishment, conditional on the presence of corruption, was 100 percent. Nevertheless, on balance, the results demonstrate that the traditional economic approach to fighting crime—increasing the expected cost of crime by increasing the probability of being caught—can play an important role in reducing corruption, even in a highly corrupt environment where those doing the monitoring are themselves potentially corruptible.

Another approach to providing monitoring—that does not involve a central auditor—is grassroots monitoring, where regular citizens are empowered to monitor their officials to prevent corruption. Olken's study also examined this by randomly allocating villages to receive more intensive community monitoring. This was done through two interventions, with different purposes. The first intervention involved inviting hundreds of villagers to attend local accountability meetings, to reduce elite control over which community members were involved in the monitoring. The second intervention involved distributing hundreds of anonymous comment forms throughout the village, in order to allow community members to voice concerns or complaints without fear of retaliation.

The invitations intervention reduced theft of materials, but only for theft of wages (i.e., convincing villagers to work for free but billing the project for their work). One reason may be that if theft of wages was detected, the benefits would go to the small number of people who worked on the project and should have been paid; they, therefore, have a strong personal incentive to make prevent this type of corruption. By contrast, the benefits from detecting theft of materials would accrue to the village as a whole in the form of a better road, so the free rider problem may be more severe. With regard to anonymous comment forms, they were successful

only when they were distributed via school children, not via the neighborhood government, as the neighborhood leaders channeled the forms towards preferred people who were more likely to support the elite in the project. One important take-away is that for community participation to work, it is important to get the details right in terms of protecting people from retaliation, limiting the free rider problem, and preventing elite capture.

Increasing community participation can influence governance through multiple channels. The first, which is emphasized by Olken, is improvements in monitoring. A second possible channel is improved information – leaders may learn more about villagers' preferences and villagers, in turn, may learn more about outcomes. The second channel may be particularly important when the outcomes being measured relate to service delivery not corruption.[9]

Ferraz and Finan (2008) examine the role of electoral sanctions. Randomized timing of municipality audits allows them to examine whether the impact of audit timing on the probability that the mayor is re-elected. Conditioning on the number of corruption violations found by the auditors, those audited before the election were less likely to be reelected than those who were audited after the election. The finding suggests an important complementarity between audits—which provide information about corruption—and electoral accountability.

Finally, electoral rules can also create mechanisms and incentives to increase political accountability. In a follow-up paper, Ferraz and Finan (2010,a) compare corruption practices for mayors audited at the same time but who differ in whether they are serving in a first term (eligible for re-election) or a second term (non-eligible for re-election). Using the share of total federal resources transferred to municipalities that are associated with fraud in the public procurement of goods and services, diversion of funds, and over-invoicing of goods and services as a measure of corruption, they find that the share of stolen resources is, on average, 27 percent

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[9] Bjorkman and Svensson (2010) examine a community monitoring intervention in Uganda, in which local NGOs encouraged communities to be more involved in the state of health service provision. The intervention included meetings to discuss baseline information on the status of health service delivery relative to other providers and the government standard and encouraged community members to develop a plan identifying key problems and steps the providers should take to improve health service provision. The intervention increased the quality and quantity of primary health care provision; however, the design of the intervention suggests that the mechanisms could have included either or both better information flows and monitoring.

lower among mayors with re-election incentives than among mayors without re-election incentives. Although this result suggests a two-term period is more effective than a one-term period as an anti-corruption policy, it does not mean politicians should be re-elected indefinitely. Term limits could also produce benefits if politicians in the absence of the pressure of being re-elected have better incentives to implement socially optimal policies with a long-term horizon.

(iii)   Selection

Although the simple framework above suggested that the selection of who chooses to become a bureaucrat is potentially important, there is relatively little evidence on this point. Ferraz and Finan (2010, b) find that higher salaries attract better political candidates in Brazil, though the effects are relatively modest—a 20 percent increase in wages only leads to a 0.2 increase in the average years of schooling and a 0.05 increase in the number of terms of experience. Higher wages also improve the performance of a politician while in office. A 20 percent increase in wages leads to an increase of 25 percent in the number of bills submitted, however. They do not, however, examine impacts on corruption per se. Evidence on selection of politicians and the impact on corruption forms an important area for future work.

