CORRUPTION AND MICROENTERPRISES IN RUSSIA

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By

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ABSTRACT

Over the past decade, the repressive legal and regulatory environment in transition economies has received considerable attention in the literature. This widespread interest focuses on the resulting distortions and distributional consequences for firms of all sizes and ownership structures operating in a hostile economic and policy environment. The consequences of ubiquitous regulatory intrusion, such as it exists in Russia, are pronounced and widespread. In Russia, this framework has resulted in an environment in which rules and regulations govern almost all aspects of economic activity. Firms are forced to set aside scarce resources dedicated to simultaneously fulfilling a minimum number of regulatory obligations while persistently trying to evade others. Furthermore, the elaborate system of regulations with which firms must comply, in combination with a lack of accountability for regulatory enforcers, has created a corrupt cadre of government officials who frequently 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.

The objective of this dissertation is to investigate the manner in which regulatory-induced corruption affects micro and small enterprises in Russia. Empirical evidence suggests that micro and small enterprises 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 that they charge), similar to a price-discriminating monopolist facing hidden information.

The model shows that both the price of a bribe and the number of bribes that a firm must pay, is the Nash equilibrium outcome of a two-period game with incomplete information. The game is played between a regulator and a firm, and takes place under the auspices of regulatory inspections to monitor firm compliance. In the first period, the regulator observes a firm's production technology, and forms a probability distribution around what the firm is willing to pay for a bribe. The regulator sets a price, based on this probability distribution, and makes a take-it-or-leave-it offer. The firm accepts or rejects the offer, signaling to the regulator information about where the firm lies on the distribution. If the entrepreneur rejects the offer, a penalty equivalent to that period's profits is incurred. The regulator updates his prior distributional assumptions based on the firm's response. In the second period, the regulator decides whether or not to revisit the firm, depending on the cost of the visit and the expected payment he will receive. If he decides not to visit, the game ends. If he does revisit the firm, the game is repeated, and the regulator again updates his prior assumptions regarding the firm's willingness-to-pay function.

The model shows that production technologies, input choices, and other 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. In particular, certain types of technologies signal to regulators a higher ability to pay a bribe, and firms that use them are more likely to experience higher degrees of regulatory extortion. Finally, I 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 the least profitable, or that are run by entrepreneurs with few alternative income-generating activities.

Supportive evidence comes from survey data collected on Russian microenterprises. The model described above is tested using econometrics, and numerical simulations. A multinomial logit estimation is used to show that the probability of being targeted by corrupt regulators is, in part, determined by firm-specific characteristics that are consistent with the theoretical model. Numerical simulations demonstrate how a bribe offer price will change with changes in the firm-level profit distribution, discount rates, and reservation profits of entrepreneurs. Simulations also show loss functions that estimate the total losses associated with both payment and non-payment of bribes.

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 in Russia is by most accounts relatively small and underdeveloped. This observed phenomenon may, in part, be due 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 use of inputs. 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, and because finance, from any source, may be inaccessible.

Dedicated to my mother.

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CHAPTER 1

INTRODUCTION

Over the past decade, the repressive legal and regulatory environment in transition economies has received considerable attention in the literature. This widespread interest stems from, and focuses on, the resulting distortions and distributional consequences for firms of all sizes and ownership structures operating in a hostile economic and policy environment. The consequences of ubiquitous regulatory intrusion, such as it exists in Russia, are pronounced and widespread. This politicization of economic life has been linked empirically and theoretically to the movement of firms into the unofficial economy (Johnson *et al.*, 1998 and 1999; Braun and Loayza, 1994; Fortin *et al.*, 1997), a reduction in government budgets and public goods expenditures (Johnson *et al.*, 1999), the loss of foreign investment (Wei, 1997; 1998), the sustained existence of inefficient state-owned enterprises (Schleifer and Vishny, 1993; Claessons and Djankov, 1998), the emergence of organized criminal activities (Frye and Zuravskaya, 2000), and widespread corruption of public employees (Banerjee, 1997; Besley and Mclaren**,** 1993**;** Schleifer and Vishny, 1995). [1]

This repressive legal and regulatory environment is a legacy of a prolonged period under central planning, experienced in varying degrees by all transition economies, but for the longest duration in Russia. In spite of more than a decade of economic restructuring and the introduction of extensive market reforms, many of these countries

continue to suffer from widespread political control of economic activity (EBRD, 1999). However, such politicization significantly inhibits the creation of new private firms, which are the engine of growth for transition economies (Blanchard and Kremer, 1996).

In Russia, this framework has resulted in an environment in which rules and regulations govern almost all aspects of economic activity. Firms are forced to set aside scarce resources dedicated to simultaneously fulfilling a minimum number of regulatory obligations while persistently trying to evade others. Furthermore, the elaborate system of regulations with which firms must comply, in combination with a lack of accountability for regulatory enforcers, has created a corrupt cadre of government officials who frequently 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.

In spite of the prolific literature on the regulatory environment in transition economies, the analytical framework for examining *how* the regulatory environment impacts micro and small enterprises is somewhat limited in its scope. The region-specific literature linking regulation, bureaucracy, and corruption to economic development focuses on a limited number of topics. Much has been written on the effects and implications of excessive regulation on public finance, for example, focusing on the inability of the public sector to collect sufficient revenues and to provide an adequate level of public goods (Johnson *et. al*, 1999; Fortin *et. al*, 1997). Following this argument, Frye and Zuravskaya (2000) and others have examined the consequences of the poor provision of public goods, which can lead to the rise of institutions such as organized

crime, that privately and efficiently provide services normally reserved for the public sector, such as protection or law and order.

The literature that directly deals with firms under conditions of excessive regulation and corruption usually relies on macroeconomic or cross-country comparisons. For instance, Wei (1998) examines the impact of regulation and corruption on foreign investment, using cross-country indices of corruption and levels of direct foreign investment. Not surprisingly, their findings suggest that the level of corruption and bureaucracy across countries is significantly and negatively related to levels of private foreign investment. Kauffman and Wei (1999) examine whether bribery offers enterprises the possibility of avoiding excessive bureaucracy, by comparing average time wasted with bureaucratic negotiations and the level of bribery across countries. Johnson *et al*. (1997) show that excessive regulation drives firms into the informal economy, using a ratio of electricity consumption to GDP as a measure of unofficial activity across countries.

More relevant articles relating regulation and corruption to enterprises are found in Schleifer and Vishny's work (1995) where they present a model of bargaining between politicians and managers that explains many stylized facts about the behavior of state firms. (However, the dynamics between regulators and private firms differ considerably, and are not treated in this work.) Schleifer and Vishny (1993) also show that the illegality of corruption and the need for secrecy make it more distortionary and costly than its sister activity, taxation.

The more general literature is also fairly narrow in its scope, and usually brings a macroeconomic perspective to the analysis. The literature on rent-seeking and

corruption, for instance, is centered on incentives and institutional design of bureaucracies (Kruegar, 1974; Klitgaard 1988; Rose-Ackerman, 1978 and 1999). This literature is useful because it describes why rent-seeking and opportunism is so endemic under certain types of political institutions, and why it is so costly. The costs of corruption and/or regulation, however, are generally analyzed across countries, typically comparing the level of corruption or regulation to national income. Few empirical studies have been conducted at the firm level (Svenson, 2000).

The literature on the economics of the informal sector does provide a useful framework for analysis. DeSoto's (1989) seminal work on the informal sector in Peru was the first to document and explain enterprise participation in this sector. DeSoto's documentation of the barriers to formal market entry show that operating informally is a logical response to a system which has traditionally made small entrepreneurs a victim of legal and economic apartheid.

Rausch (1991) provides a more technical theoretical characterization of the informal sector and show that operating informally is a rational choice for firms constrained by labor market regulations. Braun and Loayza (1994) and Loayza (1997) demonstrate that the informal sector exists under conditions of over-regulation and high entry costs into the formal sector, coupled with an inefficient and corrupt system of compliance control.

While these macroeconomic models provide a useful point of departure, the characteristics of the Russian environment limit their applicability. This is because the informal sector models are based on developing country contexts, where choosing to operate informally is much less costly.[2] In many transition economies, particularly in

Russia where the regulatory burdens are arguably most acute, the penetration of the regulatory environment makes working completely outside the formal economy a virtual impossibility. This last point is of particular importance, since similar types of firms in the former context make a bivariate choice of which sector to operate in. In economic models of this type of informal economy, firms allocate all of their resources *either* to the formal or informal sector. Russian enterprises, on the other hand, make intra-firm resource allocation decisions, between formal and informal operations, arguably introducing a greater distortion.

It is surprising, given the increasingly important role played by micro and small firms in transition economies, the lacuna of information and analysis regarding the impact of regulation-induced corruption on firms operating in the lowest strata of economic activity in Russia. While there are often passing references in the literature to the distortions and misallocation of resources that regulation and opportunism evoke, the subject has rarely been attacked with analytical rigor, nor has been empirically investigated. This lack of attention is no doubt in part related to the difficulties of collecting reliable data from firms that devote a large amount of resources to avoiding any official investigation into the activities of their enterprise.

However, the question of how and why micro and small enterprises (MSEs) are subjected to process regulation and corruption of public officials in Russia, and an analysis of the high transactions costs that accompany these barriers, has important welfare consequences. In Russia, extended households and other social insurance mechanisms to deal with unanticipated income shocks, such as sudden unemployment, are not prevalent (Barberia *et. al*, 1998). In the absence of traditional state-sponsored

employment or other social safety nets that have gradually disappeared over the decade, the income-generating opportunities provided by micro and small enterprises play an important role in poverty alleviation and household risk reduction.[3] Indeed, micro and small enterprises have been known to contribute to (1) household income and welfare, (2) social change, political stability, and democracy, (3) distributional or development objectives, as well as (4) self-confidence and empowerment of the individual (Liedholm and Mead, 1999). Micro and small enterprises play an important role in providing productive employment opportunities for an increasing number of job seekers (Mead, 1994), arguably an important role given recent enterprise restructuring programs and the August 1998 crisis that has led to the observed high systemic unemployment.

Furthermore, a better understanding of a firm's allocation of resources and its economic determinants is crucial for formulating appropriate development policies and projects and for evaluating those already existing. Most small enterprise programs are supply driven, providing standardized training, technical assistance, and credit (Tendler and Amorim, 1996). However, one must question the effectiveness of many standard programs and policies aimed at supporting small businesses if they neither take into account nor accommodate the regulatory anomalies facing Russian entrepreneurs.

Therefore, this dissertation primarily seeks to contribute to an understanding of the consequences of a highly repressive regulatory environment by reviewing existing theories, developing models of regulatory impact, and empirically testing the latter in order to evaluate hypotheses formulated within the context of the Russian regulatory environment. Conclusions drawn here should be taken as a basis for discussing policies

and development programs better adapted to the constraints faced by Russian microentrepreneurs.

1.1 Objectives of the Dissertation

The objective of this dissertation is to investigate the manner in which regulatory-induced corruption affects micro and small enterprises in Russia. The regulatory environment matters because a repressive legal and regulatory environment forces firms to incur a number of unproductive costs and may lead to a welfare-reducing allocation of resources. In many studies of transition economies, the impact of the regulatory environment on micro and small enterprises is usually relegated to a footnote, however. Microenterprises that experience serious regulatory difficulties are generally assumed away into the unofficial economy, with no analytical or empirical investigation of what operating unofficially entails (Johnson *et al.,* 1997).[4] Studies have yet to elucidate the costs associated with operating unofficially, nor the distortions that are introduced by this process.

Because of the high costs associated with regulatory compliance, most firms choose to operate unofficially.[5] Unofficial status, however, also consumes valuable resources because it can imply that enterprises a) are exposed to corrupt officials who demand bribes in exchange for "looking the other way", b) may be forced to expend resources and/or alter production decisions to avoid regulations and/or regulators, and c) may experience difficulties in other market transactions, such as in the formal or informal financial market.

Furthermore, these costs are not necessarily uniform across firms. In fact, there is evidence of differential incidence and persistence of extortion and regulatory enforcement. The costs of regulation, and its corollary corruption, vary across firms and depend on firm-specific characteristics that underlie enterprise production technologies.

The dissertation is a positive analysis that explains why firms experience these varying levels of costs, and highlights the welfare effects and distortions that accompany differential bribe payments. The theoretical model explores why certain firms may be more vulnerable to corruption of public officials than other firms of similar size.

This observed phenomenon is a result of regulators customizing the nature of their rent-seeking activities in order to maximize net rents. Since micro and small enterprises enjoy no bargaining power vis-à-vis any public official, corrupt regulators are able to arbitrarily choose the level of rents to extract from each firm. Because regulators have incomplete information on firm profits, however, they do so based on their *perception* of an enterprise's ability to pay, and will extract the maximum rent that will not induce exit from the sector. Firms with certain types and levels of production technologies and input choices, however, may inadvertently signal to regulators a higher ability to pay a bribe, and are therefore more likely to experience higher degrees of regulatory extortion.

Finally, I examine the policy implications and welfare effects of distortions associated with differential bribe payments across firms. This model suggests that if regulators had full information on firm-level profits, bribe payments would simply represent a transfer of surplus from the firm to the regulator, with no effect on production choices, technical or economic efficiency, or sector of operation. The introduction of the signaling mechanism described above, however, implies that under certain conditions,

enterprises may alter their input, technological, or sectoral choices in order to avoid additional regulatory scrutiny. In the end, the dissertation suggests that firms experiencing high levels of regulatory scrutiny and extortion may be less likely to increase variable input levels, adopt innovative, cost-saving technologies, or go into sectors characterized by more transparent production technologies.

Supporting empirical evidence comes from a survey of 305 urban and peri-urban micro and small enterprises located within and around the city of Samara, Russia. The survey was designed to document the frequency of regulatory intrusion, and to assess the degree to which rules, regulations, and monitoring are systematically or arbitrarily applied to various types of enterprises. The study also documented the extensiveness of corrupt activities, identified the types of government services that necessitate bribe payments, and the types of firms that are required to pay bribes more frequently.

1.2 Organization of the Dissertation

The organization of the dissertation is as follows. In Chapter two the survey design and methodology are reviewed, as well the economic and institutional environment for microenterprises in Russia. In this chapter descriptive statistics from the sample are presented, familiarizing the reader with the manner and extent of the regulatory intrusion into firm dynamics.

Chapter Three sets up the theoretical model, and the equilibria bribe payments are derived which show how firms differ in the bribe price and number of bribes that they may be charged. In Chapter Four, the comparative statics, welfare effects, and extensions of the model are provided. In Chapter Five the model is tested empirically, while in

Chapter Six I offer a summary and conclusions with policy implications for addressing the problem of regulation and corruption in a transition economy.

Notes –Chapter 1

[1] The term *politicization of economic life* was coined by Simon Johnson, and implies the exercise by politicians of control rights over business. Such rights may include regulatory powers over privatized and private firms, the ability to regulate and restrict entry, control over the use of land and real estate that private businesses occupy, the determination and collection of taxes on businesses, the right to inspect firms and close them if regulations are violated, control over international trade and foreign exchange transactions, and in some cases the power to set prices (Johnson *et al*., 1997).

[2] It is true that the costs of operating informally are treated in several of these papers. However, costs of operating unofficially are generally characterized as *opportunity costs*. For instance, firms that operate unofficially do not have access to public goods, such as the court system or law and order. Firms that are not registered are less likely to obtain credit from banks, to participate in government sponsored training programs, to obtain foreign exchange, and to advertise the enterprise. In Russia, however, the degree of penetration of the regulatory environment, even into the lowest echelon of firms, makes the costs associated with operating unofficially much higher because evading regulators is more difficult. It is important to note that firms that are successful in completely immersing themselves into the unofficial economy are almost invariably criminal in nature. The majority of enterprises, however, operate concurrently in the official and unofficial sectors.

[3] The decline of the traditional social safety net began in 1992, with the launch of reforms by the Russian government privatizing state enterprises where these safety nets largely were operating. These reforms put a great strain on the existing system of social protection and state-subsidized institutions.

[4] The unofficial activity is any economic activity that is not reported to the state statistical office.

[5] As mentioned earlier, operating unofficially does not imply that enterprises are completely outside the formal, regulated sector. In the Russian context, this term refers to firms that allocate resources to hiding some output or avoiding regulations.

CHAPTER 2

CONTEXT OF THE STUDY

The purpose of this chapter is to provide an understanding of the economic and institutional context in which the study takes place. In order to familiarize the reader with the setting, a description of the current economic and institutional climate in Russia is provided. Additionally, it is in this chapter that the conditions under which the survey was implemented are described; including an overview of the project, the survey design and implementation, the nature of the data collected, a brief description of the region in which the study was carried out, and summary statistics of the sample.

2.1 Context of the Study

Russian micro and small enterprises have the difficult task of operating within a backdrop of recent economic and political destabilization and negative economic growth in the wake of the August 1998 financial crisis. While economic conditions marginally improved over the past two years, the economic environment in Russia is still characterized by slow growth and under-investment in most sectors. Per capita GDP growth for 1998 was negative (-4.6 percent) and the estimated level for 1999 was between zero and two percent growth, depending on the source (EBRD Transition Report, 1999 and *Business Central Europe*, 1999). While there were some tentative

indications of recovery, much of the minimal growth that occurred since the August 1998 crisis can be attributed to the apparent windfall gains for exporters from devaluation (*Business Central Europe*, 1999).

Comparative economic indicators for transition countries place Russia seventh (out of 26) in per capita GDP and twenty-first in the category of GDP growth. This poor ranking can be attributed to the missing economic and institutional conditions that have facilitated the prolonged growth at rates of 5-7 percent achieved by some central European economies. In fact, the present climate for business in Russia is quite hostile in several respects. A complex tax system and high statutory tax burden, onerous regulatory requirements, backlogs at regulatory and administrative agencies, and inadequate legal infrastructure all serve to deter business starts, drive businesses into the gray economy, and reduce business profitability and rates of expansion (Buckberg, 1997).

