The Differential Impact of Corruption on Microenterprises in Russia

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Introduction

In spite of more than a decade of economic restructuring and the introduction of extensive market reforms in Russia, there still exists widespread political control over most forms of economic activity. In Russia, this type of politicization has resulted in an environment in which rules and regulations govern almost all aspects of enterprise activity. Firms are forced to set aside scarce resources dedicated to simultaneously fulfilling a minimum number of obligations while persistently trying to evade others. Furthermore, the elaborate system of regulations with which firms must comply has created opportunities for a corrupt cadre of government officials to engage in rent-seeking behavior while monitoring and enforcing firm compliance. This behavior exacerbates the regulatory burden for enterprises and creates an environment in which bribes and side-payments are the norms to do business.

This paper addresses the issue of rent-seeking regulatory behavior, which has become endemic and entrenched throughout the Russian economy. Descriptive statistics from a survey of Russian microentrepreneurs reveals the breadth and depth to which firms are subject to regulatory harassment in the form of frequent inspections and the necessity of making "irregular payments" to avoid artificial penalties imposed by regulators. Furthermore, empirical evidence suggests that firms vary significantly in both the quantity of inspections that they undergo, as well as across individual perceptions of regulatory difficulties and harassment.

A theoretical model helps explain this observed phenomenon. The explanation is that firms may vary in the quantities and prices paid for bribes because regulatory officials act price-discriminating monopolists. In doing so, corrupt regulators charge each firm a unique bribe price and quantity based on a regulator's perception of an entrepreneur's willingness-to-pay, as well as on the costs of extracting the bribe payment for the regulator. A game theoretical application helps explain the empirical evidence in a manner consistent with the observed stylized facts. By employing a unique data set on Russian microenterprises, and a theoretical model that captures an observed, stylized phenomenon, we show that (i) corruption is indeed endemic to the microenterprise sector, (ii) that firms vary in the degree to which they are vulnerable to rent-

extracting officials, and (iii) we employ a conceptual model to explain how and why these differential transactions occur.

The paper is organized in the following manner: in Section One a very brief overview of the descriptive statistics from the survey is provided. In Section Two the theoretical model is explained, and optimal bribe prices and quantities across firms are derived. In Section Three simulations illustrate changes and differences of bribe offers across firms, as well as the welfare effects of regulatory-induced corruption. In Section Four a summary and policy prescriptions are provided.

Section One: Descriptive Statistics

The legal and regulatory environment for enterprises in Russia is both oppressive and ineffective. Rules, regulations, and statutes abound which govern all levels and types of economic activity. Furthermore, regional and local political autonomy have led to uneven enforcement of the rules, and the local authorities enjoy a high degree of regulatory discretion. Equally problematic as the regulations *per se*, however, is the potential niche they create for opportunistic behavior on the part of corrupt regulatory officials, which most often occurs during these regulatory inspections. In order to examine the effect of this institutional backdrop on microenterprises in Russia, data was collected from approximately 200 micro and small firms located in and around Samara City, a large and economically diverse Russian city, in the summer of 1999.

The survey responses yielded numerous insights that shed light on the manner in which firms are affected by the regulatory environment in Russia. In order to briefly illustrate regulatory impact, some tables are presented that highlight trends and averages from the survey results.

The majority of enterprises in the survey are recent start-ups and engage in a wide range of services, ranging from retail distributors to small manufacturing firms. The sample was comprised of only those firms that employed less than 30 workers. Most enterprises (70 percent) employ less than five workers, besides the owner, however. Thus, the information collected provides valuable insight into the lowest economic strata of firms, a constituency that is often ignored in both statistical and policy analysis in Russia.

On average, microenterprises in the survey are inspected 55 times per year, by a variety of inspectorates who have legal right to inspect unannounced, at any time, and to impose fines for

cognizant or unwillful lack of compliance. These inspections provide excellent opportunities to extract bribes, on one hand, while simultaneously gathering information about the enterprise or entrepreneur, on the other hand. *Table 1* illustrates the frequency of supervisory monitoring through visits to the enterprise, and the variation across firms of regulatory visits. Important to note is the high proportion of firms subject to regulatory and supervisory inspections, the frequency with which the authorities visit them, and the wide range of visits indicating variance across firms.

Table 1: Mean Regulatory Inspections per Year Reported by Firms

Inspecting Body	Percent of Firms	Mean Visits per Year	Hours/visit	Standard Deviation of Inspections	Min	Max
Tax	68	10.9	8.2	28	0	200
Fire	61	7.5	1.6	22	0	365
Sanitation	49	16.0	1.9	55	0	365
Trade	30	10.7	2.3	31	0	365
Militia	38	81.5	0.8	102	0	365

*Source: Legal and Regulatory Survey of Microenterprises, 1999

While it is widely accepted that the Russian business and political environment is rife with corruption, it is difficult to assess the degree to which this type of behavior exists at the local level and the extent to which it affects the types of firms found in our sample. Among the goals of the survey were to investigate the pervasiveness of bribery and corruption for micro and small enterprises, to identify government services that necessitate bribe payments, and to discover if firm-specific features exist within the sample that appear more inviting to rent-seeking officials.

Responses indicate that corruption of civil servants is either problematic or highly problematic for one-third of enterprises in the survey, as indicated by *Table 2* below. Furthermore, the table shows that the majority of entrepreneurs perceive that government officials enjoy discretionary power, while 40 percent of firm owners have actually experienced its (arbitrary) usage during a firm inspection.

Table 2: Entrepreneurs' Perceptions of Corruption and Enforcement

Corruption and Arbitrary Enforcement	Percent of Respondents
Corruption Problematic or Highly Problematic to Enterprise	36
Regulators Have Discretion in Interpreting Regulations	65
Regulators Have Changed Regulatory Requirements Without Prior Warning	40

Source: Legal and Regulatory Survey of Microenterprises, 1999.