Selection based on propensity to be corrupt may lead to multiple equilibria in corruption. In particular, in a corrupt equilibrium the people who have the highest propensity to take advantage of corruption will disproportionately choose to become civil servants, which could make fighting corruption in the future more difficult—i.e. the same policies that effectively control corruption in a low-corruption country might not be enough to eliminate corruption in a high-corruption country, and in fact the same set of incentives might be consistent with both high and low corruption equilibria. Testing whether there are multiple equilibria in corruption—for reasons of selection or for other reasons—is an important area for future work.

(iv)   Incentives

The framework outlined above was implicitly a model in which the only way the principal can observe what the bureaucrat is doing is through monitoring. For many government activities, however, there are direct indicators of agent behavior. This opens the possibility of tying incentives more closely to performance either through direct financial awards or more complex incentive schemes through promotions, assignments and the like. However, performance indicators can be imperfect measures of the civil servants' corrupt behavior: we want citations

issued only for those drivers who actually break the law, and not issued for those who do not; we want taxes collected when they are due but we do not want overzealous tax collectors collecting from those who do not owe. Hence, in designing such incentive schemes it is critical to deal with the so-called "multitasking" problem (Holmstrom and Milgrom, 1991) and ensure that the true goals of the principal are achieved, not just the ones that are incentivized.

Evidence that directly links performance pay or other incentive schemes with corruption outcomes is largely lacking. Much of what we know comes from studies in the health and education sector where incentives are conditioned on either worker absenteeism or directly on health or education outcomes. The evidence on the effectiveness of incentive schemes that condition on worker absenteeism is mixed – in situations where mechanisms to monitor performance are relatively tamper-free, performance-based pay can reduce absenteeism and in the case of school teachers improve test scores (Duflo et al (2010)). However, if service providers can collude with their monitors and/or tamper monitoring tools then such mechanisms may be undone in the medium run (Banerjee et al (2008)).

Similarly, evidence on the effect of performance pay for teachers is mixed. Muralidharan and Sundaraman (2009) conduct a randomized evaluation of a teacher incentive program in government-run rural primary schools in India. Teachers in treatment schools were eligible to receive a bonus payment based on the improvement of the students' average test scores. Some schools were assigned to a group incentive treatment, in which teachers were paid a group bonus based on improvements in the school-level average test score, while other schools were assigned to an individual incentive treatment in which the teacher was paid an individual bonus based on improvement in the average test scores of his/her students. They find significant improvements in student test scores. However, while group and individual incentive schools performed equally well in the first year of the program, average test scores were 0.10 standard deviations higher in schools where teachers were given individual incentives relative to schools with group incentives by the end of second year of program. In contrast, a study by Glewwe et al (2010) in Kenya showed that performance pay for teachers led to an improvement in outcomes only along the measures that are used to compute the formula that determines pay.

Outside education and health, there is little evidence on how incentives change the performance of bureaucrats. Kahn et al (2001) use tax reform instituted by the Brazilian

government in 1989 to study the effect of performance-based wages for tax collectors, in an economy with widespread tax evasions. The reform offered a bonus to tax officials based on group and individual performance in finding and collecting taxes from tax evaders. They find that the growth rate of fine collection exhibits a break in 1989, and estimate that fine collections per inspection are 75 percent higher on average than what they would have been in the absence of the program, with substantial heterogeneity across regions. The authors do their best to provide evidence that the surge in tax collections post-1989 was due to the performance incentives provided by the tax reform, but since they do not have a control group, the evidence is suggestive but not conclusive.

Taken together, the tentative conclusion of this evidence is that there is room for incentives to succeed, but that caution must be taken to design the incentives well and prevent them from being undermined. It is striking that very few studies directly examine the impact of improved incentives on corruption outcomes.

3.1.2. The Market for Bribes: Changing the Structure of the Bureaucracy to Harness the Forces of Competition.

The previous section focused on how a principal—i.e., the government—can best monitor its agents—civil servants. In other settings, however, strategic interactions between corrupt agents themselves become important and depending on how the market is structured, these kinds of strategic interactions can either raise or lower the bribe amounts.