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. At both the individual and the firm levels, high transactions costs are incurred in either fulfilling or avoiding excessive regulation. Regional and local political autonomy have led to uneven enforcement of the rules, and the local authorities enjoy a high degree of regulatory discretion. A relatively large number of rules, coupled with this regulatory autonomy of authorities have led to an institutional environment where bribes, extortion, and side-payments are the norm to do business.

Furthermore, the rule of law remains relatively weak, and this is likely to prove a major impediment to economic growth over the long term. The security of property rights is lacking, and unless corrected, weak property rights, pervasive corruption, and

poor contract enforcement could constitute a long-term drag on investment, leaving more profit to be made through rent-seeking pursuit of monopoly and tariff privileges than through entrepreneurial behavior (EIU, 1999).

The painful transition process that has characterized this decade has been severe, and more problematic for Russia than for most transition countries. The most important reasons for the length and depth of the post-soviet depression, which exceeded post-communist output contractions in most of central Europe include:

- a prolonged history of communism and central planning,
- an unraveling of economic ties attendant on the collapse of the Soviet Union,
- sharp falls in the production of a range of goods, particularly defense-related, for which demand collapsed as a result of the shift from planners' to consumers' preferences and the shrinkage of the state sector,
- the delayed macroeconomic stabilization and reluctance to impose hard budget constraints on enterprises, and
- political uncertainty, which has continued to fuel doubts about the durability of the reforms.

Turbulent economic changes that characterized the decade had a strong negative impact on household income. Collapsing output and rising inflation had a devastating effect on living standards, which fell sharply in the early part of the 1990s, as incomes were lost either through unemployment and wage arrears, or were eroded by steeply rising prices.

Moreover, income inequality has increased dramatically, with the average income of the top 10 percent of the population estimated at 15 times that of the bottom 10

percent. The average monthly wage is now below $70, down over one-third in real terms from the previous year, and unemployment is officially at 18 percent (*Business Central Europe*, 1999). Since the crisis, real incomes have fallen to 36 percent of pre-crisis levels, leading to a significant deterioration of the social situation (EBRD Transition Report, 1999). Currently, some 35 percent of the population operates below the officially defined poverty line, while 60 percent of the population consider themselves poor (Milanovic and Jovanovic, 1999). Many of the microenterprise start-ups emerging over the past several years have been in direct response to these worsening economic conditions for the lowest economic strata.

It is precisely within the economic and institutional environment described above that FINCA, a non-governmental organization specializing in making loans to microentrepreneurs in developing countries, began to investigate the possibility of implementing a village-banking credit program targeting microenterprises in Samara, Russia. FINCA, however, became quickly apprised of the difficulties of setting up such an institution given the legal and regulatory obstacles constraining microfinance institutions. Furthermore, they became concerned that these same regulatory obstacles that existed for the construction and successful implementation of their program were equally problematic for their traditional clientele base of microentrepreneurs.

This discomfort with the regulatory environment was the catalyst for what was to later become known as the FINCA/Ohio State University Policy Initiative in Russia. This USAID-supported project was designed to foster the development of sustainable microfinance institutions (MFIs) in Russia by documenting the regulatory environment that affected MFIs on one hand, and micro and small entrepreneurs, on the other hand.

The purpose of this data collection exercise was to examine the degree to which regulations are relevant in practice, the manner in which they are enforced (*i.e.* systematically or arbitrarily), as well as to investigate the relative regulatory vulnerability of particular types of micro and small businesses. Therefore the FINCA/OSU Policy Initiative launched a survey during the summer of 1999 in Samara, Russia, the city where FINCA had set up its village banking program. The purpose of the survey was to provide information on:

1. The general profile of micro and small enterprises with respect to employment, business activities, investment opportunities, and firm growth.
2. The business environment for the micro and small enterprise sector. The study assessed the quality and availability of public goods and services, such as infrastructure, law and order, public safety, and health services.
3. The existence of and extent to which regulations and bureaucracy impede enterprise transactions and operations. The survey was designed to document the frequency of regulatory intrusion and to assess the degree to which rules, regulations and activity monitoring are arbitrarily applied to selected types of enterprises.
4. The pervasiveness of corruption fostered by the inefficient bureaucracy of the Russian civil administration. The study documented the extent of corrupt activities and identified types of government services that necessitate bribe payments. We also tested whether the opportunity to pay bribes provides a return to firms by lessening the regulatory obligations for those who pay them and whether certain firm-specific characteristics invite predatory behavior by officials.

2.2 The Survey

The survey was designed to collect information on firm-specific characteristics, legal and regulatory compliance, corruption, financial flows, and access to public goods. To avoid suspicion about the overall objective of the data collection effort, the survey was implemented through a reputable local university, Samara State. Enumerators were primarily graduate students and sociologists with substantial training in survey techniques. Members of the Ohio State University team trained and monitored all enumerators, and only questionnaires that met high quality standards were used in the analysis. Furthermore, the most sensitive questions (corruption, mafia, finance, and tax compliance) were carefully tested and built around existing surveys on regulatory constraints. Most of the questions on corruption, for example, were phrased in an indirect fashion to avoid implicating the respondent of wrongdoing. Additionally, the most sensitive questions were asked at the end of the interview, by which time the enumerator had established the necessary credibility and trust.

The procedure followed to select the respondents was a two-stage stratified sampling method. The sampling frame used for the survey was a comprehensive list of micro and small enterprises operating in the city of Samara. To find firms, a two-stage sample design was used, first selecting the clusters to be sampled (in this case *rayons*, or districts), and then from firms within the selected *rayons*. In the first stage, *rayons* from which the sample was drawn were chosen based on the number of registered enterprises and their proximity to the urban center. In the second stage, a quota sampling methodology was used, based on lists of registered businesses generated by the Samara

Statistical Bureau. A quota of firms to be interviewed was given to each enumerator that was specific to firm size and type of enterprise. The quota was based on a list of the number, type, and size of MSEs in each *rayon*, and was intended to simulate the distribution of the micro and small enterprise population, given a target sample size.

It should be noted that the difficulties of collecting reliable empirical information from Russian enterprises are pronounced. Problems associated with the data collection process have likely impacted both the representativeness of the sample, as well as the depth of information obtained by the survey.

The degree to which the sample is representative of the population is unclear. For example, the repressive regulatory environment has evoked problems that directly affected the sampling methodology used in the data collection process. Because of the tax policy in Russia, enterprises have become adept and skilled at various techniques to avoid taxation. One of the most notable is to set up fictitious satellite companies through which a "real" enterprise can channel its revenue. However, these satellite companies are formally registered and are counted among the comprehensive list of enterprises by the Statistical Service, the source of our list of businesses. In fact, the list from which the quota of firms was calculated may not be representative of either the numbers or types of businesses that operate in Samara. It is unclear if, and in what way, this misrepresentative list may bias the survey.

Furthermore, an in-depth exploration of problematic issues for firms was not possible. In part, this is due to the legacy of central planning, when firms were often required to participate in surveys designed to monitor regulatory and policy compliance on behalf of the government. As a result, respondents are generally highly suspicious of

data collection efforts, and exhibit ennui at participating in time-consuming surveys, particularly during the peak business season.

Additionally, the sensitive nature of many issues under investigation, particularly the questions on corruption, Mafia, finance, and profits, had to be taken into account when the survey was designed. Due to the non-responses evoked by even seemingly benign questions, many standard questions used in MSE studies worldwide could not be included. Despite these many obstacles and the inevitably narrow scope of the observations, the results from the survey are at least consistent with expected behavior, and overall they seem quite satisfactory.

2.3 The Respondents

Data was collected from 202 micro and small enterprises located in and around Samara City. It should also be noted that all firms that participated in the survey were legally registered private enterprises, rather than those involved in the underground economy. In Russia, this is an important defining criterion, because illicit status usually implies serious economic distortions or illegal activities (Aslund, 1997).

The nature of the questionnaire used for the survey focuses on obstacles to business start-ups, survival, and expansion, particularly those that are legal and regulatory in nature. The questionnaire used for the survey can be found in the appendix of this dissertation. The principal components of the questionnaire were designed to investigate specific legal and regulatory obstacles, the activities of government regulators, financial constraints and transactions of enterprises, the business environment, and enterprise characteristics. Many of the responses were designed in the form of non-continuous variables, either binary or ordinal rankings on a scale of one to four.

The legal and regulatory questions focus on difficulties of the registration process, time needed to secure permits and licenses, and the existence of barriers, in the form of permits or licenses, to starting up certain types of businesses. This section also investigated the degree to which the tax burden is problematic, and solicited the respondent's perception of discretion in enforcement or interpretation of tax statutes and laws. Other regulatory issues, such as difficulties posed by labor regulations, zoning requirements, and securing business premises were also investigated. The line of questions on activities of government regulators focuses on the degree to which corrupt officials are problematic for businesses, the transaction costs incurred by regulatory inspections, such as their frequency and duration, and the types of public services that are perceived to necessitate bribe payments.

The section on loans and finance investigates perceived and actual sources of credit, the extent of credit rationing, loan demand, sources of start-up capital, and savings patterns. The business environment section examines the quality and availability of public goods, such as law and order, property rights, and transportation networks. Finally, the section on enterprise characteristics documents the growth in employment, type of industry, age of enterprise, and seasonality of revenues and employment.

2.4 Regional Context: Samara

The survey was implemented in and around Samara City, located approximately 900 kilometers southeast of Moscow. The city is large, with a population of over one million inhabitants, and it is characterized by a high degree of economic diversity. The city of Samara is the capital of Samara Oblast, which is considered one of Russia's key

regions both economically and politically. Its political strength stems from its size and higher than average degree of urbanization. Recently, the oblast has acquired a reputation as a region that has been developing dynamically and is relatively prosperous, at least in the national context of economic crisis (Romanov and Tartakovskaya, 1998).

Samara is considered relatively prosperous, and the oblast rates sixth in real per capita income levels. Because of the dominance of many former state-owned enterprises, however, arrears of wage and salary payments remain large and widespread, indicating that the region is subject to all of the economic ills which plague Russia as a whole. The overall scale of the registered small firm sector is not easy to assess. One account is that they make up 6 percent of total firms (Romanov and Tartakovskaya, 1998), a figure that is likely to be a significant underestimation of the total number of the firms, as it ignores informal and unregistered firms. Privatization has been extensive in the region. The non-state sector accounted for over 90 percent of all industrial output, but the bulk of this output comes from privatized firms, rather than from new private firms.

In short, the region provides an excellent backdrop in which to examine the MSE sector. It is characterized by a relatively prosperous economy, yet it exhibits economic deficiencies pertinent to enterprise growth. Caution must be exercised, however, in generalizing the results and policy implications to Russia as a whole. Regional oblasts are extremely heterogeneous with respect to federal budget funding, tax and regulatory policy, and arbitrary enforcement of federal statutes and laws, all of which influence firm behavior (Freinkman and Starodubrovskaya, 1996). Nonetheless, limiting the survey to one region eliminates the statistical problems of controlling for variations across regions

in regulatory enforcement policies, regional economic health, and institutionalized corruption.

2.5 Descriptive Statistics

This section is intended to introduce the reader to the descriptive statistics derived from the data set. 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 effectively illustrate regulatory impact, several tables and charts highlight trends and averages from the survey results. These figures provide an overview of the data and a justification for hypotheses to be tested that were enumerated in Chapter 1. *Table 2.1* below highlights the most general characteristics of enterprises in the sample.

Enterprise Characteristics	Percent of MSE's
New Start Ups	73
Purchased or Inherited from State	13
Other	14

Type of Ownership

Physical Persons	38
Partnerships	8
Companies	51

Type of Enterprise

Production	23
Retail/Trade	48
Services	26

Employment

Mean Number of Workers	8.6
Median Number of Workers	5
Mean Employment Growth (persons per year)	.61
Percentage of Enterprises that Grew	40
Mean Employment Growth of Growing Firms	2.17

Table 2.1 Characteristics of MSEs

The majority of enterprises in the survey are recent start-ups, although a small proportion of MSEs (13 percent) began as state-owned enterprises. The limited number of small firms that germinated from the state sector reflects the overall failure of the privatization effort to reach the lower tier of stakeholders in the companies. A much larger proportion of the surveyed firms were start-ups. This trend may reflect survival

efforts by those with few options. While not always true, a significant proportion of new enterprise starts are driven by the necessity to find any source of income, even those providing only minimal returns, in situations where few alternatives are available (Liedholm and Mead, 1999). This phenomenon is particularly relevant to the Russian context, which was characterized by an initial enterprise restructuring effort in the early part of the decade, followed by a more recent industrial restructuring as a result of the August, 1998 crisis. Both events resulted in widespread layoffs accompanied by a sharp increase in the level of underemployment and unemployment.

The legal form of the enterprises is also a key characteristic in determining the costs of market entry, access to legal recourse, access to financial services, and tax liability. Businesses registered as individual enterprises (physical persons) face a much less complex registration procedure than companies (juridical persons), and registration can usually be completed within one week for the former type of firm. Contract enforcement is much more problematic for these individual enterprises, however, because businesses registered as physical persons do not have access to the same arbitration courts as do companies. Since it is required for both parties to be registered as juridical persons to arbitrate disputes in a Commercial Court, individual enterprises are less attractive clients or customers for companies, because contract enforcement would be more costly, while disputes are less likely to be resolved.

Many tax regulations that apply to individual entrepreneurs are less stringent than for firms established according to other legal forms (Nadolnyak and Hartarska, 1999). Firms registered as individual enterprises generally enjoy a much lower *de facto* tax burden because it is more difficult to monitor their activities, and they typically find it

easier to hide a large proportion of their income from tax authorities. In an effort to shore up perceived tax evasion, however, regulations require that firms registered as companies report to tax authorities all business transactions that take place with individual enterprises. Seemingly positive attributes of individual enterprises thus actually impede their interaction with other enterprises, and contribute to a perception (by both the supervisory authorities and other types of enterprises) that individual entrepreneurs are less trustworthy and more skilled at avoiding regulations. As a result, they are harassed and inspected more often by supervisors and are avoided by more institutionalized businesses, such as companies and partnerships.

The majority of enterprises are retail distributors (48 percent), followed by services (26 percent), and manufacturing or processing enterprises (23 percent). This overall distribution may reflect, in part, the difficulties for small manufacturing firms to compete with larger and more favored industrial firms. In Russia, large-scale producers are generally given favorable tax treatment, more access to loans, and are held to softer budget constraints (Gaddy, 1998).

Additionally, firms that were started after the initial transition primarily gravitated towards sectors that had previously been repressed, in essence, exploiting the pent-up demand resulting from prolonged central planning (EBRD Transition Report, 1999). The predominance of service and retail firms is also due to the facility of starting up an enterprise in these sectors, which is less difficult because smaller initial levels of capital and inputs are required.

Enterprise growth is an important indicator of success, and a barometer of qualifications for medium-term survival. Indeed, McPherson (1992) shows that growing

MSEs are more likely to survive than those that remain of the same size. While we do not have information on enterprise attrition rates to test this theory directly in the Russian environment, we do know that results from several empirical studies on MSEs in other countries indicate that for every one percent annual increase in employment, the MSE reduced its likelihood of closing during the year by approximately 5 percent (McPherson, 1992).

Employment growth rates for MSEs indicate that many enterprises appear to be relatively successful, with 40 percent reporting growth in employment since their inception averaging 2 persons per year. This statistic, however, likely underestimates true enterprise growth, because labor is usually the last production input to be added in a successful firm.

2.6 Firm Constraints

Firms were asked to rank the constraints to business that most affected their operations. Rankings were on a scale of one to four, with four indicating the most constraining, while one indicated that there was no affect on business operations. These constraints fell into four distinct categories: *Regulation* (Taxes, Zoning, and Labor Regulations), *Corruption* (Corruption of Government Officials and the Mafia), *Finance* (Access to Working Capital), and *Economic/Institutional Environments* (Input Markets, Output Markets and Dispute Resolution). The results of the survey indicate that the most important constraints for enterprises are taxes, finance, output markets, and corruption of government officials. Furthermore, barriers to the development of micro and small enterprises affect different types of firms differently, depending on the sector in which they operate. See *Table 2.2* below.

Regulatory Constraints	All Enterprises	Manufacturing Enterprises (1)	Retail Enterprises (2)	Service Enterprises (3)
Taxes	2.9	3.26	2.81	2.83
Zoning	1.6	1.27	1.77	1.51
Labor Regulations	1.32	1.40	1.27	1.46

Corruption	All Enterprises	Manufacturing Enterprises	Retail Enterprises	Service Enterprises
Local Officials	2.1	2.16	1.95	2.05
Mafia	1.25	1.24	1.20	1.29

Finance	All Enterprises	Manufacturing Enterprises	Retail Enterprises	Service Enterprises
Working Capital	2.1	2.26	2.17	2.01

External and Institutional Environment	All Enterprises	Manufacturing Enterprises	Retail Enterprises	Service Enterprises
Input Markets	1.6	2.04	1.62	1.77
Output Markets	2.2	2.34	2.33	2.09
Dispute Resolution	1.4	1.41	1.40	1.40

*Rankings for constraints are based on a 1-4 scale, with one indicating not problematic at all, and 4 indicating highly problematic.

Table 2.2 Mean Ranking of Constraints by Type of Firm

2.7 Regulation and Corruption

The regulatory environment for firms in this sample is one of the central focuses of this dissertation. A high degree of regulation has an adverse effect on the economy, is usually subject to political influences, and is rarely implemented with the sole purpose of

improving economic efficiency (Guasch and Hahn, 1999). The costs of various kinds of process regulation caused by inefficient bureaucracies and high levels of corruption can add substantially to enterprise burdens. This survey was intended to capture the extent of state interference and monitoring of the activities of small enterprises.

The regulation to which firms in the sample are most vocal about is the high and arbitrary tax burden. This is not surprising, given that the issue of taxation is notoriously problematic in Russia. The business community in Russia commonly argues that its total tax burden, as a share of profits, is excessive due to the simultaneous taxation of turnover, wage costs, profits, and capital, such that full compliance may leave almost no after-tax profit. Furthermore, the system of taxation of MSEs in Russia is complicated, inefficient, ambiguous, and highly dynamic. Taxes are subject to continuous change, are rarely stable for more than two or three years, and are open to re-interpretation by the local authorities. Enterprises often complain of being double or triple taxed (OECD, 1998). As a result, tax evasion is the norm, rather than the exception, has become increasingly sophisticated, and is considered a necessary business practice to ensure survival.