Table 3 below suggests actions that may necessitate bribes, and the frequency with which these types of transactions take place. Notable is the wide array of government services that are perceived to require additional side-payments to government officials, underscoring the ubiquity of this practice in the Russian setting.

Table 3: Government Services that Require Bribes

Government Services Perceived to Necessitate Bribes	Percent of Microenterprises
Issue Permits or Licenses	65 (18)
Secure Premises	67 (19)
Access Loans	59 (25)
Facilitate or Lower Tax Obligations	42 (26)
Protect Business	66 (21)

*Numbers in parentheses indicate the percentage of respondents who declined to answer the question. Source: Legal and Regulatory Survey of Microenterprises, 1999.

In addition to examining the pervasiveness of corrupt activities, it was also of interest to uncover certain firm-specific characteristics that are more likely to elicit rent-seeking behavior

by regulators. *Table 4* below highlights firm-level characteristics that appear to attract attention from corrupt officials.

Table 4: Characteristics of Firms Reporting Problems with "Irregular Payments" to Officials

Firm Characteristics	Unit of Measurement	Firms Not Targeted for Bribes	Firms Targeted for Bribes	Comments
Firm Size	No. of employees	8.46	9.87	Larger firms
Age	Year Started	1994	1994	No difference
Operating Hours	Hours/Day	9.19	10.75	Open longer hrs**
Operating Days	Days/Week	5.59	5.94	Open more days per week**
Seasonality	Percentage Change in Seasonal Revenue	121	159	More seasonal variations
Annual Growth	Employees Added	0.45	1.01	Higher growth firms**
Tax-Change	Percentage responded "yes" to arbitrary tax question	61	78	More vulnerable to arbitrary tax collection**
Monitoring	Visits by All Regulatory Authorities/Yr	50.4	54.2	Monitored more frequently
Female-Owned	Percent Owned by Females	37	26	Female Owner less likely**
Working Capital	Ranking of Finance as Constraint (1…4)	2.06	2.38	More constrained by finance**
Legal Form	Percent Registered as Private Individual	38	37	No difference
Sector	Percent of Manufacturing Firms	21	29	More dominated by the manufacturing sector**

**Indicates mean differences are significant at the α=.10 level.
Source: Legal and Regulatory Survey of Microenterprises, 1999.

It is not surprising that the higher growth firms invite more extortionist behavior since officials can earn a higher rent by targeting the most profitable businesses. Other notable trends emerge from *Table 4* as well. Firms that are open longer hours and more days per week tend to

be more vulnerable to regulatory harassment. This could be attributed to a reduction in costs incurred by the regulator in visiting the firm, making it easier to visit with greater frequency. It is also not surprising that firms monitored more frequently find rent-seeking to be more problematic than those that are monitored less, given that official visits to firms provide ideal opportunities to extract additional rents from entrepreneurs. It is also of interest to note that firms that are targeted for bribes report, on average, that they are more financially constrained than enterprises that are not targeted. This finding (along with other supportive data not presented here) may indicate that there are spillover effects of corrupt activities into other related markets.

In summary, descriptive statistics from this survey suggest that even the lowest echelon of entrepreneurs, those that would generally operate outside or on the boundaries of the formal sector in other countries, are penetrated and subjected to the same levels of bureaucracy, inspections, and penalization as one would expect for much larger firms in such an environment. The data reveal that high degrees of regulation and their corollary, rent-seeking practices, have emerged as a major impediment to business growth. Furthermore, firms differ substantially in the degree to which they are subject to regulatory intrusions and demands for bribes. The theoretical reasons why this is the case are now explored.

Section Two: The Model

The variation across firms with respect to being targeted for bribes stems from regulators' ability to use their monopoly position to both influence and to extract information on an individual firm's ability and willingness to pay for a bribe. In this sense, regulators act as first-degree price discriminators and extract all surplus associated with individual bribe payments.

The concept of modeling the government (or agents of the government) as a monopolist is not new. In fact, Klitgaard (1990) defines corruption to be a combination of monopoly power and discretion in regulatory enforcement. Lal (1989) models the state as a predatory monopolist who charges for the provision of 'protection' and 'justice' at high enough prices to maximize profit while maintaining barriers to entry. More recently, Schleiffer and Vishny (1993) model the market structure of the supply of government goods as a determinant of the level and consequences of corruption.

This particular model is an analysis of a regulator who acts as a pure, single-product monopolist facing a large number of price-taking "buyers." Since one can easily argue, from both the literature and the most casual of in-country observations, that the rules and regulations with which firms must comply in Russia are superfluous, unenforceable, and are possibly designed to preclude compliance, it logically follows that regulators are completely predatory in nature.

The following model captures the price and quantity decision mechanism used by the regulator in order to determine the price of a bribe, as well as the number of bribes an entrepreneur will be charged or offered. The purpose of the highly stylized model is to show that both the price of a bribe and the number of bribes that a firm must pay is the Bayesian equilibrium outcome of a two-period game with incomplete information.

The game is a leader-cum-follower game, played between a regulator and a firm, and takes place under the auspices of regulatory inspections to monitor firm compliance. A regulator is assigned to monitor firm compliance with a specific regulation, and does so through an on-site inspection of the firm. The regulator uses this opportunity to extract a bribe from the firm, regardless of whether the firm is in compliance with the regulation or not. This is a reasonable assumption, given that the regulator has complete discretion in deciding whether or not a firm is in compliance, and there is no oversight mechanism in place that can corroborate whether or not the regulator is being honest in his/her assessment. We also assume that entrepreneurs do not have the incentive to shirk in the face of bribes, so long as post-bribe profits increase monotonically.