If a person needs to bribe multiple corrupt officials to perform a given task, Shleifer and Vishny (1993) argue that that the "double-marginalization" problem can arise. Specifically, if each agent does not fully internalize the effect of their bribes on other agents' bribe revenues, the total amount of bribes one would need to pay could be higher than if agents had acted independently.

Olken and Barron (2009) use data on the bribes truck drivers pay to empirically test the idea that market forces partially determine the level of corruption and specifically to test for this type of double-marginalization. They exploited the fact that, during the period studied, the number of checkpoints along one of the roads was reduced in accordance with a peace agreement signed earlier in the year. They used this change in market structure to estimate the elasticity of the

average bribe paid with respect to the expected number of checkpoints. They show that the average price paid at checkpoints increases when the number of checkpoints declines, consistent with the double-marginalization idea. These findings highlight the need to consider strategic interactions between corrupt agents themselves, in addition to interactions between principals and agents, in designing effective anti-corruption policy.

An implication of this view is that a policy reform that moves from having a large number of independent agents to a single agent may reduce corruption and increase economic efficiency. Bruhn (2008) uses the sequential implementation of a reform that simplified business entry regulations across municipalities in Mexico to estimate the economic effects of such reforms more convincingly than in cross-country data. Although the paper does not look at the effects of the reform on corruption directly, the results show that simplified regulation improved efficiency. She finds that the reform increased the number of registered businesses by 5 percent, which was accounted for by former wage earners opening businesses. Wage employment also increased by 2.2 percent as a result of the reform, while competition from new entrants decreased the income of incumbent businesses by 3 percent.

The flip side of strategic interactions between bureaucrats is that if bureaucrats are competing against one another, this could reduce the bribes paid and lead to lower bribes and more output.

One recent study that examines this is Burgess et al (2011), which explores this issue in the context of deforestation in Indonesia. In particular, the study explores a setting in which local district forestry officials can allow logging beyond the legal logging quota in exchange for bribes. The study shows that as the number of political jurisdictions increases, so that there are more bureaucracies with the potential to facilitate illegal logging in a province, logging rates increase and prices for wood fall, consistent with a model of Cournot competition between bureaucrats.

Despite the potential for competition between bureaucrats to reduce bribes, other than the Burgess et al (2011) study we know of no other evidence that examines how competition between bureaucrats works in practice. In the Burgess et al study, competition occurs only through the product market—each district chooses how much wood to extract and market forces—a common demand curve—determine how much they receive in rents. In many other

settings, however, individual agents would be able to choose which bureaucrat to work with to obtain a service, and the bureaucrats might compete on price. This type of Bertrand competition could result in even larger impacts of competition than type of Cournot-style competition studied by Burgess et al (2011). We regard further studies examining competition between agents as a first-order question for future work.

It is important to note that competition leading to lower bribes is not necessarily socially optimal. In particular, it depends on what the government is trying to accomplish and whether the bribes are on top of, or instead of, official government fees. For example, in the case of deforestation studied by Burgess et al (2011), bribes were to allow more logging than the government had deemed optimal (for example, for reasons of watershed protection or biodiversity protection). Competition meant lower bribes and greater quantities, which in this context meant more illegal logging, and hence greater social losses, than had there been less competition. On the other hand, in the case of the road checkpoints studied by Olken and Barron (2009), traveling the road should have been free, so lower bribes would have meant greater road travel and greater efficiency. Understanding the welfare implications of these types of strategic interactions depends therefore on whether higher or lower bribes would increase or decrease social efficiency, and we do not yet know of an empirical example demonstrating how competition between bureaucrats could lead to greater social efficiency.

3.2. Transparency

One of the key themes of the international anti-corruption movement is the role of transparency—so much so that the largest worldwide anti-corruption NGO is called "Transparency International." But does transparency matter?