Equally problematic for enterprises is the degree of uncertainty associated with their tax obligations due to the discretion given to tax authorities. Sixty-nine percent of firms report that tax payments are subject to change frequently, while approximately 40 percent of enterprises in the sample stated that tax inspectors have altered or interpreted required tax payments without prior warning or announcement. Tax inspectors are given a high degree of discretion and frequently conduct on-site inspections, which may or may not be announced prior to arrival. MSEs, on average, are inspected over 10 times per year by tax authorities.

While taxation receives the most attention in the literature regarding the impact of regulation on MSEs in Russia, other regulatory exigencies force enterprises to incur high transactions costs. Because of the poor drafting of laws and regulations, combined with the lack of easy access by those affected to the text of the regulations, substantial managerial and financial resources are consumed simply in identifying the statutory requirements that apply, and in determining (a) what range of approvals are needed in order to operate in full compliance with federal, regional, and local laws; (b) in what sequence; and (c) what documentation is required in each case (Buckberg, 1997). Ensuring compliance with the multitude of statutes is a major concern for the regulatory authorities, but there is little transparency and predictability and MSEs incur very high costs compared to the size of their operations.

On average, enterprises 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. *Table 2.3* illustrates the frequency of supervisory monitoring through visits to the enterprise, or requirements that entrepreneurs visit the supervisory office themselves. Important to note is the high proportion of firms that are subject to regulatory and supervisory inspections and the frequency with which the authorities visit them. Also, it is clear from the table that regulatory inspections, in addition to providing an opportunity for regulators to extract rents, impose high costs on entrepreneurs because of the time required to interact with regulators. For example, note that an average tax inspection can consume at minimum an entire business day, deviating scarce entrepreneurial resources.

MSEs					
Inspecting Body	**Percent of Firms (1)**	**Mean Visits per Year (2)**	**Hours/visit (3)**	**Number of Visits to Agency (4)**	**Hours/visit (5)**
Tax	68	10.9	8.2	7.7	2.7
Fire	61	7.5	1.6	2.6	1.6
Sanitation	49	16.0	1.9	5.2	1.4
Trade	30	10.7	2.3	6.1	1.7
Militia	38	81.5	0.8	9.8	1.2

Table 2.3 Inspections of MSEs by Regulatory Authorities

It is difficult to compare vulnerability to harassment across distributions of firms, however, because inspectorates are matched according to the type of activity in which any one firm is engaged (*i.e.*, sanitation with food services, fire inspection with fixed premise locations). Nevertheless, one can gauge a more impartial comparison by examining only the frequency of inspections by the tax authorities and the militia, since in principle these inspectorates have jurisdiction over all types of firms, regardless of activity, location, or type of premises.

Equally problematic as the regulations *per se*, however, is the potential niche they create for opportunistic behavior on the part of corrupt regulatory officials. Indeed, corruption in most countries is attributed to a substantial amount of discretionary power exercised in carrying on the work of a modern administration (Klitgaard, 1988). The inadequate funding of administrative agencies and the low salaries of civil servants can, and often does, lead to obstructionist implementation and rent-seeking in the form of high fees for services and demands for bribes. Furthermore, the lack of clear, published

requirements facilitates corruption because applicants cannot independently verify the requirements for approval (Buckberg, 1997).

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. One of the goals of the survey was 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.

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 Regulation Without Prior Warning	40

Table 2.4: Perceptions of Corruption and Arbitrary Regulatory Enforcement

We know can see from *Table 2.4* above that corruption of civil servants is considered either problematic or highly problematic for one-third of enterprises in the survey. *Table 2.5* 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.

Government Services Perceived to Necessitate Bribes	Percent of MSEs (1)
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.

Table 2.5 Government Services that Require Bribes

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 illicit rent-seeking behavior. *Table 2.6* below highlights firm-level characteristics that appear to attract attention from corrupt officials. This is an important table because it highlights the systematic and differential impact of corruption on microenterprises in the study.

The calculations below are based on firms' ranking of corruption. Firms that reported that corruption was either problematic or highly problematic to their enterprise (*i.e.* on a scale of 1-4, they reported either a 3 or a 4) appear to differ systematically from those enterprises that did not report corruption of government regulators as impeding the success of the enterprise.

Firm Characteristics	Unit of Measurement (1)	Firms Not Targeted for Bribes (2)	Firms Targeted for Bribes (3)	Comments (4)
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

Table 2.6 Characteristics of Firms Vulnerable to Rent-seeking Officials

It is not surprising that the more entrepreneurial firms (proxied by growth in employment, hours of operation, and enterprise size) invite more extortionist behavior since officials earn a higher rent by targeting the most profitable businesses. Other notable and interesting trends emerge from *Table 2.5*. Firms that are open longer hours

and more days per week experience higher rates of growth tend to be more vulnerable to regulatory harassment.

These characteristics, if considered as proxies for firm success and entrepreneurship of the owner, would indicate that the most successful firms are most susceptible to attracting regulatory and supervisory actions. 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 should be noted that a likelihood-ratio chi-squared statistic, G^2, was used to test the hypothesis that targeted firms (by regulators) and firm characteristics are independent in the population. The null hypothesis was rejected, indicating that there is indeed a relationship between firm characteristics and reporting of problems with corrupt regulators.

Additionally, it was of interest to question whether there exist spillover effects of incidences of corruption onto other market transactions, specifically into financial market transactions. *Table 2.6* above does indicate that firms targeted for bribes report access to finance as being more problematic than firms reporting fewer problems with corrupt regulators. However, a relevant question is whether or not this fact translates into firms actively seeking out credit sources in order to meet this demand, and whether or not their access to various forms of financial resources differ significantly from those firms that are left relatively intact by regulators.

Tables 2.7 and *2.8* indicate that there is a consistent pattern of targeted firms applying for loans more frequently from all sources of credit. Equally interesting is that these same firms are refused loans, from all sources of credit, at higher relative

proportions than firms reporting few problems with corrupt regulators. While the margin of frequency is sometimes small, the overall consistency of the direction suggests that this correlation is, in fact, real.

Source of Finance	Percent of Firms that Applied for Loans		
	Firms Not Targeted for Bribes	Firms Targeted for Bribes	Likeliness of Targeted Firms Applying
Banks	36	45	More
Govt.	8	17	More
Input Supplier	38	42	More
Buyer	39	43	More
Friends/Family	41	50	More
Moneylender	11	15	More
Private Firm	7	10	More

Table 2.7 Firms Targeted for Corruption and the Demand for Finance

Source of Finance	Percent of Firms Rejected by Credit Source		
	Firms Not Targeted for Bribes	Firms Targeted for Bribes	Likeliness of Targeted Firms Being Rejected
Banks	36	48	More
Govt.	72	63	Less
Input Supplier	1	1	N/A
Buyer	0	7	More
Friends/Family	1	9	More
Moneylender	6	22	More
Private Firm	1	28	More

Table 2.8 Firms Targeted for Corruption and Rejection by Credit Source

Table 2.7 indicates that enterprises that consistently experience regulatory irregularities (*i.e.* report corruption as being problematic or highly problematic for the enterprise) are more likely to apply for loans from every type of credit source compared to firms for which regulatory anomalies are not problematic. Equally interesting is that of the firms that applied for loans from any credit source, those firms for which corruption is problematic are more likely to be rejected (overall) by the source from which they applied. While far from being conclusive, this data does suggest that there may indeed be some type of spillover effect of regulatory corruption into both formal and informal financial market transactions.

In summary, the purpose of this chapter was to familiarize the reader with the economic, legal, and institutional environment in which Russian microenterprises operate. This goal was accomplished both through a broad overview of the Russian economy, as well as by highlighting specific obstacles revealed by the survey responses.

The findings of the survey suggest that even the lowest echelon of entrepreneurs, those who 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 an impediment to business growth, although the degree to which rent-seeking impedes firms still remains somewhat opaque, given data collection limitations.

Furthermore, firms differ substantially in the degree to which they are subject to regulatory intrusions and demands for bribes. The data suggests that firms targeted by

regulators for purposes of extracting bribes systematically differ in certain characteristics from those firms that are not targeted. The theoretical reasons why, and the implications of this stylized fact, are the subjects for the coming chapters.

CHAPTER 3

THE REGULATOR AS A PRICE-DISCRIMINATING MONOPOLIST

In 1988, Klitgaard identified corruption as one of the most important problems of the developing world, and pointed out the difficulties of addressing a morally loaded problem on a subject where the literature is thin, with few theoretical frameworks, international comparisons, or careful case studies. While more than a decade has passed since Klitgaard's non-technical overview of corruption in developing countries, Svenson (2000) points out that still, despite its practical importance for many developing countries, economic studies continue to be rather limited.

Corruption typically takes place in circumstances where officials who have discretion over disbursements of public goods are tempted to corruptly charge monopoly rents. Doing so creates inefficiencies, as citizens pay "too high" a price for these goods and services (Klitgaard, 1988). One can also think of corruption as an agency problem defined as "the use of public office for private gains, where an official (the agent) entrusted with carrying out a task by the public (the principal) engages in some sort of malfeasance for private enrichment which is difficult to monitor for the principal (Bardhan, 1997)."

While the assertion that corruption is a stylized fact in most countries appears to be undisputed, those making a transition from communism are particularly at risk (Rose-Ackerman, 1999). These economies are more vulnerable because development is a process of transforming a large complex of institutions, but the culture of corruption in poor counties is at least partly a result of underdeveloped institutions (Bhagwati *et. al*., 1996).

There is little dissent that among the causes of corruption are the regulations and bureaucratic allocation of scarce public resources (Tanzi, 1998; Rose-Ackerman, 1999; Klitgaard, 1988). Indeed, it is the regulatory state with its elaborate system of permits and licenses that spawn corruption, and different degrees of insertion of the regulatory state in the economy give rise to varying amounts of it (Bardhan, 1997; DeSoto, 1989). DeSoto (1989) claims that a system of permits and regulations exist in order to give officials the power to deny them, and to collect bribes in return for providing the permits, and Tanzi (1998) points out that "when rules can be used to extract bribes, more rules will be created. Furthermore, these rules are kept intentionally opaque so that more power will remain on the side of those who enforce them."

Notwithstanding the causes, once it is entrenched in an economy, corruption becomes self-sustaining because it exhibits general equilibrium increasing returns, in the sense that an increase in rent-seeking lowers the cost of further rent-seeking (Murphy *et. al.*, 1998). Murphy *et al.* (1998) show that the technology of corruption itself exhibits increasing returns to scale.

Furthermore, corruption of a cost-increasing kind is often coercive for small enterprises and especially for new, emerging enterprises. These enterprises are often

bullied by bureaucrats and by tax inspectors into making substantial payments (Tanzi, 1998; EBRD, 1999). Furthermore, bribe taxes are very regressive (EBRD, 1999). The incidence of corruption affects smaller firms at more than twice the rate of larger firms, and the size of the bribe for small firms also is more than double the rate than for large firms. This stylized fact can likely be attributed to the control rights that regulators exude over a firm's operation, which affects who they target and how much they extract (Svensson, 1999; Schleifer and Vishny 1995).

This brief review is useful because it provides a superficial understanding of why corruption exists, who is most likely to be most affected by corrupt regulators, and features that characterize the economic relationships governing corrupt behavior. Additionally, the literature does broadly identify the most likely targets of institutionalized and pervasive corruption. However, little more than a generalized characterization exists, identifying the losers of corrupt behavior as small innovative firms, or the very poor.

Within this genre of economic players, however, the differential treatment of firms or individuals by predatory regulators is never examined, either in a theoretical or empirical manner. This objective of this dissertation, however, is to do both. By employing a unique data set on Russian microenterprises and a theoretical model that captures an observed, stylized phenomenon, I 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) use a conceptual model to explain how and why these differential transactions occur.

The variance 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 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. In a similar manner, Kauffman and Wei (1999) model corrupt bureaucrats in a Stackleberg equilibrium, where the regulator customizes the nature of harassment so that firms are more willing to pay for bribes.

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." I choose to employ a framework that incorporates a price discriminating monopolist, although one can view this in a principal-agent framework as well. The agency problem can be thought of in the following manner: the regulator (the principal) sets up an optimal contract for the entrepreneur (the agent). The contract is designed to be incentive compatible because the regulator sets the bribe price so as not to encourage the hiding of a class of agents, and not to discourage entrepreneurial effort in maximizing profits.

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. Furthermore, it is assumed that the monopolist's market is sufficiently self-contained to neglect strategic interdependency between other regulators' markets for bribes, and in this sense he ignores potential actions and reactions by the suppliers of related goods.

While this is a strong assumption, it is not without precedent. Schleifer and Vishny (1993) model the differences between cases where one single or colluding monopolist (institutionalized corruption) extracts bribes, versus independent agencies (random corruption) that ignore the effect of raising the bribe on demand for complimentary permits. In their stylized model, they present the colluding monopolist as an entity that existed under communist Russia and an independent agency as one that presently exists in post-communist Russia.

Additionally, the incorporation of other regulators' bribe demands is actually implicit in the model because each regulator does not hold perfect information on firm profits. One of the elements of this uncertainty can be thought of as how many other inspectors have demanded bribes, and the amount they have collected. Furthermore, in large urban areas such as Samara, there is likely to be little common information shared between the inspectors, and thus each inspector would continue to act as a monopolist pricing bribes under uncertainty. However, the model would have to be modified in the case of a less urban setting, where the inspectors more likely share information and thus may collude or compete as a group.

The regulator is modeled as a strong monopolist, implying that he has full control over his choice of a price function; he can set linear or non-linear prices, and can charge different prices to different buyers. In other words, he can use a sophisticated pricing scheme to pocket the entire gain from trade, restricted only by the entrepreneur's willingness-to-pay function. Furthermore, it is assumed that no one will ever doubt the credibility of his pricing policy. Once again, this assumption is grounded in preceding studies on corruption in transition economies, where it has been highlighted that significant discretionary power is given to regulatory officials charged with monitoring and enforcing compliance amongst firms (EBRD, 1999; EIU, 1999, Buckberg, 1997).

This analytical framework is appropriate for examining the problem of varying levels of regulatory-induced extortion across firms since, by definition, first degree price discrimination occurs if the monopolist charges different prices both across units and across individual customers. Ever since Pigou (1920), it has been common to equate first-degree discrimination with perfect discrimination where the monopolist generates the maximal gain from trade and captures all of it.

A perfectly discriminating monopolist must know the marginal willingness to pay of each potential customer, prevent customers from engaging in arbitrage transactions, and unambiguously convey to customers that it is pointless to haggle. All of these assumptions are relevant to a corrupt regulator, armed with discretion in enforcement, who solicits bribes.

Furthermore, to be a perfect discriminator a monopolist must be able to identify different customers and different states of nature so that it can tailor the "perfect" price schedule and price discrimination is only possible when a firm's product cannot be

resold. The limiting case is perfect discrimination: a (non-uniform) price schedule is tailored to each consumer in each state of nature to capture the entire consumer surplus. Few, if any monopolists or sellers attain this level of discrimination, however, since gathering information to identify consumers is costly. Furthermore, identifying the true "state of nature" is difficult or impossible at the time a pricing schedule must be named.

In short, price discrimination in the real world is *imperfect*, and even more so in the world of the bribe-extracting regulator, since entrepreneurs never voluntarily reveal their willingness-to-pay a bribe. Under such situations, when only the distribution of characteristics of consumers is known, we characterize the situation as one of imperfect discrimination. Individuals in such markets cannot be perfectly identified, although discrimination is nonetheless possible through the use of non-uniform pricing policies. This type of pricing structure implies that different consumers pay different average and/or marginal prices per unit of consumption, which I take as my definition of price discrimination. Within this general framework the monopolist can succeed with a simple pricing scheme in which he offers a *take-it-or-leave-it* offer.

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. Traditional models of price-discriminating monopolists, which are prolific in the literature, are not drawn upon for this analysis. This is because most of these models rely on either a demand curve for a product, or a utility function for a buyer in order to derive various prices and quantities. However, in the case of the extortionist regulator, his "customers" do not demand bribes in traditional sense, nor is

paying a bribe utility enhancing for an entrepreneur. These features make most traditional models of price-discrimination irrelevant for this problem.

3.1 Bribe-Extracting Behavior between a Regulator and an Entrepreneur

The purpose of the following 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 Russian context, this is a reasonable assumption, given that the technology needed, and often times employed, to close down a firm for one period may require nothing more than a padlock for the front door of the enterprise.

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 he decides to do so, 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 (3.1)

$$\frac{\partial \pi_H}{\partial K} > 0 \text{ if } MP_K > 0, \frac{\partial \pi_H}{\partial L} > 0 \text{ if } MP_L > 0, \frac{\partial \pi_H}{\partial T} > 0, \frac{\partial \pi_H}{\partial P_i} < 0, \frac{\partial \pi_H}{\partial P_o} > 0. \quad (3.2)$$

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. I assume 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 $[0, \pi_2]$ 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 π_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^*, 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 the 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).

I begin the analysis by describing the players' strategies and beliefs, after which I will define a perfect Bayesian equilibrium. Below, in *Figure 3.1* is provided an extensive-form representation of a simplified version of the game. In the simplified version there are only two possible values, for each period, of π (π_L and π_H), and the regulator has only two possible bribe offers in each period, b_L and b_H, where H and L represent high and low, respectively. In this simplified game, the regulator has the move at three information sets, so the regulator's strategy consists of a bribe offer in the first period, a decision of whether or not to visit the firm in the second period, and a bribe offer in the second period if the regulator does choose to visit the firm.

In the full game, as opposed to the simplified game shown below, 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, so there is a continuum of such information sets, rather than two as shown in *Figure 3.1*. At each information set, the regulator's belief is a probability distribution over these nodes. In the full game, I denote the regulator's first-period belief about the firm's profit by $\mu_1(\pi_1(K_1,L_1,T_1,P_{1i},P_{1o}))$, and the regulator's second period belief as $\mu_2(\pi_2(K_2,L_2,T_2,P_{2i},P_{2o})|\ b_1)$. 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, as the model is explained, I will assume 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 (in either the simplified or the full game). 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.