The problem of the regulator, in the first period, is to set a bribe price to charge the entrepreneur. Since the regulator does not have full information regarding the entrepreneur's willingness-to-pay a bribe, the bribe is set based on the observed production technology of the firm, and the regulator's knowledge of factor prices. The regulator seeks to extract the maximum that the entrepreneur is willing to pay, without overcharging her. If he sets the price too high, the entrepreneur refuses to pay, and the regulator would receive nothing.

The set-up of this decision problem is grounded in the fact that there is neither bargaining in the model, nor borrowing or lending, so that the firm's budget constraint is binding. In order to motivate the entrepreneur to pay the bribe, if she is able, the regulator will impose a penalty

that would result in the loss of that period's firm profits in the case of non-payment. It is assumed that the imposition of this penalty is costless to the regulator.

In the second period the regulator decides whether or not to re-visit the firm with the intention of extracting another bribe. This decision is based on whether the costs of the second visit are less than the expected value of the second-period bribe that he would receive. If the regulator decides to visit in period two, he then sets the bribe price for the second period based on what he was able to collect in the first period, and this period's production technology. A more technical description of the game follows.

The minimum profit that the entrepreneur needs to survive, *i.e.* her reservation profit, is denoted as π_R. The entrepreneur's true profit, denoted as π, is uniformly distributed on $[\pi_L, \pi_H]$, but the true value of π is private information, and is known only to the entrepreneur. To simplify the analysis, assume that $\pi_R=\pi_L=0$. π_H is part of the belief system of the regulator, and is set based on the production technology, production function, and number and types of inputs that are observed by the regulator. In fact, in each period, π_H is based only on observable firm characteristics, such as capital, labor, technology, and input and output prices. Thus,

$\pi_H=f(K,L,T,P_i,P_o)$, and (1)

$$\frac{\partial \pi_H}{\partial K} > 0 \text{ if } MP_K > 0, \frac{\partial \pi_H}{\partial L} > 0 \text{ if } MP_L > 0, \frac{\partial \pi_H}{\partial T} > 0, \frac{\partial \pi_H}{\partial P_i} < 0, \frac{\partial \pi_H}{\partial P_o} > 0. \quad (2)$$

The game lasts exactly two periods. In the first period, the regulator makes a bribe offer of b_1. If the firm/entrepreneur accepts the offer, than the payoffs to the regulator and the entrepreneur are b_1 and $\pi_1 - b_1$ respectively. If the entrepreneur declines to pay the bribe in the first period, a penalty is imposed of $-\pi_1$. In this case, the payoffs to both the regulator and entrepreneur are 0. Note that the regulator need not know the true profit in the first period to impose this penalty. He could shut down the firm, for example, or harass customers or management. Recall that imposing the penalty is a costless action for the regulator.

The game then proceeds to the second period. In the second period, the regulator has the choice of either visiting the firm again in order to extract a second bribe, or he can choose not to visit. Now, however, he must consider the cost of the visit, as well as the potential payoffs from the bribe, when making this decision. (Note that in the first visit, he did not account for the cost since it was assigned as part of his job.) The cost of the visit is known to both players, is

exogenous, and is unique to each firm, *i*. If the regulator chooses not to revisit the firm, the game ends and the second period payoffs for the regulator and entrepreneur are [0, π_2] respectively. If he does choose to re-visit the firm, he again sets a bribe price based on the production technology that he observes in the second period, as well as the information conveyed to him by the firm's decision to pay or not pay in the previous period, and the bribe price of b_1 that was offered in period one. The payoffs for the regulator and firm in the second period are then b_2-C and $\pi_2 - b_2$ respectively if the firm accepts the offer, and –C and 0 if the firm rejects the regulator's offer.

Thus, in each period high profit firms accept the regulator's offer, while low profit firms reject it, and the regulator's second period belief reflects this first-period action. In this model, I solve for optimal b_1^* and b_2^*, (*i.e.* bribes in period one and two), as well as the optimal action of the regulator in deciding to revisit the firm in the second period. I show that the optimal prices charged depend on the regulator's *beliefs* about the profit distribution and the optimal action of the firms. Furthermore, the action of the regulator in returning to collect more bribes depends on 1) the observed characteristics of the firm in the first period, (*i.e.* π_H), 2) the bribe amount that was collected in the first period (*i.e.* b_1^*), and 3) the costs of returning to collect the bribe from firm *i*, (*i.e.* C_i).

In the game, a strategy for the regulator is a first period offer b_1, the decision whether to visit the firm again, depending on the costs of the visit and what was collected first period $A_r(V_2|b_1,C)$, and a second-period offer of $b_2(b_1)$ that specifies the offer b_2, to be made depending on whether the first offer was accepted or rejected and the beliefs about the profit distribution in the second period.

There is one second-period information set for each different first-period bribe offer the regulator might make, and his beliefs form a probability distribution over these information sets. In the full game, I denote the regulator's first-period belief about the firm's profit by $\mu_1(\pi_1)$, and the regulator's second period belief as $\mu_2(\pi_2|b_1)$. For the remainder of the model, however, I will denote beliefs for the regulator more simply as $\mu_1(\pi_1)$ and $\mu_2(\pi_2|\, b_1)$. Additionally we make the simplifying assumption that first and second period profits do not change, and are known with certainty by the entrepreneur.