The basic idea about transparency is that by enabling information about government actions, citizens can better monitor government officials and enforce greater electoral accountability. However, the effect of making information about politicians publicly available is a priori unclear. While disclosure of information can increase political accountability it can also undermine politicians' privacy and, thus potentially worsen the pool of entrants.

Several pieces of evidence suggest a relationship between providing access to information about politicians' performance and both the political accountability and the quality of

government. In a cross-sectional, cross-country study, Djankov et al (2010) study the relationship between disclosure rules for information about parliament members and a numbers of measures of quality of government and corruption. Their main conclusion is that public disclosure, but not internal disclosure to parliament, is associated with lower perceived corruption and better government. They further find that information about politicians' assets, liabilities, income sources, and potential conflicts, as opposed to simply income and wealth levels, are more consistently associated with better government. Since the study is cross-sectional in nature, they cannot rule out reverse causality (i.e., higher quality governments adopt better transparency laws).

In a more micro example, Banerjee et al (2011) study how public disclosures about politicians' performance and qualifications can influence electoral accountability in settings characterized by weak institutions and a less educated population by conducting a randomized experiment in Delhi, India. Using the Indian Right to Information Act and candidates' affidavits, they created report cards for ten assembly jurisdictions during the run-up to the 2008 election in Delhi. They then randomly provided slum dwellers with pamphlets and free newspapers containing information on candidate qualifications and legislator performance. The information increased voter turnout by 3.5 percentages points and reduced the incidence of vote buying by 19 percentage points. The information campaign seems to increase the quality of government: the vote share of the best performing incumbent increased by 7 percentage points in the treatment group relative to the controls.

A related example, which we discussed in the monitoring section (Section 2.1.6) is Ferraz and Finan's (2008) study in Brazil on how public dissemination of corruption scandals in local governments had a negative effect on incumbents' electoral performance. Importantly, they found more pronounced impacts in areas where local radio stations were present to broadcast the results of the audit reports. The probability of reelection for an incumbent who committed two corruption violations in municipalities with pre-election audit was 7 percentage points lower than one who had zero violations and 11 percentage points lower if radio stations were present in the municipality. One interpretation for the larger effect in municipalities where local radios were present to divulge the information is that radios are more efficient in transmitting information about local politics to smaller municipalities.

A second way that transparency may matter—and the way that many suggest it does—is by providing citizens with information on what they are entitled to. Reinikka and Svensson (2005) study how an information campaign to monitor local officials can reduce corruption and increase educational outputs. They exploit a newspaper campaign in Uganda aimed at reducing capture of public funds by providing students' parents with information to monitor local officials' use of an educational grant. Their empirical strategy used distance to the nearest newspaper outlet as an instrument of school exposure to information, and find that an increase in information resulted in an increase in spending reaching the schools and ultimately an increase in school enrollment and student learning. An important caveat is that distance to newspaper outlets may be non-randomly assigned, and may also have other, direct impacts on educational performance.

A third way in which transparency could matter is by allowing citizens to signal interest in a particular outcome. Peisakhin and Pinto (2010) examine this by conducting a randomized experiment to test whether freedom-of-information laws can improve access to basic public goods that are otherwise attainable only through bribery. The experiment randomly assigned individual applicants in India to one of three mechanisms used when requesting public benefits and then tested the effect of these mechanisms on the time that elapsed before the applicant received the benefit. In the first treatment group, applicants submitted an information request under the Right to Information Act shortly after their applications. The second group of applicants presented a letter of support from a local NGO with their application. Finally, the third group of applicants paid a bribe to a local to obtain the benefits. According to the results 94 percent of those who pay bribes or sent an information request received benefits over the course of one year, as opposed to 21 percent in the NGO and control groups. Individuals in the group that paid bribes received benefits in a median of 82 days, 38 days less than those in the groups that filed an information request. The groups that neither paid a bribe nor requested information only obtained benefits after 343 days. The results suggest that requesting information under the freedom of information law is a reasonable, though imperfect, substitute for bribing an official. In a follow-up study, Peisakhin (2011) estimates the effect of the freedom-of-information law in the process of voter registration and here they find that the information law is an effective, free and legal substitute to bribery for middle class applicants.