The strategies $[b_1, b_2(b_1), A_r(V_2|b_1,C)]$ and $[A_1(b_1|\pi_1), A_2(b_2|\pi_2)]$ and the beliefs $\mu_1(\pi_1)$ and $\mu_2(\pi_2| b_1)$ are a perfect Bayesian equilibrium if the satisfy the following requirements (Kreps, 1990):

1) Given their beliefs, the players' strategies must be sequentially rational. That is, at each information set the action taken by the player with the move must be optimal given the player's belief at that information set and the other players' subsequent strategies.

2) At information sets on the equilibrium path, beliefs are determined by Bayes' rule and the players' equilibrium strategies.

3) At information sets off the equilibrium path, beliefs are determined by Bayes' rule and the players' equilibrium strategies where possible.

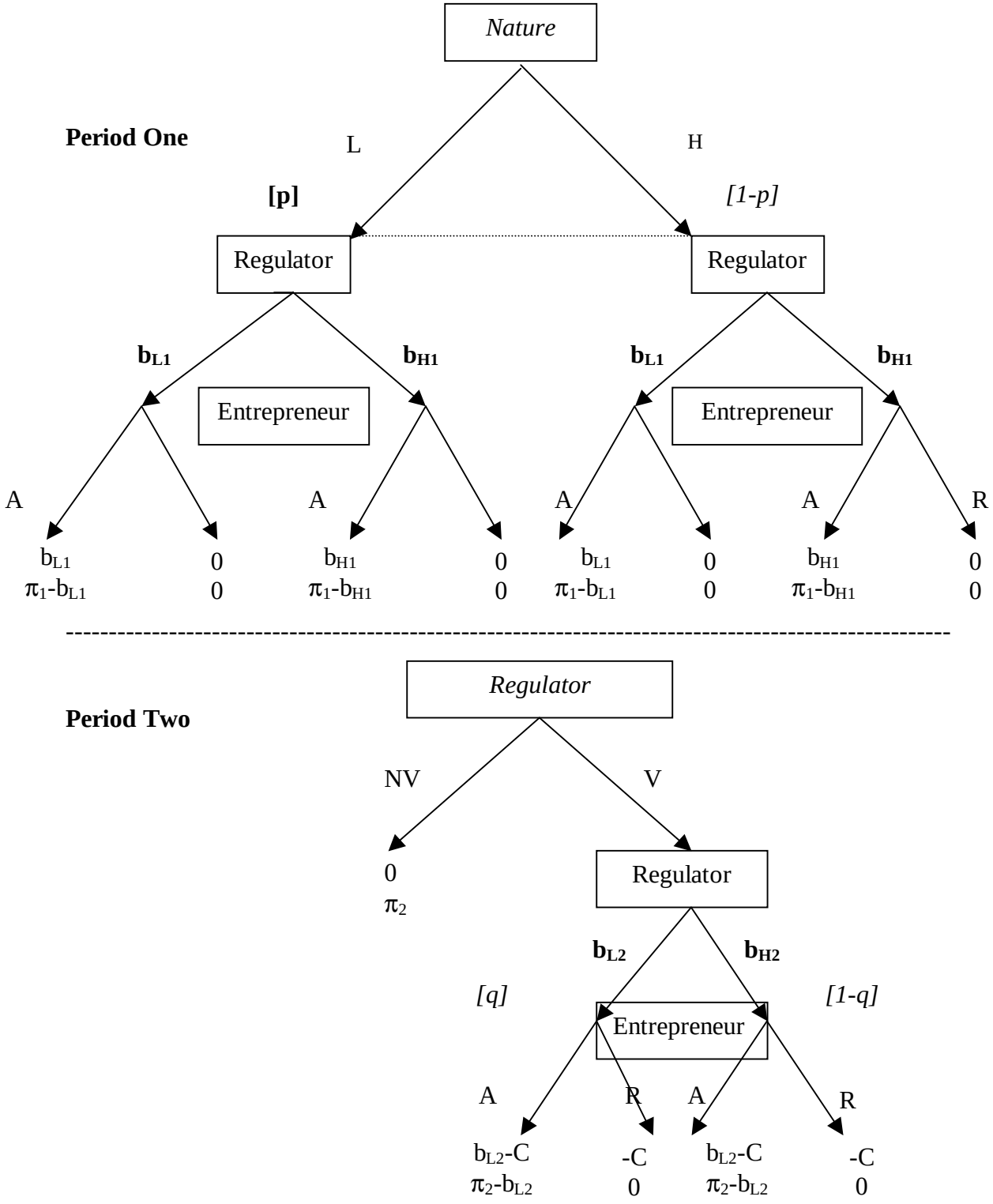

Figure 3.1: Simplified Game Between Regulator and Entrepreneur

3.2 Solving the Game for the Myopic Entrepreneur

I now more succinctly outline steps for solving the game between the regulator and the entrepreneur in the case when the entrepreneur is myopic. *Table 3.1* below summarizes the strategies and beliefs for both players over both periods of the game. *Table 3.2* provides a glossary of the notation used throughout the model.

		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	$A_2(b_2\|\pi_2)$	

Table 3.1: Strategies and Beliefs for the Regulator and the Firm

Notation	**Definition**
b_1	Bribe offer in period one by the regulator to the firm.
b_2 (b_1)	Bribe offer in period two by the regulator to the firm. Second period offer incorporates first period action of the firm.
$A_r(V_2\|b_1,C)$	Action by the regulator in second period. It is the decision of whether or not to visit the firm in period two, given the bribe paid in period one and the cost of the visit.
$\mu_1(\pi_1)$	Prior beliefs of the regulator regarding firm profits in period one.
$\mu_2(\pi_2\| b_1)$	Posterior beliefs of the regulator regarding firm profits in period two. Updated based on first period action of the firm.
$A_1(b_1\|\pi_1)$	Action of the firm regarding whether to accept or reject first period offer. Based on true level of firm profit in the myopic case.
$A_2(b_2\|\pi_2)$	Action of the firm regarding whether to accept or reject second period offer.

Table 3.2 Notational Definitions Used in Bayesian Game

The simplest step to solving the game is to apply rule 1) to the firm's second-period decision, $A_2(b_2|\pi_2)$: since this is the last move of the game, the optimal decision for the firm is to accept b_2 if and only if $\pi_2 > b_2$. Thus, the firm's second period strategy is always:

$$A_2(b_2 \mid \pi_2) = \begin{cases} 1 \text{ if } \pi_2 - b_2 \geq 0 \\ 0 \text{ otherwise} \end{cases} \tag{3.3}$$

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 apply rule 1) to the regulator's second period choice of a bribe offer: 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 challenge is to determine the belief $\mu_2(\pi_2| b_1)$.

I begin by temporarily considering the following one-period problem for exposition. In the one-period problem, suppose the regulator believes that the firm's profit is uniformly distributed on $[0, \pi_1]$, where π_1 is a function of capital, labor, technology, and factor prices. If the regulator offers b_1, then the firm's best response is clear: accept b_1 if and only if $\pi_1 > b_1$. Thus the regulator's problem can be stated as:

$$\underset{b_1}{Max}\, b_1 \bullet \Pr\{\text{firm accepts } b_1\} + 0 \bullet \Pr\{\text{firm rejects } b_1\}, \tag{3.4}$$

where $\Pr\{\text{firm accepts } b_1\} = (\pi_1 - b_1)/\pi_1$ for the relevant range of bribe offers. The optimal bribe offer is therefore $b^*(\pi_1) = \pi_1/2$. This outcome is illustrated in *Figure 3.2* below.

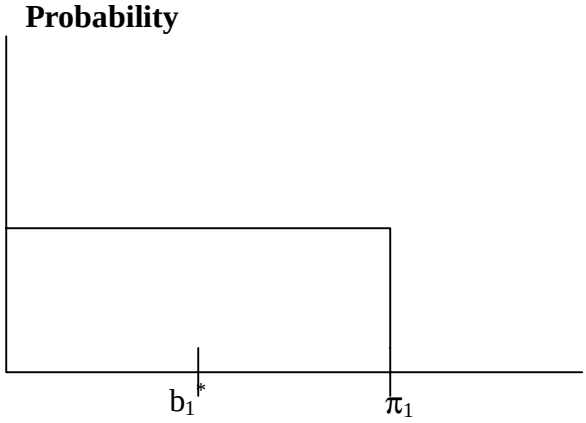

Figure 3.2: Probability Distribution (*i.e.* Regulator's prior beliefs) about first period firm profits and optimal first-period bribe for the one-period problem.

Since requirement 2 dictates that the firm act optimally given the players' strategies, we can derive $A_1(b_1|\pi_1)$ for an arbitrary value of b_1. Recall that for arbitrary values of b_1 and b_2, if the regulator offers b_1 in the first period, the firm's payoffs are π_1-b_1 if she accepts and 0 if she rejects. As long as $\pi_1 - b_1 > 0$, then the firm will accept the bribe. The firm will be exactly indifferent between accepting and rejecting if $\pi_1 = b_1$. (Note that for the myopic entrepreneur, strategies in the first and second periods are identical). In other words:

$$A_1(b_1 \mid \pi_1) = \begin{cases} 1 \text{ if } \pi_1 - b_1 \geq 0 \\ 0 \text{ otherwise} \end{cases} \qquad (3.5)$$

We can now derive $\mu_2(\pi_2|b_1)$ for the regulator's second period belief at the information set reached if b_1 is rejected. In the case where the first period bribe offer was rejected, the regulator believes that π_2 is now uniformly distributed on $[0, \pi_1(b_1)]$ where $\pi_1(b_1)$ is the value of π where the firm is just indifferent between accepting b_1, and

rejecting it, namely $\pi_1(b_1) = \pi_H/2=b_1$, as computed in the one-period problem. Thus, given the first part of the firm's strategy, $A_1(b_1|\pi_1)$ just derived, the regulator's belief must be that the types remaining in the second period are uniformly distributed on $[0,\pi_1]$, where $\pi_1=b_1$. The regulator's posterior beliefs about the distribution of profit when the first period bribe is rejected are shown in *Figure 3.3* below.

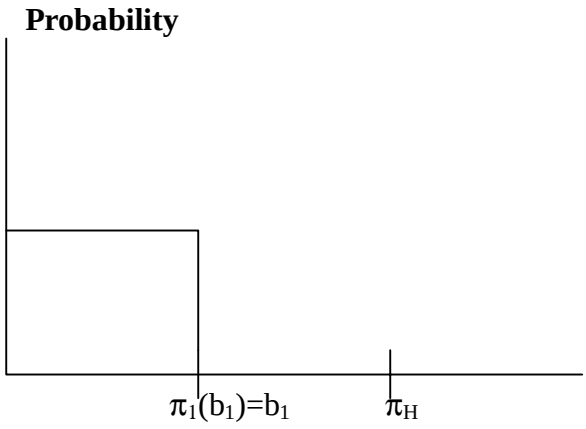

Figure 3.3: Probability Distribution (i.e. Regulator's posterior beliefs) of second period firm profits when the entrepreneur rejects the first-period bribe.

Given this belief, the regulator's optimal second period offer must be;
$b_2^*(\pi_1(b_1))=\pi_1/2=b_1/2$, which is shown in *Figure 3.4* below.

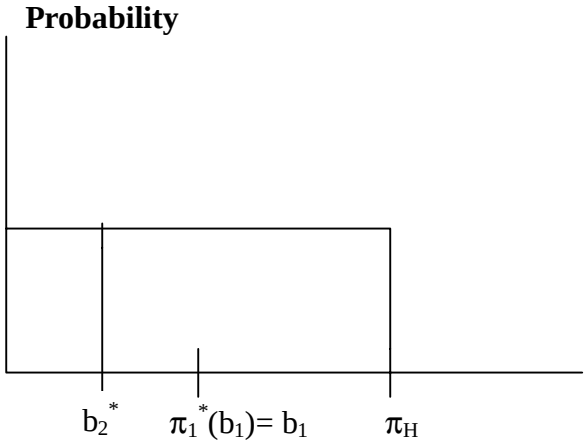

Figure 3.4: Optimal bribe in second period, given Regulator's posterior beliefs of second period firm profits when the entrepreneur rejects the first-period bribe.

In a similar manner, we can derive $\mu_2(\pi_2|b_1)$, the regulator's second period belief at the information set reached if the first period offer of b_1 was accepted. Requirement 4 implies that the correct belief is that π is uniformly distributed on $[\pi_1(b_1), \pi_H]$, where $\pi_1(b_1)$ is the value of profit such that the firm is indifferent between accepting b_1 and rejecting it, namely $\pi_1(b_1)=\pi_H/2=b_1$ as computed in the one-period problem. To see this, again, recall that requirement 2 dictates that the regulator's belief be determined by Bayes' rule and the firm strategy. Given the first part of the firm's strategy, $A_1(b_1|\pi)$, the regulator's belief must be that the types remaining in the second period are uniformly distributed on $[\pi_1,\pi_H]$, where $\pi_1=b_1$. Given this belief, the regulator's optimal second period offer must be;

$$b_2^* = \frac{3\pi_H}{4} = \frac{3b_1}{2} \qquad (3.6)$$

where b_2^* is the solution to the following maximization problem;

$$\underset{b_2}{Max}\, b_2 \bullet \Pr\{\text{firm accepts } b_2 \mid \text{firm accepted } b_1\} \tag{3.7}$$

where;

$$\Pr\{\text{firm accepts } b_2 \mid \text{firm accepted } b_1\} = \frac{\pi_H - (b_2 - b_1)}{\pi_H}. \tag{3.8}$$

The solution to this problem is depicted in *Figure 3.5* below.

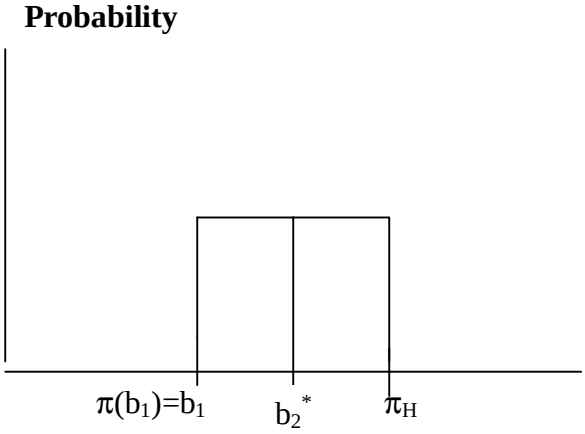

Figure 3.5: Optimal bribe in second period, given Regulator's posterior beliefs of second period firm profits when the entrepreneur accepted the first-period bribe.

One can now summarize the perfect Bayesian equilibrium of the two period bribe game with incomplete information, which is shown in the *Table3.3* below.

Period One	Prior belief about the probability of firm accepting offer of b_1 $\frac{\pi_H - b_1}{\pi_H}$	Prior belief about the probability of firm rejecting offer of b_1 $\frac{b_1}{\pi_H}$
	$b_1^* = \frac{\pi_H}{2}$	$b_1^* = \frac{\pi_H}{2}$
Period Two	Posterior belief about the probability of firm accepting offer of b_2 if accepted b_1 $\frac{\pi_H - (b_2)}{\pi_H}$	Posterior belief about the probability of firm accepting offer of b_2 if rejected b_1 $\frac{\pi_1(b_1) - b_2}{\pi_H}$
	b_2^* if firm accepted b_1 $b_2^* = \frac{3\pi_H}{4} = \frac{3b_1}{2}$	b_2^* if firm rejected b_1 $b_2^* = \frac{\pi_H}{4} = \frac{b_1}{2}$

Table 3.3: Beliefs and optimal bribes offered by the regulator given myopic firm strategies, characteristics and actions

3.3 Solving the Game for the Longsighted Entrepreneur

The myopic problem described above, while insightful, is an extremely simplistic way of modeling firm strategies, and is incorporated mostly for illustrative purposes. Unless entrepreneurs have extremely low discount rates, it is unlikely that they do not include the second-period signal that their actions give to the regulator in their decision-making process. Instead, the following additional model incorporates forward thinking into the strategy of the entrepreneur. In this model, firms take into account how the

accepting or rejecting of a first period bribe might affect the bribe price they will pay in the following period, significantly influencing their strategy. Another factor influencing a firm's decision is the 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;

$$A_r(V_2|b_2(b_1))= \begin{cases} 1 \text{ if } b_2(b_1) \geq C \\ 0 \text{ otherwise} \end{cases} \qquad (3.9)$$

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 will always return 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. Firm strategies according to the costs of regulator visits and relative payoffs are shown in *Table 3.4* below.

Type of Firm	**Cost to the Regulator of Visiting**	**Firm Strategy (*i.e.* accepts b1 if)**
High Cost Firm	$C > b_2(b_1 \mid a_1)$	$\pi_1 > b_1$
Medium Cost Firm	$b_2(b_1 \mid a_1) > C > b_2(b_1 \mid r_1)$	$\pi_1 > b_1 + \delta b_2(b_1 \mid a_1)$
Low Cost Firm	$C < b_2(b_1 \mid r_1)$	$\pi_1 > b_1 + \delta(b_2(b_1 \mid a_1) - b_2(b_1 \mid r_1))$

Table 3.4 Firm Strategies in the Forward Looking Case

For each of the three classes of firms described above, I now 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 strategy and equilibrium first period bribe is identical to the first period myopic case in which the discount rate was zero. In this case, the regulator simply sets first period bribe according to the following maximization problem;

$$\underset{b_1}{\text{Max}}\, b_1 \bullet \Pr\{\text{firm accepts } b_1\} + 0 \bullet \Pr\{\text{firm rejects } b_1\} \qquad (3.10)$$

where;

$$\Pr\{\text{firm accepts } b_1\} = \frac{\pi_H - b_1}{\pi_H} \tag{3.11}$$

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 firms, 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.

$$\pi_1 - b_1 \geq \delta[(\pi_2 - b_2(b_1 \mid r_1)) - (\pi_2 - b_2(b_1 \mid a_1))] \tag{3.12}$$

$$\pi_1 \geq b_1 + \delta[(\pi_2 - b_2(b_1 \mid r_1)) - (\pi_2 - b_2(b_1 \mid a_1))] \tag{3.13}$$

$$\pi_1^*(b_1, b_2) = b_1 + \delta\big(b_2(b_1 \mid a_1) - b_2(b_1 \mid r_1)\big) \tag{3.14}$$

Note that the left-hand side (LHS) of equation 3.12 reflects the payoffs from paying the bribe in period one, while the right-hand side (RHS) 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 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.