A strategy for the firm involves two decisions. Let $A_1(b_1|\pi_1)$ equal one if the firm would accept the first-period offer b_1 when its profit is π_1, and zero if the firm would reject b_1 when its

profit is π_1. Likewise, let $A_2(b_2|\pi_2)$ equal one if the firm would accept the second-period offer b_2 when its profit is π_2 and zero if the firm would reject b_2 under these circumstances. A strategy for the firm is a pair of functions $[A_1(b_1|\pi_1), A_2(b_2|\pi_2)]$. Since the firm has complete information throughout the game, the beliefs of the firm are trivial. *Table 5* below summarizes the strategies and beliefs for both players over both periods of the game.

Table 5: Strategies and Beliefs for Entrepreneurs and Regulators

		Strategies	***Beliefs***
Regulator	Period One	b_1	$\mu_1(\pi_1)$
	Period Two	b_2 (b_1), $A_r(V_2\|b_1,C)$	$\mu_2(\pi_2\| b_1)$
Firm	Period One	$A_1(b_1\|\pi_1)$	Trivial, full information
	Period Two	$A_2(b_2\|\pi_2)$	

We now more succinctly outline steps for solving the game between the regulator and the entrepreneur. The simplest step to solving the game is to solve out for the last move, $A_2(b_2|\pi_2)$. Since this is the last move, the optimal decision for the firm is to accept b_2 (*i.e.* the bribe offer in period 2) if and only if $\pi_2 > b_2$. Thus, the firm's second period strategy is always:

$$A_2(b_2 \mid \pi_2) = \begin{cases} 1 \text{ if } \pi_2 - b_2 \geq 0 \\ 0 \text{ otherwise} \end{cases} \qquad (3)$$

The next step is to identify the optimal bribe in the second period, b_2, given the firm's optimal action (shown above) and the regulator's beliefs about π_2. Given the firm's strategy, it is also straightforward to show that b_2 should be set to maximize the expected payoff, given the regulator's belief $\mu_2(\pi_2|b_1)$ and the firm's subsequent strategy $A_2(b_2|\pi_2)$.

The regulator's beliefs in the second period, $\mu_2(\pi_2|b_1)$, depend on the actions of the firm in the first period. If the firm rejects the first period offer, the regulator updates his beliefs about where the firm lies on the distribution of profits in the second period. By rejecting the bribe offer in the first period, the entrepreneur signals to the regulator that the endpoint of the profit distribution on which she lies (*i.e.* π_H) can be no higher than the first period bribe offer. Conversely, if the first period offer was accepted, the updated belief about second period profits is that the lower bound of the profit distribution can be no less than the first period bribe offer, otherwise the firm would have rejected the offer.

In the first period, however, firms also take into account how the accepting or rejecting of a first period bribe might affect the bribe price they will be offered in the following period because of the signal their action sends to the regulator. Another factor influencing a firm's decision is ...e cost to the regulator of visiting in the second period, since the entrepreneur knows that the regulator will only return for a second visit if $C_i<b_2(b_1)$, *i.e.* if the costs of doing so are less than the bribe amount set in period two. In short, firms have different strategies based on their knowledge of the costs to the regulator of returning for a visit, as well as their knowledge of the regulator's strategy $A_r(V_2|b_2(b_1))$ for returning to collect a bribe. The regulator's strategy to visit in the second period is;

$$A_r(V_2|b_2(b_1))= \begin{cases} 1 \text{ if } b_2(b_1) \geq C \\ 0 \text{ otherwise} \end{cases} \qquad (4)$$

There are essentially three different strategies for a firm, based on the regulator's costs for visiting in period two. I refer to the firm as a *high cost visit firm* if firm characteristics are such that the regulator's cost of returning are higher than any possible bribe collected in period two, *i.e.* if $C>b_2(b_1|a_1)$. In this case, given the regulator's strategy, he will never return to collect a bribe in period two. I refer to the firm as a *low cost visit firm* if firm characteristics are such that the regulator's cost of returning are always lower than the possible bribe collected in period two, *i.e.* if $C<(b_2(b_1|r_1)$. In this case, the regulator always returns to collect a bribe in period two, whether or not the first period bribe was rejected. Finally, I refer to the firm as a *medium cost visit firm* if firm characteristics are such that costs are less than the second period bribe if the first period bribe was accepted, but greater than the second period bribe if first period was rejected, *i.e.* $b_2(b_1|a_1)>C>(b_2(b_1|r_1)$. In this case, the regulator will return in the second period if the first period bribe was accepted, but will not return in the second period if the first period bribe was rejected.

Thus, the firm's forward-looking strategy depends on whether or not the regulator will be back in the second period, and the relative payoffs of paying versus not paying the bribe. The payoffs of not paying the bribe now include the discounted value of a reduction in the price

charged next period. For each of the three types of firms described above, we solve for the equilibrium bribe in period one, the indifference level of profit in period one, and the second period bribes for both the case of rejection and acceptance of first period offers.

For high cost firms, the regulator simply sets the first period bribe according to the following maximization problem;

$$\underset{b_1}{\text{Max}}\, b_1 \bullet \Pr\{\text{firm accepts } b_1\} + 0 \bullet \Pr\{\text{firm rejects } b_1\} \tag{5}$$

where;

$$\Pr\{\text{firm accepts } b_1\} = \frac{\pi_H - b_1}{\pi_H} \tag{6}$$

In the case of high cost firms, the optimal bribe in period one is $b_1^* = \frac{\pi_H}{2}$, and in period two, $b_2^*=0$ since the regulator never returns in the second period. The indifference profit (*i.e.* the profit level at which the firm is indifferent between accepting and rejecting the profit) is $\pi_1^*(b_1)=b_1$.