3.3. Technology and Communications

Technological innovations can help make available tools that are hard for humans to tamper with and to enhance communication. For many (though not all) corrupt activities, the corrupt agent needs to somehow evade the rules or procedures that the official government bureaucracy has set up. Technology can help address this problem by ensuring mechanically that certain procedures are followed (Duflo et al (2010)).

Technology can also have a substantial impact on corruption by facilitating communication, which can enable better monitoring. Yang (2008) explores how hiring foreign inspectors to verify the tariff classification and the value of shipments before they leave their origin country impacts import duty collections. The key mechanism to reduce customs fraud is the transmission of information from the foreign firm at the origin port to the client government. The flow of information could not only improve the monitoring ability but also reduce the bargaining power of corrupt customs officials, which can reduce bribes payments and custom clearance time. The results from the study provide evidence in favor of this hypothesis showing pre-shipment imports inspection programs increased import duty collection by 15 to 30 percentage points in the first five years after implementation.

Related to this, in many countries technology has played an important role in the design and administration of the tax system. One key idea of tax enforcement is double-reporting, where the tax department compares two independent reports about tax performance and investigates discrepancies. In the developed world, Kleven et al (2010) analyzes a randomized tax enforcement experiment in Denmark and find that that the tax evasion rate is very small (0.3 percent) for income subject to double-reporting and much higher (37 percent) for self-reported income. Relatedly, in Chile, Pomeranz (2010) finds that audits have a much larger impact on the part of the VAT chain where there is not double-reporting, suggesting that for the rest of the VAT chain double reporting played an important role in encouraging truth telling. Technology plays a key role here: in a manual system actually doing the matching from all the double-reported information would be very challenging, but once the system is automated it is much easier. Given the large number of countries in the process of modernizing and computerizing their tax infrastructure, it should be possible to study the impacts of this type of technology in the context of poorer countries where tax evasion is usually higher.

A final area where technology holds promise is in procurement. Throughout the world, including in the developing world, governments have been moving to online procurement systems. Online procurement systems can potentially reduce corruption by increasing access to information (undermining bidding rings) and by making the procurement system more transparent. Lewis-Faupel et al (2011) examine the impact of electronic procurement for road projects in India, taking advantage of a staggered rollout across Indian states. They find that electronic procurement leads to higher quality of roads, as measured by independent central government audits, though not to lower costs. The evidence suggests that the quality improvement comes from higher quality contractors being more likely to win contracts.

4. Some Caveats: Adaptation in the Short and Medium Run

Much of the evidence discussed above shows the short-run effects of anti-corruption policies and programs. But there is ample evidence to believe that the long-run impacts could be quite different. For example, it could take corrupt officials time to learn how to manipulate a new system, so the long-run effects of an anti-corruption policy could be smaller than the short-run effects. Alternatively, it could take time for a new group of civil servants to select into the system, so an anti-corruption policy could be more effective over time if it encourages more low-corruption types to select into the civil service. Or, officials might simply substitute from one form of corruption to another.

In the short-run, we have seen several examples of substitution from one type of corruption to another. In the Olken (2007) study, an increase in auditing of road expenditures led to decreased missing expenditures from the project, but more family members of project officials being hired to build the roads. In Niehaus and Sukhtantar (2010), conversely, an increase the wages of daily wage jobs (and hence in the ability to steal from those workers) led to a reduction in theft of piece-rate jobs. Burgess et al (2011) find that when a district's oil and gas revenue increases, providing an alternate source of rent extraction for local district officials, illegal logging falls. In all these cases, it appears that corrupt officials have different avenues of corruption available to them, and substitute among them as the returns to one form of corruption get easier or harder. If an anti-corruption policy clamps down differentially on certain types of corruption (as almost all do), one needs to take care that corrupt officials do not substitute to other forms of corruption with more severe efficiency costs.

There are also several examples that suggest that the long-run effect of anti-corruption policies may be smaller than the short-run effect as officials adapt. One of the examples mentioned above is Banerjee et al (2008). In this study, an incentive program on nurse attendance in India was found effective only during the first 6 months of the intervention, when the program was correctly in place. Later, however, the system was undermined by the local health administration, who took advantage of a loophole in the program design and began allowing many more unexcused absences. By 18 months after the program had started, the program was no longer able to improve nurse attendance.