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 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:

$$b_2(b_1 \mid a_1) = \frac{3\pi_1}{2} \text{ and } b_2(b_1 \mid r_1) = \frac{3\pi_1}{2} \text{ and} \tag{3.15}$$

$$\pi_1 = \pi_1^*(b_1, b_2(b_1 \mid a_1), b_2(b_1 \mid r_1)) \tag{3.16}$$

This then implies that:

$$\pi_1 = b_1 + \delta\left(\frac{3\pi_1}{2} - \frac{\pi_1}{2}\right) \tag{3.17}$$

$$\text{and } \pi_1 = \frac{b_1}{1-\delta}, b_2(b_1 \mid r_1) = \frac{b_1}{2(1-\delta)}, b_2(b_1 \mid a_1) = \frac{3b_1}{2(1-\delta)} \tag{3.18}$$

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

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

where:

$$\Pr\{\text{firm accepts } b_1\} = \frac{\pi_H - \pi_1(b_1)}{\pi_H} \tag{3.19}$$

$$\Pr\{\text{firm rejects } b_1 \text{ but accepts } b_2\} = \frac{\pi_1(b_1) - b_2(b_1 \mid r_1)}{\pi_H} \tag{3.20}$$

$$\Pr\{\text{firm accepts } b_1 \text{ and accepts } b_2\} = \frac{\pi_H - b_2(b_1 \mid a_1)}{\pi_H} \tag{3.21}$$

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

$$b_1^* = -\frac{(\delta+2)(\delta-1)}{4(1+\delta)}\pi_H \tag{3.22}$$

$$b_2^*(b_1 \mid r_1) = -\frac{(\delta+2)(\delta-1)}{4(1+\delta)(2-2\delta)}\pi_H \tag{3.23}$$

$$b_2^*(b_1 \mid a_1) = -\frac{3(\delta+2)(\delta-1)}{4(1+\delta)(2-2\delta)}\pi_H \tag{3.24}$$

$$\pi_1^* = -\frac{(\delta+2)(\delta-1)}{4(1+\delta)(1-\delta)}\pi_H \tag{3.25}$$

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 medium cost firm's optimal strategy is to accept b_1, if and only if:

$$\pi_1 - b_1 \geq \delta[(\pi_2 - (\pi_2 - b_2(b_1 \mid a_1))] \tag{3.26}$$

$$\pi_1 \geq b_1 + \delta(b_2(b_1 \mid a_1)) \tag{3.27}$$

$$\pi_1^*(b_1, b_2(b_1 \mid a_1)) = b_1 + \delta(b_2(b_1 \mid a_1) \tag{3.28}$$

Again, for arbitrary values of b_1 and b_2, firms with $\pi > \pi_1^*(b_1, b_2(b_1|a_1)$ will accept b_1 and firms with $\pi < \pi_1^*(b_1, b_2(b_1|a_1)$ will reject it, where $b_2(b_1|a_1)$ is the second period offer. Note that there is no second period offer in the case where the firm rejects first period offer, since it is cost-prohibitive for the regulator to return to the firm. Deriving $\mu_2(\pi|b_1)$ is identical to the low-cost problem described above. If the first period offer is accepted, the regulator's belief is that the types remaining in the second period are uniformly distributed on $[\pi_1, \pi_H]$ where $\pi_1 = \pi_1^*(b_1, b_2(b_1|a_1))$, and $b_2(b_1|a_1) = \frac{3\pi_1}{2}$ as derived in the myopic problem. This then implies that:

$$\pi_1^*(b_1, b_2(b_1 \mid a_1)) = b_1 + \delta(\frac{3\pi_1}{2}) \tag{3.29}$$

From this, it is easy to see that:

$$\pi_1 = \frac{2b_1}{(2 - 3\delta)} \tag{3.30}$$

$$b_2(b_1 \mid a_1) = \frac{3b_1}{(2 - 3\delta)} \tag{3.31}$$

$$b_2(b_1 \mid r_1) = 0 \tag{3.32}$$

Once again, finding the optimal bribes for the medium cost firms reduces down to a single period maximization problem, as shown below:

$$\underset{b_1}{Max}\, b_1 \bullet \Pr\{\text{firm accepts } b_1\} + \delta \bullet b_2(b_1 \mid a_1) \bullet \Pr\{\text{firm accepted } b_1 \text{ and accepts } b_2\} +$$
$$0 \bullet b_2(b_1 \mid r_1) \bullet \Pr\{\text{firm rejected } b_1 \text{ but accepts } b_2\}$$

where;

$$\Pr\{\text{firm accepts } b_1\} = \frac{\pi_H - \pi_1(b_1)}{\pi_H} \tag{3.33}$$

$$\Pr\{\text{firm accepts } b_1 \text{ and accepts } b_2\} = \frac{\pi_H - b_2(b_1 \mid a_1)}{\pi_H} \tag{3.34}$$

The solution to the maximization problem for the medium cost firms is:

$$b_1^* = -\frac{(-2+3\delta)}{(4+3\delta)}\pi_H \tag{3.35}$$

$$b_2^*(b_1 \mid r_1) = 0 \tag{3.36}$$

$$b_2^*(b_1 \mid a_1) = -\frac{3(-2+3\delta)}{(4+3\delta)(2-3\delta)}\pi_H \tag{3.37}$$

$$\pi_1^* = -\frac{2(-2+3\delta)}{(4+3\delta)(2-3\delta)}\pi_H \tag{3.38}$$

A summary of equilibrium bribes and indifference profits is shown in *Table 3.5* below.

Firm Type	$\mathbf{b_1^*}$	$\mathbf{b_2^*(b_1|a_1)}$	$\mathbf{b_2^*(b_1|r_1)}$	$\mathbf{\pi_1^*}$
High Cost	$\frac{\pi_H}{2}$	0	0	$\frac{\pi_H}{2}$
Med. Cost	$-\frac{(-2+3\delta)}{(4+3\delta)}\pi_H$	$-\frac{3(-2+3\delta)}{(4+3\delta)(2-3\delta)}\pi_H$	0	$-\frac{2(-2+3\delta)}{(4+3\delta)(2-3\delta)}\pi_H$
Low Cost	$-\frac{(\delta+2)(\delta-1)}{4(1+\delta)}\pi_H$	$-\frac{3(\delta+2)(\delta-1)}{4(1+\delta)(2-2\delta)}\pi_H$	$-\frac{(\delta+2)(\delta-1)}{4(1+\delta)(2-2\delta)}\pi_H$	$-\frac{(\delta+2)(\delta-1)}{4(1+\delta)(1-\delta)}\pi_H$

Table 3.5 Equilibrium bribes and indifference profits by type of firm

It is obvious from *Table 3.5* that there are multiple equilibrium generated by this model. While these multiple functions themselves do not generate an immediate intuitive result, one can see that bribe offers will clearly differ among firms of different types or classes, depending on idiosyncratic characteristics. Among these heterogeneous characteristics are individual discount rates, selected production technologies that are translated into profit distributions beliefs on the part of the regulator, and idiosyncratic visit costs that are exogenously determined.

A brief note on the impact of the distributional assumptions of this model are in order. The choice of a uniform distribution as the analytical basis on which the regulator makes decisions is not without consequences. In fact, the distribution of perceived profits by the regulator matters. In this analysis, the effect of the second and third

moments of the distribution on the optimal bribe offer are not addressed. However, despite the type of distribution, the optimal bribe chosen will always fall at the median (not the mean), and in this sense bribe offers are somewhat robust to alternative distributional choices for the theoretical model and resulting simulations. It should be noted, however, that the distributional assumptions affect simulated solutions both across and within members of a class of firms.

It is in Chapter Four that the comparative statics, welfare effects, and an extension of the model illustrate how relative and absolute changes in certain firm characteristics alter the equilibrium bribe offered to (and paid by) any one firm. However, it is useful to recall that one of the main goals of this dissertation was to theoretically explain the observed stylized phenomenon of differentiated bribe offers and payments across firms. In this sense, this chapter has accomplished that goal.

CHAPTER 4

COMPATATIVE STATICS, WELFARE EFFECTS, AND EXTENSIONS

4.1 Comparative Statics

The optimal bribe values derived in Chapter 4 clearly show that the equilibrium bribe and the number of times that an entrepreneur will be charged differs among firms depending 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. This chapter examines how the specific bribe values change (*i.e.* the direction of the change), the magnitude of the change, and the difference in these values by firm characteristic. I begin by examining how optimal bribes and indifference profits vary according to changes in an entrepreneur's discount rate by examining the derivative of these values with respect to the entrepreneur's discount rate, δ. These derivatives are summarized in *Tables 4.1-4.4* below.

There are several obvious issues worth briefly noting that are illustrated in the tables below. The first of these is that for high cost visit firms, the discount rate of the entrepreneur is not relevant in the first or second period decision. Additionally, in the medium cost firms, the discount rate influences only the first-period bribe and the second period bribe when the first was accepted. Finally, it is clear from these tables that an entrepreneur's discount rate is inversely related to the size of the bribe that she will be

charged, in either the first or second periods when applicable. 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.

Firm Type	$\frac{\partial \mathbf{b_1^*}}{\partial \boldsymbol{\delta}}$	**Sign (for 0<δ<1)**
High Cost	0	Zero
Medium Cost	$\frac{-3\pi_{H}}{4+3\delta}+\frac{3(-2+3\delta)\pi_{H}}{(4+3\delta)^2}$	Negative
Low Cost	$\frac{-(\delta-1)\pi_{H}}{4(1+\delta)}-\frac{\delta+2}{4(1+\delta)}+\frac{4(\delta+2)(\delta-1)\pi_{H}}{(4+4\delta)^2}$	Negative

Table 4.1 Derivatives of first-period optimal bribes with respect to changes in the entrepreneur's discount rate, by firm type.

Firm Type	$\frac{\partial b_2^*(b_1 \mid a_1)}{\partial \delta}$	Sign (for 0<δ<1)
High Cost	N/A-There is no second-period visit.	N/A
Med. Cost	$\frac{9\pi_{H}}{(4+3\delta)(2-3\delta)}\left[\frac{(-2+3\delta)}{(4+3\delta)}-\frac{(-2+3\delta)}{(2-3\delta)}-1\right]$	Negative
Low Cost	$\frac{3\pi_{H}}{4(1+\delta)(2-2\delta)}\left[-(\delta-1)-(\delta+2)+\frac{(\delta+2)(\delta-1)}{(1+\delta)}-2\frac{(\delta+2)(\delta-1}{(2-2\delta)}\right]$	Negative

Table 4.2 Derivatives of second period bribes when first period bribe was accepted with respect to changes in the entrepreneur's discount rate, by firm type.

Firm Type	$\frac{\partial \mathbf{b}_2^*(\mathbf{b}_1 \mid \mathbf{r}_1)}{\partial \boldsymbol{\delta}}$	Sign (for $0<\delta<1$)
High Cost	N/A-There is no second period visit.	N/A
Med. Cost	N/A-There is no second period visit.	N/A
Low Cost	$\frac{\pi_{\text{H}}}{4(1+\delta)(2-2\delta)}\left[-(\delta-1)-(\delta+2)+\frac{(\delta+2)(\delta-1)}{(1+\delta)}-2\frac{(\delta+2)(\delta-1}{(2-2\delta)}\right]$	Negative

Table 4.3 Derivatives of second period bribes when first period bribe was rejected with respect to changes in the entrepreneur's discount rate, by firm type.

Firm Type	$\frac{\partial \pi_1^*}{\partial \delta}$	Sign (for $0<\delta<1$)
High Cost	0	Zero
Med. Cost	$\frac{6\pi_{\text{H}}}{(4+3\delta)(2-3\delta)}\left[\frac{(-2+3\delta)}{(4+3\delta)}-\frac{(-2+3\delta)}{(2-3\delta)}-1\right]$	Negative
Low Cost	$\frac{\pi_{\text{H}}}{4(1+\delta)(1-\delta)}\left[(\delta-1)-(\delta+2)+\frac{(\delta-1)(\delta+2)}{(1+\delta)}-\frac{(\delta-1)(\delta+2)}{(1-\delta)}\right]$	Negative

Table 4.4 Derivatives of indifference profits with respect to changes in the entrepreneur's discount rate, by firm type.

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.

Alternatively, one could conceive of the discount rate as being an average over all firms, which reflects the stability of the overall economy. Thus, in highly stable economic environments we would expect the rate to be high, whereas in environments frequently characterized by economic or natural shocks, the average would be much lower. For the remainder of the dissertation, however, I will rely on the former, rather than the latter, interpretation of δ, which is consistent with the discount rate varying across individual firms.

While the above result is comfortably intuitive, merely examining the negative sign associated with the derivatives of bribes and indifference profits with respect to the discount rate does not address several key issues that are of particular interest; 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.

Figure 4.1 below visually captures these issues by showing changes in first period and second period bribe offers with changes in the discount rate. The graphs shows the results of a simulation in which firm profit distributions are artificially set at 100, and the discount rate is allowed to vary between zero and one, for all three types of firms. The

most distinctive aspect is the sharp distinction between the high cost firm vis-à-vis the medium and low cost firms. The high cost firm is charged exactly the indifference profit level, this amount is invariant to changes in the discount rate, and there is no second period bribe offer.

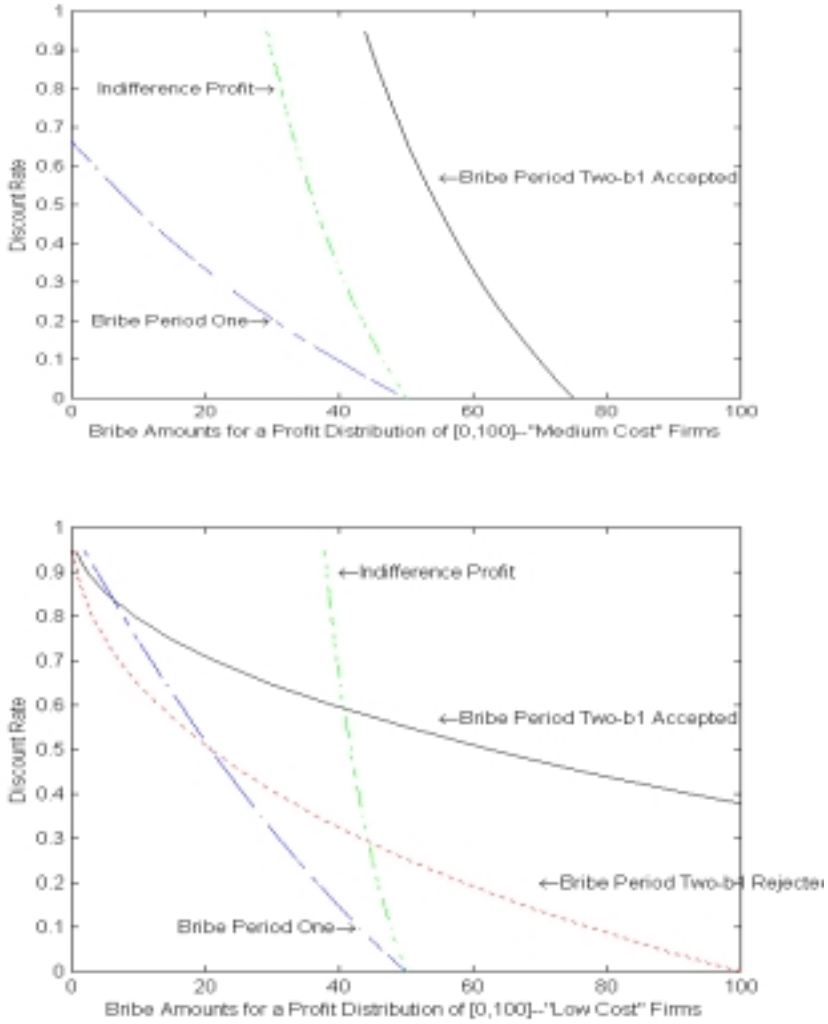

Figure 4.1 Changes in bribes charged as entrepreneur's discount rate changes for different firm types

The invariance of the bribe offer to the discount rate makes sense when one considers that the high cost firm never takes the second period offer into account, since by definition, the firm will not be visited in the second period. Also notable is that the first period bribe for the high cost firm is always greater than first period bribe for the medium and low cost firms, since the regulator need not worry about the entrepreneur incorporating the discounted future value of not paying the bribe into their payment strategy.

An examination of the medium and low cost firms is slightly more interesting, however. To begin with, note that from *Figure 4.1*, and more readily seen in *Figure 4.2* below, first-period bribes are everywhere greater for low cost firms than for medium cost firms. Once again, this is intuitive.

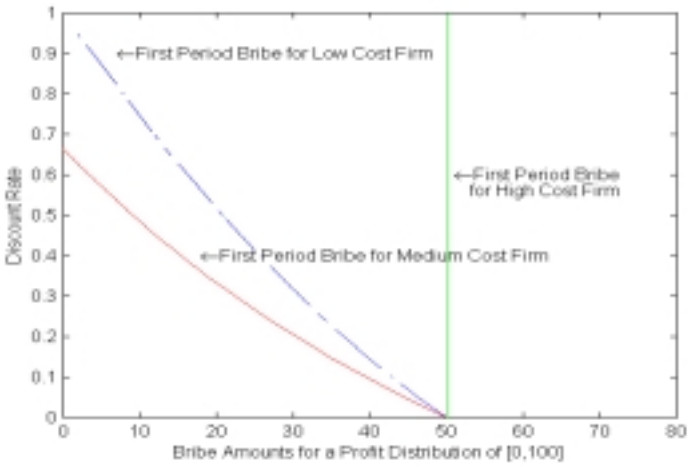

Figure 4.2 First period bribes for low, medium, and high cost firms with changes in the discount rate

This is because the more that the medium cost visit firm cares about the future, the higher the losses are from paying the first period bribe (as compared to the low cost visit firm), and the more she will need to be compensated (compared to the low cost firm) with a smaller bribe offer. Additionally, from the graph above we can see that the higher the discount rate, the more these values diverge. Also, one can observe that the medium cost visit firm's bribe offer drops to zero at relatively high discount values. 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 interesting aspect of this exercise is to compare bribe outcomes in the second period according to the firm's first-period actions, the cost structure of regulatory visits, and the firm-specific discount rate. *Figure 4.3* below captures these differences.