For the case of low cost visit firm, the situation becomes slightly complex. Low cost firms balance the payoffs this period of paying the bribe versus the discounted payoffs this period of not paying the bribe, knowing that the regulator will inevitably be back in the second period with a second-period offer. These relative payoffs are reflected in the equations below.

$$\pi_1 - b_1 \geq \delta[(\pi_2 - b_2(b_1 \mid r_1)) - (\pi_2 - b_2(b_1 \mid a_1))] \tag{7}$$

$$\pi_1 \geq b_1 + \delta[(\pi_2 - b_2(b_1 \mid r_1)) - (\pi_2 - b_2(b_1 \mid a_1)) \tag{8}$$

$$\pi_1^*(b_1, b_2) = b_1 + \delta\left(b_2(b_1 \mid a_1) - b_2(b_1 \mid r_1)\right) \tag{9}$$

Note that the left-hand side of equation 12 reflects the payoffs from paying the bribe in period one, while the right-hand side reflects the discounted payoff value of not paying the bribe in the first period. Also note that $\pi_1^*(b_1,b_2)$ represents the indifference profit, or the level of profit at which point the entrepreneur is just indifferent between paying and not paying the bribe

in period one. Thus, for arbitrary values of b_1 and b_2, firms with $\pi > \pi_1^*(b_1, b_2)$ will accept b_1 and firms with $\pi < \pi_1^*(b_1, b_2)$ will reject b_1, where $b_2(b_1|a_1)$ is the second period offer if first period was accepted and $b_2(b_1|r_1)$ is the second period offer if b_1 was rejected. Whether or not the firm accepts the first period offer thus conveys information to the regulator about where the firm lies on the profit distribution. This information is then incorporated into the regulator's second period offer.

We can now derive $\mu_2(\pi|b_1,r_1)$ if the first period offer is rejected and $\mu_2(\pi|b_1,a_1)$ if the first period offer was accepted. Given the first part of the firms' strategy, $A_1(b_1|\pi)$ just derived, if the entrepreneur rejects the first period offer, then the regulator believes that the types remaining in the second period must be uniformly distributed on $[0,\pi_1]$ where $\pi_1=\pi_1^*(b_1,b_2)$. Given this belief, the regulator's optimal second-period offer must be $b_2^* = \frac{\pi_1}{2}$.

In the case where the entrepreneur accepts the first period offer, and given the firm's strategy $A_1(b_1|\pi)$, the regulator now believes that the types remaining in the second period are uniformly distributed on $[\pi_1,\pi_H]$ where $\pi_1=\pi_1^*(b_1,b_2)$. Given this belief, the regulator's optimal second period offer is $\frac{3\pi_1}{2}$, as derived in the myopic problem. This implies that:

$$b_2(b_1 \mid a_1) = \frac{3\pi_1}{2} \text{ and } b_2(b_1 \mid r_1) = \frac{\pi_1}{2} \text{ and} \tag{10}$$

$$\pi_1 = \pi_1^*(b_1, b_2(b_1 \mid a_1), b_2(b_1 \mid r_1)) \tag{11}$$

This then implies that:

$$\pi_1 = b_1 + \delta\left(\frac{3\pi_1}{2} - \frac{\pi_1}{2}\right) \tag{12}$$

$$\text{and } \pi_1 = \frac{b_1}{1-\delta}, b_2(b_1 \mid r_1) = \frac{b_1}{2(1-\delta)}, b_2(b_1 \mid a_1) = \frac{3b_1}{2(1-\delta)} \tag{13}$$

The optimal bribe problem for the regulator is now reduced to the following one-period maximization problem:

$$\underset{b_1}{Max}\, b_1 \bullet \Pr\{\text{firm accepts } b_1\} + \delta \bullet b_2(b_1 \mid a_1) \bullet \Pr\{\text{firm accepted } b_1 \text{ and accepts } b_2\} +$$
$$\delta \bullet b_2(b_1 \mid r_1) \bullet \Pr\{\text{firm rejected } b_1 \text{ but accepts } b_2\}$$

The solution to the maximization problem for the low cost firm is:

$$b_1^* = -\frac{(\delta+2)(\delta-1)}{4(1+\delta)}\pi_H \qquad (14)$$

$$b_2^*(b_1 \mid r_1) = -\frac{(\delta+2)(\delta-1)}{4(1+\delta)(2-2\delta)}\pi_H \qquad (15)$$

$$b_2^*(b_1 \mid a_1) = -\frac{3(\delta+2)(\delta-1)}{4(1+\delta)(2-2\delta)}\pi_H \qquad (16)$$

$$\pi_1^* = -\frac{(\delta+2)(\delta-1)}{4(1+\delta)(1-\delta)}\pi_H \qquad (17)$$

where $b_2^*(b_1|r_1)$ is the second period offer if first period offer is rejected, while $b_2^*(b_1|a_1)$ is the second period offer if the first period offer is accepted.

For medium cost firms, in the case where $b_2(b_1 \mid a_1) > C > b_2(b_1 \mid r_1)$, and given that the regulator's strategy is to visit firms in the second period only when $C>b_2$, the solution algorithm is similar to the low cost visit firm's similar to the low cost visit firm's. Again, finding the optimal bribes for the medium cost firms reduces down to a single period maximization problem, similar to the one shown above. A summary of equilibrium bribes and indifference profits for the three types of firms is shown in *Table 6* below.