In the case of Brazil, Ramalho (2007) uses the 1992 impeachment of President Fernando Collor to evaluate the impact and persistence of corruption on the market value of politically connected companies. The results suggest that the market perceived the decrease in the president's probability of staying in power as affecting the value of politically connected companies, but only temporarily. According to the results, family-connected companies had on average daily abnormal returns 2 to 9 percentage points lower during bad event days, with the effect reversing completely within one year. One interpretation is that over the course of the year, these previously politically connected firms were able to form new connections.

In Colombia, Camacho and Conover (2009) study the manipulation of the poverty index score as an eligibility requirement to gain access to social programs. In particular, people were eligible for the program if their poverty index was below a given threshold. In the first year of the program, there was no discontinuity in poverty index scores at the threshold, but over the subsequent years, as the formula became better known, more and more manipulation began to take place, resulting in a larger number of people with scores just below the eligibility threshold. The results suggest that in total three million people had their score changed, which accounts for about 40 percent of the beneficiaries.

A final example comes from Burgess et al (2011). As noted above, when a district's oil and gas revenue increases, providing an alternate source of rent extraction for local district officials, illegal logging falls. However, within 3 years, the effect reverses and illegal logging returns to almost its previous level. Burgess et al provide suggestive evidence that the mechanism is a change in the political equilibrium—the higher oil and gas rents change the nature of the governing coalition towards a type of coalition associated with higher rent extraction. This new

political coalition presumably extracts rents not just from oil and gas but also from the forest sector.

While these examples have highlighted cases where adaptation took place over time, it is also possible that in some situations the long-term impacts of anti-corruption policies exceed the short-run effects. One area where this is likely is the case of transparency reforms– a higher likelihood of information disclosures may both incentivize politicians to perform better and improve the incentives for high talent individuals to enter politics.

Taken together, the existing and ongoing research on corruption in developing countries suggests a large and promising research agenda. Researchers have identified several innovative ways of measuring corruption and economic theory offers us significant guidance on how to design anti-corruption policies. At the same time, the ability of individuals to outguess those who seek to regulate them suggests an important need to collect data on both the short- and long-run impacts of many different anti-corruption policies in many different contexts.

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Table 1: Magnitudes of Corruption

Paper	Country	Context	Strategy for Assessing Corruption	Corruption estimate	Corruption Estimate (in percent)
Estimates of bribery					
Svensson (2003)	Uganda	Bribes firms pay	Survey evidence	Firms pay bribes of US$88 per worker	8% of costs
Olken and Barron (2009)	Indonesia	Bribes truck drivers pay to police on their routes	*Direct observation:* Enumerators accompanied truck drivers on their regular routes, dressed as truck drivers' assistants and observed illegal payments	Truck drivers pay bribes averaging US$0.50 to US$1 per payment	13% of cost of a trip
McMillan and Zoido (2004)	Peru	Bribes the secret police paid to judges, politicians, and media to support the Fujimori	*Direct observation:* After fall of Fujimori regime, videotapes and bribe receipts became public	Politicians received bribes of $3,000 - $50,000 per month. Media received bribes as much as $1.5 million per month	N/A

Paper	Country	Context	Strategy for Assessing Corruption	Corruption estimate	Corruption Estimate (in percent)
		regime		for one television station's support.	
Sequeira, Djankov (2010)	South Africa Mozambique	Bribe payments to port and border post officials	*Direct observation*: Enumerators shadowed clearing agents in ports to collect information on bribe payments	Bribes amounted to 14% and 4% respectively of the total shipping costs for container passing through Mozambique and South Africa.	14% of shipping costs (Moz.) 4% of shipping costs (S. Africa)
Estimates of graft					
Reinikka and Svensson (2004)	Uganda	Graft in public spending of educational funds intended to cover school's nonwage payments	*Estimate by subtraction:* PETS compared the amount of grant sent down from the central government to the amount received by schools.	Schools received on average only 13 percent of the grants	87% of funds