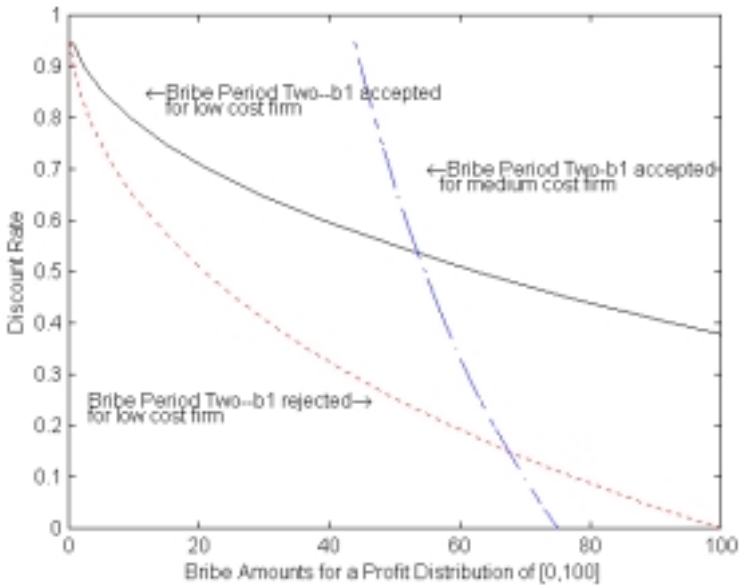

Figure 4.3 Second Period Bribes for Low and Medium Cost Firms

The most obvious component of this graph is that, for low cost firms, bribes are higher (lower) in the second period, depending on whether or not the firm accepted (rejected) the bribe in the first period. (Remember that for medium cost firms, the firm does not pay a bribe in the second period in case of first period rejection, since it is too costly for him to return in period two.) More interesting, however, is that in the case of acceptance of the first-period offer, medium cost visit firms will everywhere be offered lower second-period bribes compared to low cost visit firms in the second period for low values of δ (less than .56 in this example), but will pay higher bribes in second period for higher values of δ (greater than .56 in this example). However, this outcome makes sense when recalling that the medium cost firm's first period offer was everywhere lower, because the firm is compensated for a smaller bribe in first period due to the higher losses incurred in second period. In a sense, this graph just illustrates the equalization of bribe offers over two periods to the different types of firms.

Another important aspect of this exercise is to identify the totality of bribe offers, since a separate examination of first and second period provides only a partial perspective of the dynamic outcomes of bribe offers. Total bribes for both periods are shown in *Figure 4.4* below.

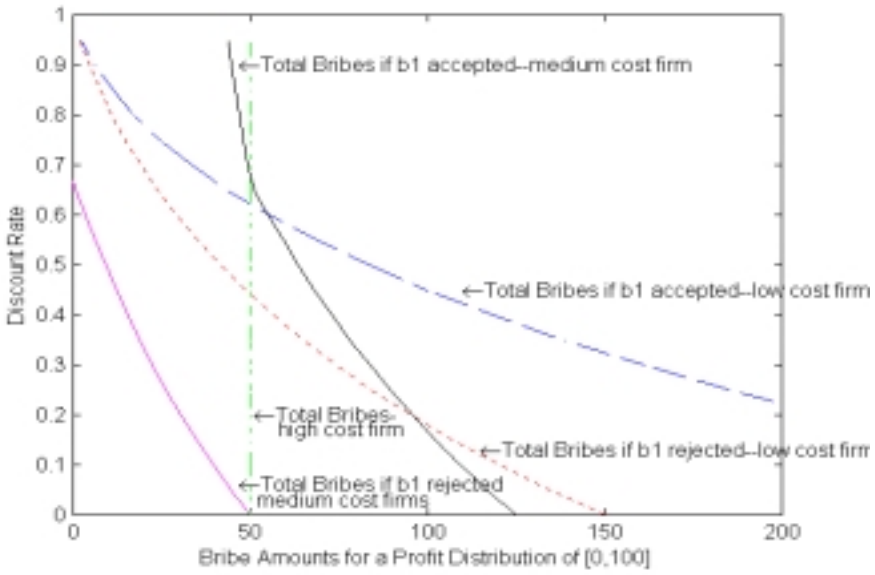

Figure 4.4 Total Bribe Amounts for High, Medium, and Low Cost Firms

A few sentences are in order, in order to clarify and summarize the graph above. For firm-specific high discount rates (above .7 in this example), high cost visit firms are offered the highest total bribes, across both periods. Also, for higher discount rates (same as above), medium cost visit firms are offered more total bribes across periods under a first period acceptance than low-cost firms. As the discount rate drops, so does the ordering of bribe offers to firms of varying types. *The most important point of this graph, however, 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. Indeed there are several aspects to this issue that merit some discussion. One issue to examine how changes in the perceived profit distribution affect bribe offers to firm types of different types.

It is straightforward to calculate the derivative of bribe offers and indifference profits across firm types, simply by glancing at the optimal bribe offers themselves. From *Table 3.4* earlier, we can easily observe the derivatives of optimal bribes and indifference profits with respect to changes in the profit distribution. These values are shown in *Table 4.5* below.

Firm Type	$\frac{\partial \mathbf{b}_1^*}{\partial \boldsymbol{\pi}_H}$	$\frac{\partial \mathbf{b}_2^*(\mathbf{b}_1 \mid \mathbf{a}_1)}{\partial \boldsymbol{\pi}_H}$	$\frac{\partial \mathbf{b}_2^*(\mathbf{b}_1 \mid \mathbf{r}_1)}{\partial \boldsymbol{\pi}_H}$	$\frac{\partial \boldsymbol{\pi}_1^*}{\partial \boldsymbol{\pi}_H}$
High Cost	$\frac{1}{2}$	0	0	$\frac{1}{2}$
Med. Cost	$-\frac{(-2+3\delta)}{(4+3\delta)}$	$-\frac{3(-2+3\delta)}{(4+3\delta)(2-3\delta)}$	0	$-\frac{2(-2+3\delta)}{(4+3\delta)(2-3\delta)}$
Low Cost	$-\frac{(\delta+2)(\delta-1)}{4(1+\delta)}$	$-\frac{3(\delta+2)(\delta-1)}{4(1+\delta)(2-2\delta)}$	$-\frac{(\delta+2)(\delta-1)}{4(1+\delta)(2-2\delta)}$	$-\frac{(\delta+2)(\delta-1)}{4(1+\delta)(1-\delta)}$

Table 4.5 Derivatives of Optimal Bribes and Indifference Profits with respect to Changes in the Perceived Profit Distribution

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 4.5* shows how changes in the bribe offered in first period differ among firm types as perceived profit distributions change. We can see that the payment ordering is not symmetric to cost structure, *i.e.* high cost firms are offered the highest bribe, followed by low cost firms, with medium cost enterprises receiving the smallest offer price for all levels of perceived profit distributions. Furthermore, the relatively steep slope for the medium cost firms' bribe function suggests that higher perceived profit distributions translate into relatively small increases in the bribe price for this cohort. Note that this is not the case for low and high cost firms.

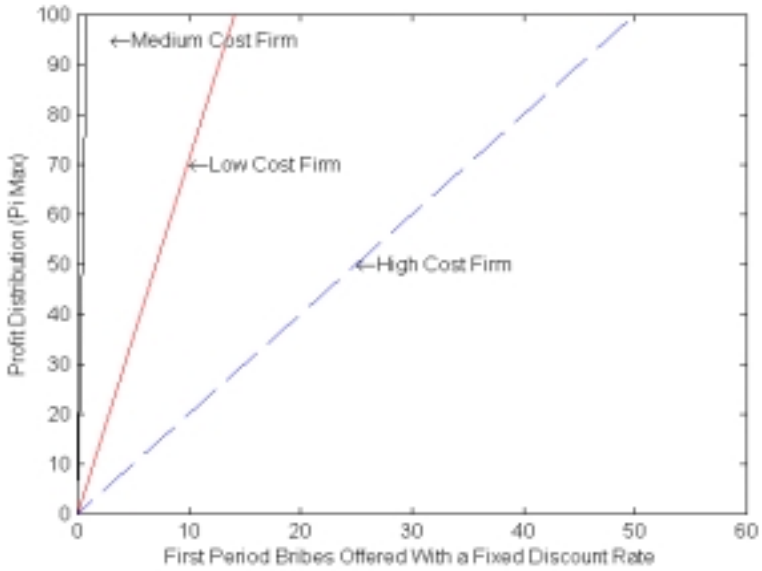

Figure 4.5 First Period Bribes with Changes in the Perceived Profit Distribution of the Regulator for High, Medium, and Low Cost Firms (δ=.65)

Similarly, *Figures 4.6* and *4.7* below show how second period bribes change with changes in the perceived profit distribution of the regulator. However, in the second period, the ordering of bribe prices in not invariant to the discount rate. Note that as the discount rate falls (from .65 to .5 as shown in these two examples below), the medium cost firm bribe price drops below that of the low cost firm. These results suggest that it is necessary to examine the simultaneous effects of changes in the perceived profit distribution and the discount rate on the bribe prices offered in first and second period.

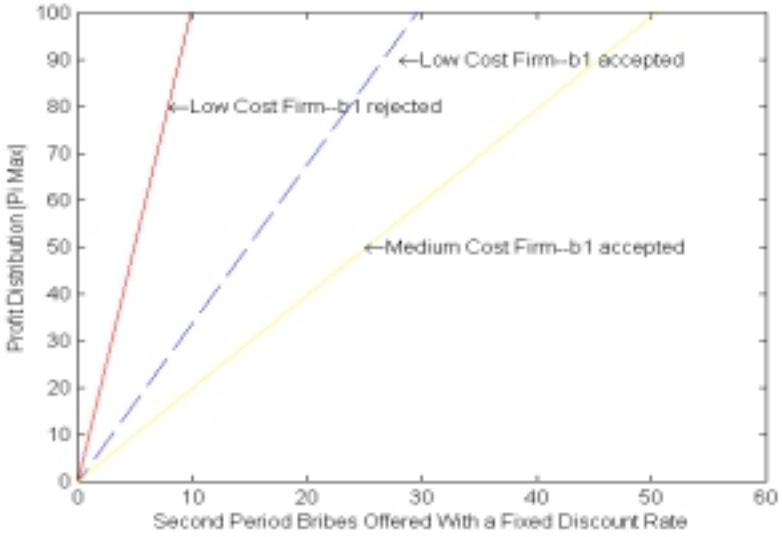

Figure 4.6 Second Period Bribes with Changes in the Perceived Profit Distribution of the Regulator (δ=.65)

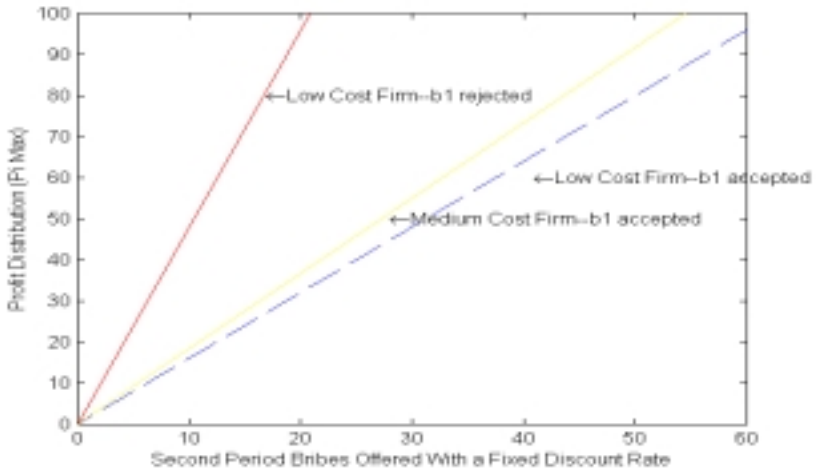

Figure 4.7 Second Period Bribes with Changes in the Perceived Profit Distribution of the Regulator (δ=.5)

The simultaneous effect of changes in perceived profit and the discount rate are captured in the three dimensional graphs shown below.

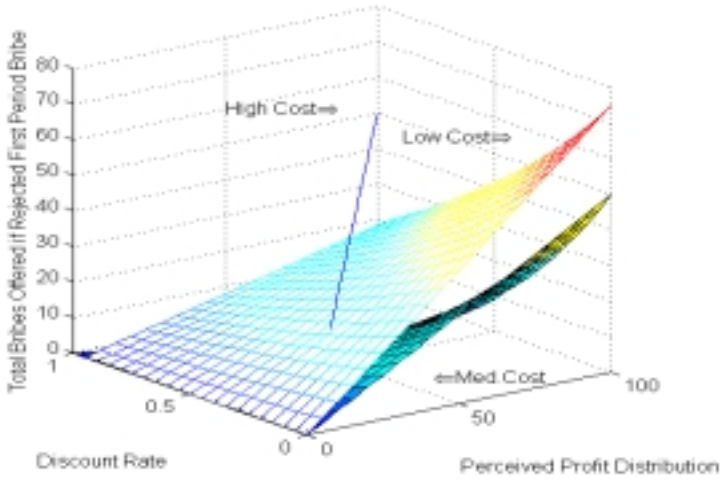

Figure 4.8 Total Bribes Offered if Firm Rejected in First Period by Firm Size

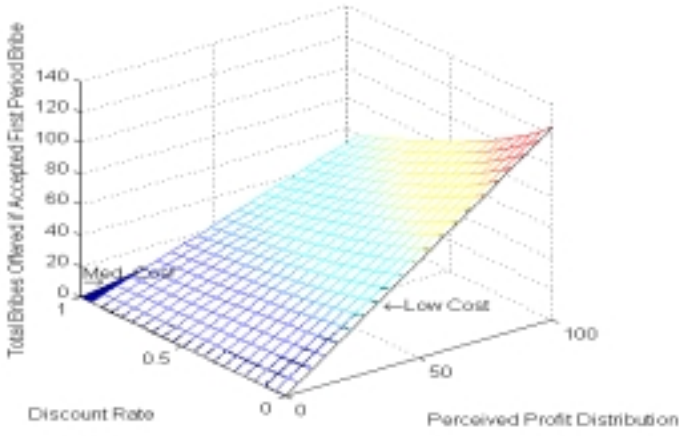

Figure 4.9 Total Bribes Offered if Firm Accepted First Period by Firm Size

These two figures show that, 1) as profit distributions increase, bribe offers increase commensurately for all types of firms, 2) regardless of whether first period bribes were accepted or rejected, as profit distributions increase, the differences between the low and medium cost firms narrows, until eventually, at very high discount rates, the values converge, and 3) the increase in bribe offers from increases in profit distributions is muted at higher discount rates for the entrepreneur.

What is of importance to consider when examining the comparative statics exercise with respect to the profit distribution is to remember from Chapter 3 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. To assert that changes in a firm's production technology cause changes in π_H, which then cause equilibrium bribes for all firm types to increase, is a tautological statement, since it rests on a contrived assumption that such is the case. However, if one does find the assumption plausible, then the derivative of bribe prices and quantities with

respect to changes in the profit distribution perceived by the regulator become much interesting.

Without invoking a specific production function for any one type of firm, one can only broadly characterize how changes in factor inputs shift out the perceived profit distribution of the regulator. However, it is relevant to consider more than simply $\frac{\partial b}{\partial \pi_H}$, but to also consider how changes in the levels and numbers of production inputs impact the equilibrium prices and quantities charged by the regulator, *i.e.* $\frac{\partial b}{\partial K}$, $\frac{\partial b}{\partial L}$, $\frac{\partial b}{\partial T}$, and so on. However, to do so requires the imposition of a specific function on how the levels of production technology influence a regulator's beliefs on firm profitability (See equation 3.2 from Chapter 3), and would likewise require various specific production functional forms to be imposed, so that one could eventually derive these values.

The upshot of this particular discussion is that if one accepts that bribes change according to changes in factor inputs, than one can conceive that these payments act as a tax on productive factors, and, in fact, change relative factor prices in favor of unobservable factor inputs. 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).

It is appropriate to point out the endogeneity problem associated with the comparative statics exercise above. The implicit assumption is those discount rates,

profit distributions, and costs associated with regulatory visits are exogenously determined. One can easily argue, however, that this is not necessarily the case, either in a Russian or non-Russian context. In this case, the derivatives would vary considerably as the simultaneity of the optimal bribes and other variables are incorporated into the comparative statics exercise.

4.2 Welfare Effects of Differential Bribe Payments

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 cannot be determined without knowing the true profit of the firm. Even with this information, a determination of the relative winners and losers from corrupt regulators charging different bribe prices and quantities becomes a somewhat complex exercise, and is extremely sensitive to parametric changes.

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. Only with this information can one determine the relative losses across firms of varying cost and profit structures. *Table 4.6* below provides the loss equations for firms of varying types.