Table 6: Equilibrium bribes and indifference profits by type of firm

Firm Type	b_1^*	$b_2^*(b_1\|a_1)$	$b_2^*(b_1\|r_1)$	π_1^*
High Cost Visit	$\frac{\pi_H}{2}$	0	0	$\frac{\pi_H}{2}$
Medium Cost Visit	$-\frac{(-2+3\delta)}{(4+3\delta)}\pi_H$	$-\frac{3(-2+3\delta)}{(4+3\delta)(2-3\delta)}\pi_H$	0	$-\frac{2(-2+3\delta)}{(4+3\delta)(2-3\delta)}\pi_H$
Low Cost Visit	$-\frac{(\delta+2)(\delta-1)}{4(1+\delta)}\pi_H$	$-\frac{3(\delta+2)(\delta-1)}{4(1+\delta)(2-2\delta)}\pi_H$	$-\frac{(\delta+2)(\delta-1)}{4(1+\delta)(2-2\delta)}\pi_H$	$-\frac{(\delta+2)(\delta-1)}{4(1+\delta)(1-\delta)}\pi_H$

Section 3: Simulation Exercises

It is obvious from *Table 6* that there are multiple equilibrium generated by this model. The optimal bribe values derived above show that the equilibrium bribe and the number of times that an entrepreneur will be charged differs among firms. The manner in which the price and number of bribes a firm is offered depends on 1) the entrepreneur's discount rate, 2) the cost to the regulator of visiting the firm, and 3) the profit distribution perceived by the regulator.

We examine how optimal bribes and indifference profits vary according to changes in an entrepreneur's discount rate, using simulations (see *Figure 1* below). Note that an entrepreneur's discount rate is inversely related to the size of the bribe that she will be charged. This result is intuitive: the more that the entrepreneur cares about the future, the more she will have to be compensated, in the form of a smaller bribe, for her losses next period due to her payment this period.

One interpretation of the discount rate, δ, is to think of it as the periodicity of regulatory visits. In this sense, the more periodical a scheduled visit is for the regulator, the less of a bribe he will be able to command. The periodicity of a regulatory visit is idiosyncratic to the firm, and is generally determined by the type of regulator conducting inspections. Thus, while there is always a second period in the game, the timing of the second period will vary across firms under this interpretation.

It is important to know 1) the magnitude of the change associated with a variation in the discount rate, 2) how different firm types are affected differently according to changes in the discount rate, and 3) a difference in the net amount of bribes paid according to firm type with a given discount rate. These are important issues because they invoke a sense of relative "winners" and "losers" by firms of different types, which is of interest from a societal welfare perspective. These issues are illustrated in *Figure 1* below.

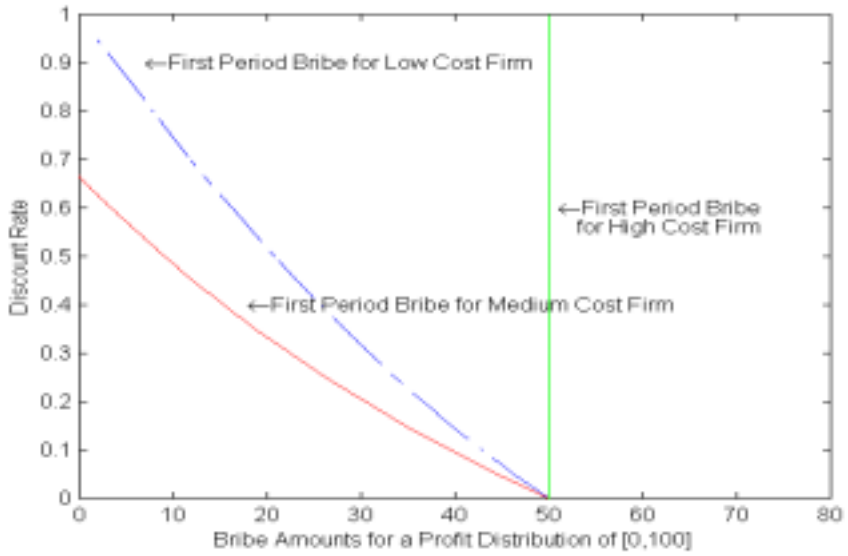

Figure 1: First period bribes for low, medium, and high cost firms with changes in the discount rate

These simulation results suggest that as regulatory inspections occur with greater frequency across all firms, the relative differences in bribe offers diverge substantially between low and medium cost visit firms, *ceteris paribus*.

Another important aspect of this exercise is to identify total of bribe. Total bribes for both periods are shown in *Figure 2* below.

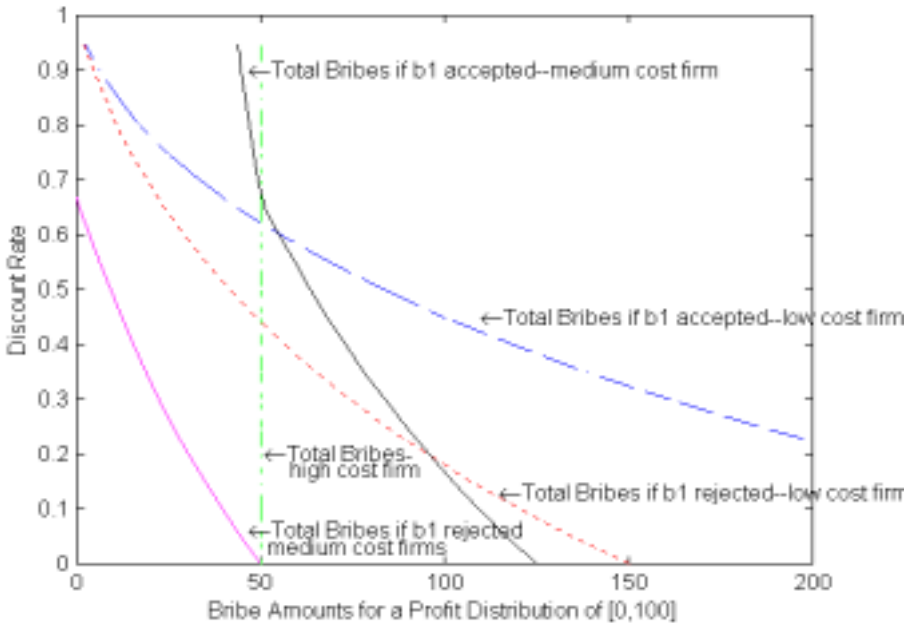

Figure 2: Total Bribe Amounts for High, Medium, and Low Cost Firms

The most important point of this graph, is to note that total bribe offers will vary substantially across different types of firms, firms with different discount rates, and according to first period actions, even assuming that enterprises have identical perceived profit distributions. The implication of these results point to the quasi-arbitrary nature of regulatory rent-seeking; even firms with identical production characteristics will be offered different bribes within and across time periods.