Paper	Country	Context	Strategy for Assessing Corruption	Corruption estimate	Corruption Estimate (in percent)
Olken (2007)	Indonesia	Graft in the building of rural roads funded through a national government program	*Estimate by subtraction:* Compared the official amount spent on the road to an independent engineering estimate of what the road actually cost to build.	"Missing expenditures" – the difference between what the village claimed the road cost and what the engineers estimated it actually cost – averaged about 24% of the total cost of the road.	24% of cost of the road
Olken (2006)	Indonesia	Theft of rice from a program that distributed subsidized rice	*Estimate by subtraction:* compare administrative data to a generally administered household survey.	At least 18% of the program's rice disappeared before reaching households.	18% of program expenditures
Hsieh and Moretti(2006)	Iraq	Bribes from the under-pricing of oil in Iraq's Oil For Food	*Estimates by subtraction:* gap between the selling price of Iraqi oil to the Oil for Food	Iraq collected $1.3 billion in bribes from under-pricing oil, or 2 percent of	2% of oil revenues

Paper	Country	Context	Strategy for Assessing Corruption	Corruption estimate	Corruption Estimate (in percent)
		Program	Program and the author's estimates of the "market" price of Iraqi oil	oil revenues.	
Khwaja and Mian (2005)	Pakistan	Politically connected loans	*Estimate from market inference:* Additional non-performance rate from politically connected loans compared to non-politically connected loans	Politically connected firms receive 45 percent larger loans from government banks in spite of having a 50 percent higher default rates.	0.3 - 1.9 percent of GDP
Niehaus and Sukhtankar (2010)	India	Wages on the National Rural Employee Guarantee Scheme	*Estimate by subtraction:* Compare officially paid wages to wages as reported by a survey	Rs. 236 stolen per actual day paid, where an actual day paid is approx. Rs. 60	79% of labor expenditures

Paper	Country	Context	Strategy for Assessing Corruption	Corruption estimate	Corruption Estimate (in percent)
Fisman (2001)	Indonesia	Value of political connections to President Suharto to Indonesian public firms	*Estimate from market inference*: Firm stock price movement when Soeharto fell ill given the strength of its political connections to Suharto	23% of the value of the most connected firms was due to political connections	23% of value of firm
Fisman et al (2006)	US	Value of personal ties to Vice-president Cheney of U.S public firms	*Estimate from market inference*: Firms' stock price movement in response to shock to Cheney's health given the strength of connection to Cheney	In all events studied there is a zero effect on the stock prices of connected firms.	0% of value of firm

Paper	Country	Context	Strategy for Assessing Corruption	Corruption estimate	Corruption Estimate (in percent)
Faccio (2006)	Cross-country	Value of political connections for firms across sample of 47 countries	*Estimate from market inference:* Stock price movements of firms around the time of announcements that officers or large shareholders are entering politics or that politicians are joining their boards.	2.29% increase in company value when a businessman enters politics. 4.32% increase in stock market value when a board member or large shareholder becomes a politician in countries where corruption is above median.	2.3% - 4.3% of company value
Gorodnichenko and Peter (2007)	Ukraine	Bribes received by public sector employees	*Estimate from market inference:* residual wage differentials between the public and private sectors (consumption levels are the same in the two groups and labor	Aggregate amount of bribery estimated to be is between US$460 million – US$580 million, or about 1% of GDP of Ukraine.	1% of GDP

Paper	Country	Context	Strategy for Assessing Corruption	Corruption estimate	Corruption Estimate (in percent)
			market equilibrium implies employees are indifferent between working in the public and private sectors.		
Finan and Ferraz (2010)	Brazil	Corruption in municipal government	Audit reports from central government auditors	Audits find average of R$327,000 diverted resources per violation, or 8% of total amount audited	8% of total amount audited
Besley et al (2011)	India	Beneficiary selection by village council	Conditional on eligibility, does political office predict beneficiary status	Chief village councilor is 10% more likely to be a beneficiary	2% of beneficiaries selected