Firm Type	Loss Equation
High Cost	$\begin{cases} b_1 & \text{if } \pi_t > \pi^*(b_1, b_2) \\ \pi_t & \text{if } \pi_t < \pi^*(b_1, b_2) \end{cases}$
Med 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	$\begin{cases} b_1 & \text{if } \pi_t > \pi^*(b_1, b_2) \\ \pi_t & \text{if } \pi_t < \pi^*(b_1, b_2) \end{cases} + \begin{cases} b_2(b_1 \mid a_1) & \text{if } \pi_t > b_2(b_1 \mid a_1) > \pi^*(b_1, b_2) \\ \pi_t & \text{if } b_2(b_1 \mid a_1) > \pi_t > \pi^*(b_1, b_2) \\ b_2(b_1 \mid r_1) & \text{if } \pi^*(b_1, b_2) > \pi_t > b_2(b_1 \mid r_1) \\ \pi_t & \text{if } b_2(b_1 \mid r_1) > \pi_t \end{cases}$

Table 4.6 Loss Equations for Firms of Various Types

An explanation of these equations and a simple numerical example can illustrate the varying effects of differential bribes on firms, depending on the perceptions of the regulator when setting the price, and the distance between the actual profits and assumed maximum profits of the firm. For high cost firms, the loss is equal to either the bribe set in first period, if the firm is able to pay it, or the loss is equal to the actual profits (π_t), if she does not pay the bribe and receives the penalty. There is no second period for the high cost firm (remember the regulator will not visit in period two), so that is the extent of the loss. However, it is important to remember that first period bribe offers are always the highest for high cost firms.

For medium cost firms, the loss in first period is equal to either the bribe paid, if the firm is profitable enough to pay it, or the loss of first period profits if payment is not possible. However, if the firm could not pay the bribe in period one, then second period losses are zero, since the regulator will not return. If the firm did pay in first period, then second period losses are either the second period bribe, if the firm paid first period and second period profits are sufficient to pay the second period offer, or a loss of second period profits if the regulator charges too high of a price in the second period. Finally, the low cost firm incurs a loss in the first period that is equal to either the first period offer, is the firm is sufficiently profitable to pay, or a loss of first period profits. In the second period, the low cost firm will either pay a second period bribe offer that reflects his payment or non-payment in first period, or will incur profit losses if he is unable to pay either of the offers.

A simple numerical example also helps clarify the loss equations. Assume there exist three firms, identical in production technologies (*i.e.* perceived profit distribution), true profits, and discount rates. These firms differ only with respect to their costs for the regulator to visit as described in the previous chapter. Furthermore, assume that the profit distribution perceived by the regulator is [0,100], their true profits are 50 for each period, and the discount rate for the second period is .65. *Table 4.6* below then illustrates the welfare differentials across firm types for these specific parameters.

Firm Type	π_{max}	π_{true}	$\pi^*(b_1,b_2)$	δ	**b_1 Offered**	**Action Period 1**
High Cost	100	50	50	.65	50	Accepts b_1
Med Cost	100	50	33.61	.65	.84	Accepts b_1
Low Cost	100	50	40.15	.65	14.05	Accepts b_1

Firm Type	**b_2 Offered**	**Action Period 2**	**Total Bribes Paid**	**Total Losses Incurred**	**Bribes Paid as a Proportion to π_{true}**	**Losses as a Proportion to π_{true}**
High Cost	0	N/A	50	50	.50	.50
Med Cost	50.42	Rejects b_2	.84	50.84	.008	.51
Low Cost	29.51	Accepts b_2	43.56	44.56	.43	.43

Table 4.7 A Simulation of the Welfare Effects of Differential Bribes According to Firm Type

To understand the welfare effects of differential bribe payments across firms, it is necessary to understand how total payments (including bribes and penalties) affect different types of firms at varying levels of true (but unrevealed) profits. One can see these visual differences in the figures shown below.

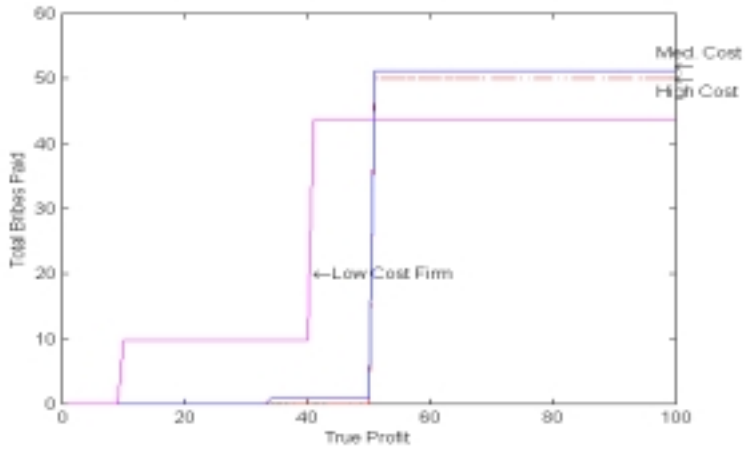

Figure 4.10 Changes in Total Bribes Paid with Changes in the True Profit of the Firm (Perceived Profit Distribution = 100)

The structural breaks in the loss functions are exhibited in *Figure 4.10*. The sharp jumps in the function represent changes in a firm's profit that cause a dichotomous change its optimal actions (*i.e.* to pay or not pay a bribe). For example, a low-cost firm at very low profit levels (*i.e.* below 10 in this example) will reject both first and second period bribe offers, simply because it cannot afford to pay. A marginally profitable firm (*i.e.* between 10 and 40 in this example) would have rejected the first period bribe offer, but accepted the second period bribe offer that was discounted because of the first period rejection (*i.e.* a second period bribe offer of 9). Finally, a profitable firm (with profits above 40 in our example) would be best served by paying both first and second period offers, reflected in the sharp jump in bribes paid. One can analyze high and medium cost firms in a similar manner.

One thing to note from this figure, however, is that less profitable low cost firms pay more in bribes than less profitable high and medium cost firms. As low cost firms

move along the profit continuum, this trend is reversed, but the marginal differences of the reversal are not as great.

Another point of interest from a welfare perspective is to examine the proportional amount of bribes paid according to true to profit levels, as shown in *Figure 4.11* below.

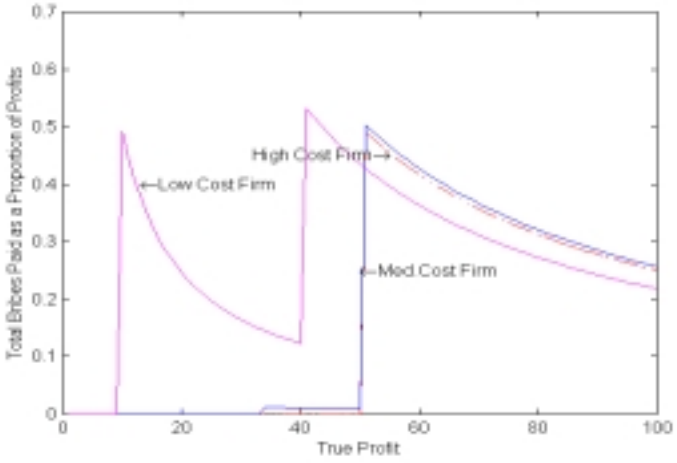

Figure 4.11 Changes in Proportional Bribe Payments with Changes in the True Profit of the Firm

We can see from the figure that proportional bribe payments vary within certain ranges. The spikes shown are representative of points around which the true profits are close to the indifference profits. However, these points do not show as much about total payments made by the firm, because as bribe payments fall to zero, penalties are being incurred by the firm for non-payment, as one may recall from the set-up of the model in Chapter 3. A more complete analysis takes this fact into account, and examines total losses incurred by the firm as a result of either paying the bribe, or refusing to pay but

incurring the penalty associated with non-payment. *Figure 4.12* below is representative of the total loss function as a proportion of the true profit of the firm.

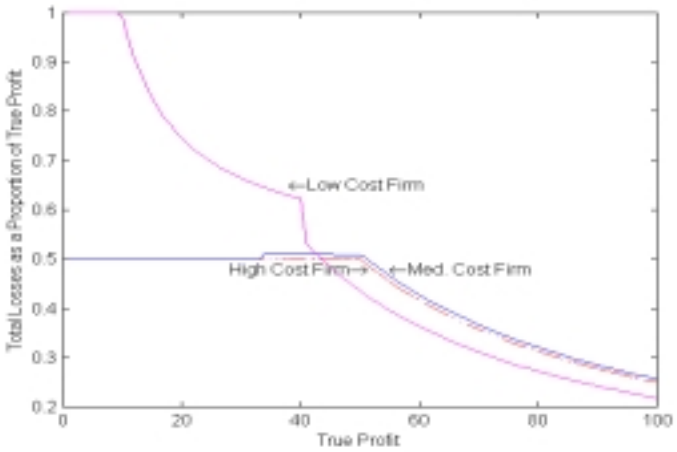

Figure 4.12 Total Losses from Bribes and Penalties as a Proportion of True Profit

It is arguable that *Figure 4.12* 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. In fact we can see from this figure that corrupt payments of this sort follow an iron law of regulatory inspections: regulatory payments disproportionally affect firms within the same class, and differentially effect firms across classes. Remember that for all of these simulations, it is assumed that the regulator sets the distributional maximum at profits being equal to 100. The lower the true profit is, and the further it is away from the regulators maximum, based on his beliefs and observation of the production technology, 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.* (1998), 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.

This finding also parallels that of Bliss and DiTella (1997) in the sense that the presence of corrupt regulators may affect market competition. The key to the argument is that differences in the cost structure of firms (assuming they are price-takers) create surpluses that an individual corrupt official can extract. This gives motivation to all officials to demand bribes, driving the most inefficient firms out of business, and possibly enhancing the profitability of other remaining firms. In the example above, however, it is important to note that for firms that lie within a very low profit range (close to the y-axis), the penalties associated with bribe offers still differ among classes of firms. This implies that low profit firms will not be unilaterally penalized and excluded from participating in the market; rather one sees marked differences in these penalties across firm types, even given the same true and perceived profit distribution.

One could argue that both the regulator and remaining firms benefit from the exit of low-profit firms due to excessive bribe penalties. For regulators, it may be possible that by inducing exit, the remaining firms may increase prospective excess profits from which to pay more in bribes. Once again, however, inducing exit of firms due to excessive regulatory demands reduces social welfare. Acting as a tax on ex post profits, corruption induces the exit of firms, causing the loss of consumer surplus associated with the consumption of each product lost on account of exit.

4.3 Relaxing the Assumption on Reservation Profit

One of the simplifying assumptions made in the initial modeling stage was to set the reservation profit of the firm, *i.e.* the profit level below which is unacceptable to the firm to pay in bribes, to equal zero. However, it is possible that entrepreneurs may have heterogeneous preferences regarding the proportion of their residual profits that they are willing to surrender to a regulator. A positive, non-zero reservation wage embedded into the entrepreneur's strategy affects optimal bribes offers and total losses of the firm. There are many ways one can conceive of incorporating changes in the reservation profit into such a model. In this section I offer a very simple, but intuitive, scenario.

Consider the model presented in section 3.3 of Chapter 3 for the longsighted entrepreneur. Assume that the regulator has the same information and makes the same assumptions as in the prior model, *i.e.* the profit distribution, the discount rate, the cost-specific strategy of the firm. However, assume now that some entrepreneurs do not have zero reservation profits, but instead have some π_R that is greater than zero, and may be either proportional to the profit level of the firm, or simply some fixed amount below which they would exit the sector for more lucrative opportunities. How would a shift in our assumptions about reservation profit change the optimal bribe prices and quantities, and losses to the firm?

From section 3.3, it is clear that a change in the reservation profit that is anticipated by the regulator will change the bribe levels offered in periods one and two. This is because the entrepreneur's optimal response to the bribe offer is different, reflected in a shift in the indifference profit. *Table 4.7* below reflects these differences.

Type of Firm	**Firm Strategy (*i.e.* accepts b1 if)**	**Actual Firm Strategy (*i.e.* accepts b1 if) with Non-Zero π_R**
High Cost	$\pi_1 > b_1$	$\pi_1 > \pi_R + b_1$
Med Cost	$\pi_1 > b_1 + \delta b_2(b_1 \mid a_1)$	$\pi_1 > \pi_R + b_1 + \delta b_2(b_1 \mid a_1)$
Low Cost	$\pi_1 > b_1 + \delta(b_2(b_1 \mid a_1) - b_2(b_1 \mid r_1))$	$\pi_1 > \pi_R + b_1 + \delta(b_2(b_1 \mid a_1) - b_2(b_1 \mid r_1))$

Table 4.8 Firms Strategies with Non-Zero Reservation Profits

Under this scenario, one can examine the changes in firm response to bribe offers, and the commensurate changes in total bribes paid, total firm losses, and proportional firm losses in the same manner as in section 4.2 above. *Table 4.8* reflects how this change altars firm actions in period one and two, as well as bribes paid in both periods.

If the regulator has information of reservation profits of the entrepreneur, he adjusts his optimal bribe offers accordingly. The optimal bribes offered for all three types of firms, with non-zero reservation profits, are shown in *Table 4.8* below. While these optimal bribe offers are technically cumbersome to observe, one can see that the values are identical to those found in *Table 4.4* in the previous chapter for values of π_R equal to zero. However, any non-zero reservation profit incorporated into the strategies of both players will unilaterally lower first and second period offers, as well as indifference profits for the firm.

Firm Type	$\mathbf{b_1}^*$	$\mathbf{b_2}^*(\mathbf{b_1}\|\mathbf{a_1})$
High Cost	$\frac{\pi_H - \pi_R}{2}$	0
Med. Cost	$\frac{-[(-2+3\delta)\pi_H + (2+6\delta)\pi_R]}{3\delta+4}$	$3\frac{-[[(-2+3\delta)\pi_H + (2+6\delta)\pi_R](3\delta+4)^{-1}] + \pi_R}{2-3\delta}$
Low Cost	$\frac{\left[-(\delta+2)(\delta-1)\pi_H + (\delta-2)(3\delta+1)\pi_R\right]}{4(1+\delta)}$	$\frac{-3(\delta+2)(\delta-1)\pi_H + 3\left[(\delta-2)(3\delta+1) + (1-\frac{\delta}{2})\right]\pi_R}{4(1+\delta)(2-2\delta)}$

$\mathbf{b_2}^*(\mathbf{b_1}\|\mathbf{r_1})$	π_1^*
0	$\frac{\pi_H - \pi_R}{2}$
0	$\frac{-2*[[(-2+3\delta)\pi_H + (2+6\delta)\pi_R](3\delta+4)^{-1}] + \pi_R}{2-3\delta}$
$\frac{-(\delta+2)(\delta-1)\pi_H + \left[(\delta-2)(3\delta+1) + (1-\frac{\delta}{2})\right]\pi_R}{4(1+\delta)(2-2\delta)}$	$\frac{-(\delta+2)(\delta-1)\pi_H + \left[(\delta-2)(3\delta+1) + (1-\frac{\delta}{2})\right]\pi_R}{4(1+\delta)(1-\delta)}$

Table 4.9 Equilibrium bribes with non-zero reservation profits.

Figure 4.13 below illustrates how changes in the reservation profit of individual firms affect bribe offers in period one for all firm types. (I omit similar graphs for second

period offers since they are redundantly similar.) The graph is simple, yet again, profound. Bribe offers fall proportionally with increases in reservation profits, and reflect a monotonic decrease in bribes for firms of all types.

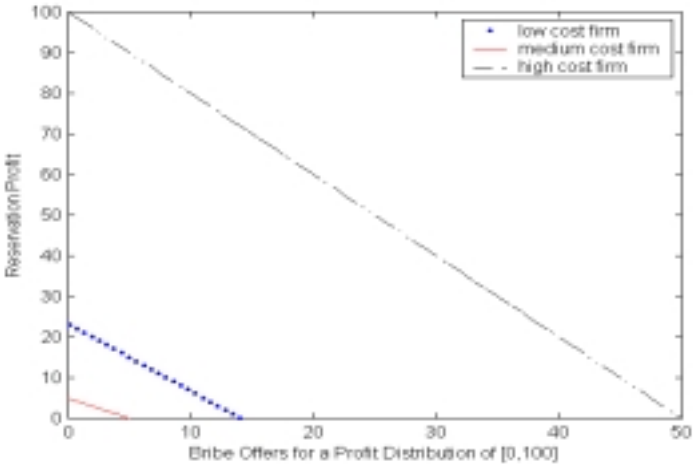

Figure 4.13 Changes in Bribe Offers with Changes in Reservation Profits

Another interesting aspect of this graph is that bribe offers quickly fall to zero for medium cost firms, a reflection of the low first period offer (relative to other firm types) they receive initially. Reservation profits are commensurately higher low and high cost firms to reach a zero-offer point. Also interesting to note is the slope of the derivatives of bribes with respect to reservation profits. Differences in the slopes reflect the relative impact of reservation profits on bribes.

While this is a simplistic manner of examining a variant of willingness-to-pay, one that goes beyond only looking at the mere ability-to-pay a bribe, it is nonetheless insightful. The equilibria bribe offers derived here show that entrepreneurs endowed with other income generating opportunities that fall between their current profit-income

and their reservation profit, will exit the sector before allocating rents to regulatory payments. The mere existence of these opportunities (which by most accounts are rare for this genre of economic agents in Russia), somewhat insulates them from higher bribe extractions, and endows them with a quasi-bargaining power with the regulator. Once again, this result demonstrates the regressiveness of bribe offers and payments; those on the margin with limited income generating opportunities will be penalized at a much higher rate.

The broader issue to be addressed in this chapter is why differential bribe payments across and within firm classes matters. The argument made here is that losses that are disproportionate to firm profits, and occur within classes of firms, have implications for income inequity because regressive and disproportional bribe-induced losses can exacerbate income inequality across entrepreneurs within and between classes.

Differential bribe payments across firm classes have the potential to alter the composition of firms across classes by altering the comparative cost structures of operating in one class vis-à-vis another one. The degree to which it does so depends on the profit loss-cost class trade-off, the degree to which high, medium, and low-cost visit attributes are exogenous or endogenously chosen, and the social cost associated with entrepreneurs expending scarce resources in order to change their firm type or class (*i.e.* high, medium, or low cost types).

CHAPTER 5

ECONOMETRIC MODEL

The purpose of this chapter is to provide relevant empirical evidence in support of the theoretical models and hypotheses of this dissertation. Thus, an appropriate econometric model would test whether one could statistically ascribe prices and quantities of bribes offered to specific firm characteristics, and would be able to do so in a rigorous and robust manner. Furthermore, the coefficients in the model would be good approximates for the price and quantity elasticities of bribes with respect to changes in production inputs, firm discount rates, or reservation profit levels.