Another aspect of the optimal and differential bribes offered across firm types is how changes in the distribution of perceived profits (*i.e.* differences in observable production technologies and inputs) changes the optimal bribe price offered by the regulator. One issue to examine is how changes in the perceived profit distribution affects bribe offers to firms of different types.

It is straightforward to calculate the derivative of bribe offers and indifference profits across firm types. However, one can easily observe from *Table 6* above, that for all non-zero derivatives shown above, the signs are consistently positive. The intuition behind this is simple, but profound; the more that a regulator perceives to be a firm's ability to pay, the higher the bribe price that he will charge. Does the magnitude differ among the changes in bribe price according to cost structure? *Figure 3* shows how changes in the bribe offered in first period differ among firm types as perceived profit distributions change.

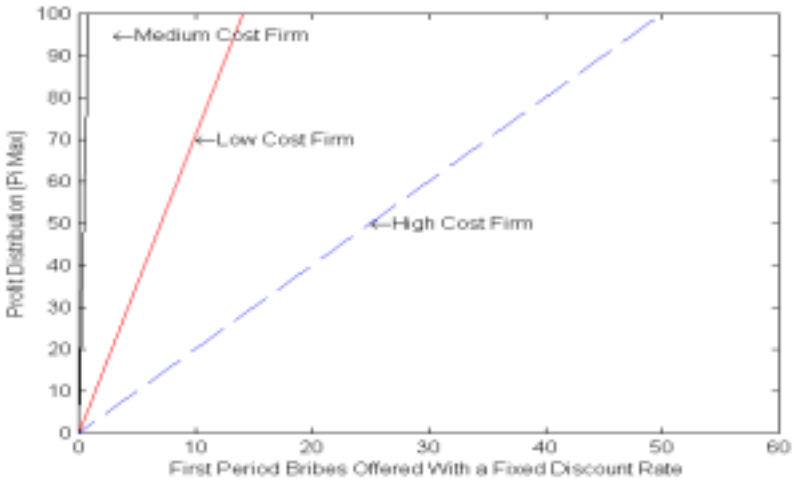

Figure 3: First Period Bribes with Changes in the Perceived Profit Distribution of the Regulator for High, Medium, and Low Cost Firms

What is of importance to consider when examining the how bribe offers change with respect to the profit distribution is to remember that the underlying assumption driving the regulator's beliefs about π_H, the maximum profit level, is a firm's observable production inputs, which are the only discernible indications of firm profitability.

The upshot is that if one accepts that bribes change according to changes in observable factor inputs, than one can conceive that these payments act as a tax on productive. The social costs of such a phenomenon may be high if entrepreneurs change productive choices on the basis of factor prices inclusive of the bribe tax, leading to sub-optimal social rates of return on productive assets. This point is in direct contrast to those that argue that graft represents a pure transfer with no effect on economic allocation (Bliss and DiTella, 1997).

While it is of interest to know how the bribe offers and quantities differ across firm types and with respect to changes in discount rates, cost structures, and profit distributions, these calculations tell us little about the relative costs imposed on firms of varying types. The actual welfare effects of different bribe prices and quantities depend on the true profit of the firm and the beliefs of the regulator, characterized by the moments of the profit distribution .

To understand how differential prices and quantities affect firms' actual payments, one is less interested in the prices and quantities charged, than in the prices and quantities paid, the payments in proportion to before-bribe profits, and the total losses incurred for both payments and non payments of bribes. In short, here we take into account the penalties that are paid when

the regulator's bribe offer is too high for the firm to pay. Only by incorporating the penalties as well as the bribes paid can one determine the relative losses across firms of different types. *Table 7* below provides the loss equations for firms of varying types.

Table 7: Loss Equations Associated with Bribe Offers and Ability to Pay

Firm Type	First Period Loss	Second Period Loss
High Cost	$= \begin{cases} b_1 & \text{if } \pi_t > \pi^*(b_1, b_2) \\ \pi_t & \text{if } \pi_t < \pi^*(b_1, b_2) \end{cases}$	$+ 0$
Medium Cost	$= \begin{cases} b_1 & \text{if } \pi_t > \pi^*(b_1, b_2) \\ \pi_t & \text{if } \pi_t < \pi^*(b_1, b_2) \end{cases}$	$+ \begin{cases} b_2(b_1 \mid a_1) & \text{if } \pi_t > b_2(b_1 \mid a_1) > \pi^*(b_1, b_2) \\ \pi_t & \text{if } b_2(b_1 \mid a_1) > \pi_t > \pi^*(b_1, b_2) \\ 0 & \text{if } \pi_t < \pi^*(b_1, b_2) \end{cases}$
Low Cost	$= \begin{cases} b_1 & \text{if } \pi_t > \pi^*(b_1, b_2) \\ \pi_t & \text{if } \pi_t < \pi^*(b_1, b_2) \end{cases}$	$+ \begin{cases} b_2(b_1 \mid a_1) & \text{if } \pi_t > b_2(b_1 \mid a_1) > \pi^*(b_1, b_2) \\ \pi_t & \text{if } b_2(b_1 \mid a_1) > \pi_t > \pi^*(b_1, b_2) \\ b_2(b_1 \mid r_1) & \text{if } \pi^*(b_1, b_2) > \pi_t > b_2(b_1 \mid r_1) \\ \pi_t & \text{if } b_2(b_1 \mid r_1) > \pi_t \end{cases}$

Recall that the penalty structure of the game is such that either a firm pays a bribe to the regulator, or incurs a penalty. These equations above represent the losses associated with either the bribe payment or the penalty for non-payment in each period. *Figure 4* below illustrates total losses incurred by the firm as a proportion of the true profit of the firm.

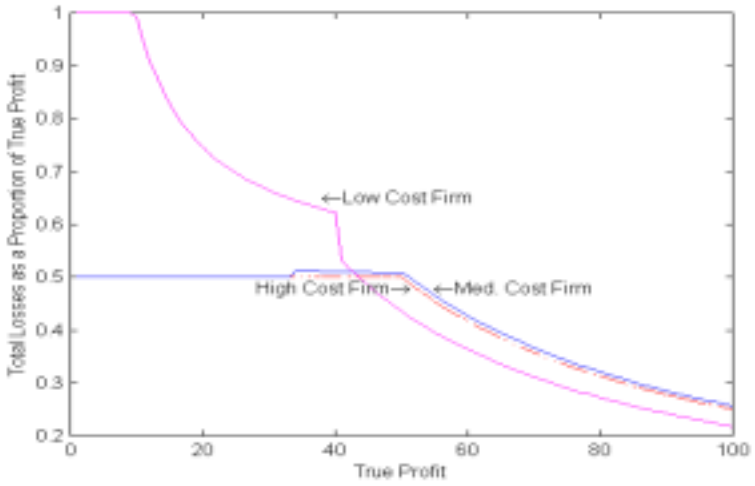

Figure 4 Total Losses from Bribes and Penalties as a Proportion of True Profit

It is arguable that *Figure 4* perhaps best illustrates the welfare consequences associated with differential bribe prices and quantities coupled with incomplete information regarding firm profit on the part of the corrupt regulator. The lower the true profit is relative to what the regulator perceives it to be, the higher the proportion of profits that are lost in a directly unproductive manner. In this sense, the best-performing firms pay the smallest relative amount in bribe taxes, while those firms on the margin pay strikingly more. This finding is consistent with the work of Tanzi (1998), Gupta *et al.* (1997), and others who maintain that not only is the problem of corruption regressive with respect to firm size, it is also regressive with respect to income levels, most affecting those with the least resources.

Section 4: Conclusion

Since 1993 the number of government workers in Russia has swelled from 800,000 to more than a million, becoming a major impediment to economic reform. Even Vladimir Putin, in his 2001 State of the Union address pointed out that,

> "The system is defending its right to so-called status quo rent. To put it in a more direct way, the right to bribes and kickbacks," and that "We must have no illusions; only transparent relations between the state and entrepreneurs can give a new impulse to the development of the Russian Economy (New York Times, April 4, 2001)."

The objective of this paper was to investigate the manner in which regulatory-induced corruption affects micro and small enterprises in Russia. Empirical evidence suggests that micro and small businesses vary substantially in reporting how problematic corruption is for their enterprise. A theoretical model explores why extortion from regulators may occur in a non-uniform manner across firms. The theoretical model postulates that government regulators customize the nature of their rent-seeking activities towards firms (*i.e.* the number of times they demand a bribe, as well as the price they will charge each firm), similar to a price-discriminating monopolist facing hidden information. Supportive empirical evidence comes from survey data collected on Russian microenterprises.

The model shows that production technologies, input choices, and exogenous firm characteristics, such as location, play a role in determining the bribe price that a regulator will charge a firm, as well as the number of times he will return to collect it. We also examine the welfare effects associated with differential bribe payments across firms. Simulations of the

theoretical model demonstrate that the presence of corruption most strongly impacts firms that are least profitable. In this sense, we show that differential corruption is extremely regressive, harming enterprises disproportionate in their ability to pay a bribe.

The policy implications of this study are profound. Involuntary bribe payments fall into the realm of directly unproductive activities (DUPs) (Bhagwati, 1982), and cause a deadweight loss to society. As scarce resources are diverted from entrepreneurial investments and innovation, to regulatory payments that are not converted into the provision of public goods, or to innovation in regulatory avoidance activities, the loss to society is immeasurable. This loss may be particularly acute in Russia, where post-transition poverty and unemployment have led to a significant deterioration in standards of living, and are reflected in current statistics on public health, crime, life expectancy, unemployment, and education.

The effect of corruption on microenterprises can be deleterious on both a sectoral and an individual firm level. Policies that inhibit the development of a microenterprise sector have implications for poverty. The microenterprise sector is particularly important in Russia because extended households and other social insurance mechanisms to deal with unanticipated income shocks, such as sudden unemployment, are not prevalent. In the absence of traditional state-sponsored employment or other social safety nets that have gradually disappeared over the past decade, the income generating opportunities provided by micro and small enterprises play an important role in poverty alleviation and household risk reduction. However, the microenterprise sector is relatively small and underdeveloped, due in part to the adverse policy environment surrounding it.

Corruption may also cause a loss of efficiency for individual firms because it may force firms to incur a number of unproductive costs, thereby leading to a welfare-reducing allocation of resources. When regulators base their bribe price on what they can observe during a firm inspection, bribe payments act as a tax on certain factors of production. In this sense, corruption changes relative factor prices and may lead to sub-optimal input use. Furthermore, firms may be less inclined to invest in cost-saving or production enhancing technologies because of the additional regulatory scrutiny that such actions may attract.

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