However, the secret and illicit nature of corrupt activities precludes the collection of precise data on some of the most necessary variables to test the theoretical model, such as the number of bribes paid, the bribe price offered, penalties invoked, and regulatory compliance. Additionally, as discussed in Chapter 2, the specificity of the Russian environment proscribes the collection of even relatively more benign variables, such as costs, profits, loans, or planned investments. Given such empirical limitations, the purpose of this econometric model is less ambitious, and is intended as a corroboration of the theoretical model, rather than a test of specific hypothesis presented earlier.

5.1 The Ordered Logit Model

The econometric model employed for this exercise is an ordinal logit model, since the dependent variable estimated is an ordinal ranking of the degree to which corruption

is problematic to enterprise activities, as reported by microenterprise owners in Russia. It should be noted that the use of the ordered logit model (OLM) implicitly treats ordinal variables as well-defined equal intervals. Since these rankings are highly subjective and individualistic in nature, one must use caution when interpreting the results (Long, 1997).

Before proceeding to a description of the actual model, it is useful to provide a brief overview of the OLM, so that interpreting the estimates will be a less cumbersome activity for the reader. The OLM can be derived form a measurement model in which a latent variable y^* ranging from $-\infty$ to ∞ is mapped to an observable variable y. The variable y is though of as providing incomplete information about an underlying y^* according to the measurement equation;

$y_i = m$ if $\tau_{m-1} \leq y_i^* < \tau_m$ for m=1 to J 5.1

The τ's are called thresholds or cutpoints. The extreme categories 1 and J are defined by open-ended intervals with $\tau_0 = -\infty$ and $\tau_J = \infty$.

For a single independent variable, the structural model is;

$y_i^* = \alpha + \beta x_i + \varepsilon_i$ 5.2

where x_i is a row vector with a 1 in the first column for the intercept and the ith observation for x_k in column k + 1. β is a column vector of structural coefficients with the first element being the intercept β_0. Also, for the ordered logit model it should be noted that ε has a logistical distribution with a mean of 0 and a variance of $\pi^2/3$.

For the estimation of the corruption model, β is set as the vector with parameters from the structural model, with the intercept β_0 in the first row, and τ is the vector containing the threshold parameters. Since entrepreneurs were asked to rank how

problematic corruption was on a scale of one to four, our τ's are one, two three, and four. Ultimately, the goal of the OLM is to identify the probability of observing whatever value of *y* was actually observed for the *i*th observation. An example specific to the Russia data would be to identify the probability that an individual firm would rank corruption as being extremely problematic for their enterprise (*i.e.* a ranking of 4), given their specific firm characteristics.

5.2 The Econometric Model for Corruption

Recall that in the theoretical model, it was postulated that firms will differ in the bribe prices and quantities offered by a corrupt regulator, who acts as a price discriminating monopolist. The model showed that prices and quantities will differ depending on 1) how costly it is for a regulator to visit a firm, 2) the perceived profit distribution of the regulator, based on observable production inputs, 3) the discount rate, and 4) the reservation profit of the entrepreneur.

Thus, one would expect that the level of bribe payments offered to a firm positively depends on what the firm is able to pay, or in terms of the theoretical model, the perceived profit distribution. Conversely, firms that have higher reservation profits, here to be proxied as other income-generating activities, will be less likely to be charged excessively high bribes. One would also expect that regulatory inspections will be positively correlated with bribe levels, since these visits are the vehicles used to both extract bribes, as well as a means of gathering information on a firm's ability to pay. It should also be noted that profits are strongly linked to entrepreneurial ability, in the level and sophistication of negotiation skill and regulatory avoidance opportunities available to

the entrepreneur. These elements are not observable, and are captured with the random variable *v*.

The survey did not directly ask for magnitudes of bribe payments made by the respondents for reasons discussed earlier. The survey elicited responses form enterprise owners in terms of a ranking on a scale of one to four, of problems of "irregular payments or unprofessional behavior of local officials." For empirical work, I make the assumption that an individual entrepreneur's rating is correlated with individual experience in bribe payments. Thus, this rank represents some linear or non-linear combination of the number and prices of bribes paid by the entrepreneur out of the firm's residual profits. Under this specification, firms that register a higher rating on their perceived incidences of bribe payments find themselves paying more in bribes from their business operations.

Furthermore, gathering specific information on various production inputs proved to be too costly to undertake. Since the perceived profit distribution of the firm is based on observable production technology, I use labor (the number of employees) as a proxy for production technology. But, because firms are extremely heterogeneous, and the marginal returns to labor may vary significantly across firms, this variable alone will not be likely to capture changes in the profit distribution. However, using employment growth more closely approximates the theoretical model. The use of employment growth controls for heterogeneity of production technology and returns to factor inputs across firms, and mimics how an increase in factor inputs will shift out optimal bribe prices and quantities charged for individual firms.

The variable employed as a proxy for reservation profit is the level of diversification of the entrepreneur's income portfolio. The underlying hypothesis is that

entrepreneurs with other income earning opportunities will have higher reservation profits since their opportunity costs of paying a significant portion of their residual profits in bribes is much higher. This proxy is calculated as the percent of the entrepreneur's total household income portfolio contributed by the enterprises' profits. In this sense, entrepreneurs with a single income source are more constrained to remain in the market because exit would be very costly, if not catastrophic. Thus entrepreneurs with multiple sources of income will be less likely to experience severe graft because any threat of exit would be considered credible.

Respondents were asked for the mean number of inspections they experienced over the course of a year, by a variety of inspectors. Since firms in certain industries are more likely to be inspected than others (e.g. a restaurant owner by a sanitation inspector) the number of inspections by tax authorities and the militia are used, which theoretically apply to all firms equally.

Additionally, several control variables are incorporated into the model. It was important to control for size (simply the number of employees) to mistakenly attribute demands for bribes to firms that are larger, rather than to differences in production inputs for firms of the same type. The legal form of the firm is also an important variable to control for because firms that are registered as private entities are generally subject to a greater number of inspection, due to the perception that they are more skilled at regulatory avoidance (Nadolynak and Hararska, 1999).

Finally, a dummy variable for sector was used, depending on whether the firm was manufacturing, or retail/trade. The rationale for including this dummy is that more visible production technologies allow for the regulator to form a better profit distribution.

In this sense, a manufacturing firm is less able to disguise the level and number of productive inputs compared to a trader, whose principal production might be entrepreneurial ability for example. A summary of these variables is shown in *Table 5.1* below.

Co-efficient on Variable	**Variable**	**Unit of Measurement**	**Proxy**
y	Ranking of Corruption y_i	Scale of 1-4, where 4 is most problematic	Quantities and Prices of Bribes Offered
β_1	Employment Growth x_1	Average Growth Since Inception	Profit Distribution
β_2	Regulatory Inspections x_2	Mean Inspections by tax and militia	Inspections Used as Vehicle for Extortion
β_3	Income Diversification x_3	Percent of Entrepreneur's Total Household Income Contributed by Enterprise	Reservation Profit
β_4	Size x_4	No. of Employees	Control Variable
β_5	Legal Form x_5	1=Registered as Companies 0=Registered as Individuals	Control Variable
β_6	Sector x_6	1=Manufacturing Firms 0=Retail/Trade	Control Variable

Table 5.1 Summary of Dependent and Independent Variables

The econometric specification uses an ordinal logit to capture changes in the probability that a firm ranks corruption to be problematic on a scale of one to four. Following Greene (1993), let y^* be the degree to which corruption is problematic for an enterprise, then:

$$y^* = \sum_{k=1}^{K} \beta_k x_k + v \qquad 5.3$$

where the probability that y falls into category j, is denoted by;

$$\text{Prob}(y = j) = \text{F}\left(\mu_j - \Sigma_{k=1}^{K} \beta_k \chi_k\right) - \text{F}\left(\mu_{j-1} - \Sigma_{k=1}^{K} \beta_k \chi_k\right) \qquad 5.3$$

where F is a general cumulative distribution function and μ is normalized to zero. The resulting specification is:

$$y_i = \beta_{1i} x_i + \beta_{2i} x_i + \beta_{3i} x_i + \beta_{4i} x_i + \beta_{5i} x_i + \beta_{6i} x_i + v_i \qquad 5.4$$

where β's are coefficients, *x*'s are the independent variables, and *i* is the subscript representing firm *i*. Estimates of the model are consistent with *a priori* expectations. The estimates are shown in *Table 5.2* below.

For notational purposes, it is important to define the various coefficients shown in the table. β is an unstandardized coefficient, β^{sy^*} is a y^* standardized coefficient and β^s is a fully standardized coefficient. β can be interpreted as for a unit increase in x_k, y^* is expected to change by β units holding all other variables constant. But, since the variance of y* cannot be estimated from the observed data, the meaning of a change in β units in y^* is not clear, thus interpretations should be based on fully standardized coefficients.

Variable	β	β^{S}	β^{sy*}	Standard Deviation
Firm Growth	.11*	0.20	0.06	3.35
Monthly Inspections	.02*	0.13	0.01	12.29
Other Income	-.73**	-0.11	-0.38	0.30
Size	.02	0.10	0.01	10.87
Dummy-Legal Form	-.56*	-0.15	-2.05	n/a
Dummy-Activity	.23	0.04	0.12	n/a

* indicates significant at the α=.05 level
** indicates significant at the α=.10 level

Table 5.2: Standardized Coefficients for the Ordered Logit Model: Dependant Variable is the Firm's Ranking of Corruption as a Problem

β^{sy*} (or a y^{*}-standardized coefficient) can be interpreted as for a unit increase in *x*, *y* is expected to increase by β^{sy*} standard deviations, holding all other variables constant. This coefficient indicates the effect of an independent variable in its original unit of measurement. This leads to the following interpretation of the coefficients pertaining to categorical ranking of corruption by firms shown above; each additional unit of labor added to the firm increases the ranking of regulatory-induced corruption by .06 standard deviations, holding all other variables constant. In a similar manner, each additional monthly inspection increases a firm's ranking by .01 standard deviations,

while each percent of total household income that comes from other sources will decrease a firm's ranking of corruption by .38 standard deviations. Note that all three of these variables are statistically significant.

Similarly, β^S can be interpreted as for a standard deviation increase in x, y is expected to increase by β^S standard deviations, holding other variables constant. Thus, the similar interpretation with respect to the empirical model above indicates that for each additional standard deviation increase in labor units (*i.e.* 3.35), a firms ranking of corruption will increase by .20, holding all other variables constant. An increase in each standard deviation for inspections (*i.e.* 12.29) will increase the corruption ranking by .13, while an increase in the standard deviation of other income sources (by thirty percent according to the data) will decrease a firm's corruption ranking by .11.

With the ordinal logit technique, measures of discrete change are much more informative than standardized coefficients, which tell little beyond the sign and the significance of the coefficient. A discrete change is the change in the predicted probability for a change in the independent variable from a start value of the independent variable to an end value. Note that the first row in *Table 5.3* shows the predicted probabilities for enterprises that exhibit mean characteristics for all independent variables. Thus, a firm that has a mean value of firm growth, monthly inspections, alternative household income sources, number of employees, is an individual entrepreneur and a manufacturing enterprise, would have a forty percent chance of reporting a corruption ranking of 1, a twenty-nine percent probability of reporting a corruption ranking of 2, and probabilities of fourteen and fifteen percent, respectively, of reporting a corruption ranking of 3 and 4, respectively. An interpretation of a discrete

change is that when x, the independent variable, changes from some start value of x_s to some end value of x_E, the predicted probability of the outcome m changes by $\Delta \Pr(y=m|x)/ \Delta x_k$, where m is equal to either a 1,2,3, or 4 ranking of corruption.

For discrete changes, with the data set and empirical model discussed above, the table shows changes in the predicted probabilities with changes in 1) the independent variable, x, when the effect of a unit change in x_k is computed by changing from $\bar{x}_k$ to $\bar{x}_k + 1$, 2) the total possible effect of x_k by letting x_k change from its minimum to maximum value, and 3) the effect of the binary variable is obtained by letting x_k change from 0 to 1. Note that for each change, each continuous variable, except x_k, is held at its mean.

The effects of a variable can be summarized by computing the average of the absolute values of the changes across all of the outcome categories. The absolute value is taken since the sum of the changes without taking the absolute value is necessarily 0. The average absolute discrete change is represented by $\overline{\Delta}$.

Independent Variable	Change	$\bar{x}$	$\bar{\Delta}$	Discrete Changes: $\partial P / \partial \bar{x}$			
				Pr(y=1)	Pr(y=2)	Pr(y=3)	Pr(y=4)
Overall	Probability	-	-	0.41	0.29	0.14	0.15
Firm Growth	$\Delta 1$	0.60	.013	-0.027	0.004	0.009	0.014
	ΔRange		.451	-0.81	-0.09	0.004	0.9
Monthly Inspections	$\Delta 1$	6.84	.002	-0.005	0.001	0.002	0.003
	ΔRange		.35	-0.28	-0.05	0.08	0.25
Other Income	$\Delta 1$	0.28	.09	0.18	-0.03	-0.06	-0.09
	ΔRange		.09	0.18	-0.04	-0.06	-0.08
Size	$\Delta 1$	7.11	.002	-0.005	0.001	0.002	0.003
	ΔRange		.37	-0.33	-0.10	0.07	0.36
Dummy-Legal Form	$0 \rightarrow 1$	Na	.177	0.137	-0.02	-0.045	-0.071
Dummy-Activity	$0 \rightarrow 1$	Na	.027	-0.056	0.006	0.018	0.031

Table 5.3 Effect Of Discrete Changes in Firm Characteristics on Categorical Ranking of Corruption

Table 5.3 shows how unit changes in the independent variable alter the predicted probability that a firm will experience higher levels of regulatory extortion. For example, the overall probability that a firm will experience extreme regulatory difficulties (*i.e.* a ranking of 4 for corruption) is 15 percent. However, with the addition of one unit of employment, the entrepreneur will increase her predicted probability of reporting

corruption to by highly problematic by .014 percent, holding all other variables constant. With an addition of the full range of employment, the probability that the firm will experience extreme regulatory difficulties will increase by .90.

One can repeat this exercise for changes in probability of regulatory targeting with changes in the levels of the all independent variables. For example, increases in the number of monthly inspections will categorically increase a firm's probability of being targeted, whether by one unit or by the full range of inspections. Conversely, entrepreneurs with more diverse sources of income will be less likely to become a target for regulatory inspectors. As entrepreneurs increase (by one unit) the percent of income from outside sources, the probability of ranking corruption as highly problematic falls by .09. The values of the average absolute discrete change, represented by $\overline{\Delta}$, indicate that firm growth, monthly inspections and size have the strongest effects on a firm's corruption ranking.

While this empirical model does not specifically test the theoretical model presented in Chapters 3 and 4, it does lend support for some of the conclusions that naturally emerge from the model. For example, recall that the theoretical model predicts that as a firm's reservation profit increases, the number and price of the bribe she will be charged falls across all firms. As long as one accepts that income diversification is a good proxy for reservation profit, and that subjective rankings of corruption are adequate proxies for bribe prices and quantities paid, then this result is consistent with the theoretical model. Similarly, if one accepts that intra-firm growth is a good proxy for perceived profit distribution by the regulator, then again, the empirical model is consistent with the comparative statics of the theoretical model.

Of course, the empirical specification and data proxies are vulnerable to obvious criticisms. The dependent variable, for example, is highly suspect because one can never know if firms report higher levels of corruption because they are offered higher prices and quantities, regardless of their ability to pay, or if it is their inability to pay a bribe, regardless of the size and quantity offered, that would lead them to report corruption as more problematic. Regardless of the correlation between the theoretical and empirical predictions, the empirical model does provide interesting, rich, and robust results. These results again emphasize that there is a statistically significant and causal relationship between specific firm characteristics and firm perceptions of regulatory targeting, and we can see how discrete changes in these characteristics increase/decrease an entrepreneur's subjective valuation.

The policy implications of these results are important. One can argue, for example, that if increasing labor units in a firm catalyzes increased regulatory scrutiny and bribe demands, then factor inputs such as labor (and probably capital and technology) have implicit costs beyond per unit wages (or rental rates). If such is the case in reality, this would imply that the presence of corruption changes relative factor prices, favoring inputs that are unobservable to a regulator, and may lead to socially sub-optimal input choices, since firms now take into account this additional regulatory cost when making factor input decisions.

CHAPTER 6

SUMMARY OF FINDINGS AND POLICY IMPLICATIONS

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. 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)."

This dissertation addresses the issue of rent-seeking regulatory behavior, which has become endemic and entrenched throughout the Russian economy. The purpose of this dissertation was to identify and evaluate the degree to which microenterprises in Russia are subject to paying involuntary bribes to rent-seeking regulatory officials. Descriptive statistics from a survey of Russian microentrepreneurs revealed the breadth and depth to which firms are subject to regulatory harassment in the form of frequent inspections and the necessity of irregular payments to avoid artificial penalties imposed by regulators. Not only does this dissertation reveal that corruption is ubiquitous in the dealings of firms in this cadre, but it highlights the fact that firms appear to vary significantly in the degree to which they are inspected, as well as across individual perceptions of regulatory difficulties.

A theoretical model postulates that firms may vary in the quantities and prices paid for bribes because regulatory officials act as price-discriminating monopolists, charging each firm a unique price and quantity based on the perception of willingness-to-pay, as well as on the costs of extracting the bribe payment for the regulator. These factors are specific to individual firms and are correlated with firm-specific characteristics.

The model is set up as a two-period Bayesian game between a price-discriminating monopolist with incomplete information and an entrepreneur. The regulator sets a price according to his beliefs about the entrepreneurs willingness-to-pay, and then subsequently updates his beliefs across periods based on firm responses and actions.

The welfare implications of differential bribe payments are also explored. I show that differential corruption is extremely regressive, harming enterprises disproportionate in their ability to pay bribes. An extension of the model, however, shows that entrepreneurs that are able to diversify their sources of income, can mitigate the frequency and size of regulatory payments, and significantly reduce their total losses from rent-seeking activity.

The theoretical model was then tested econometrically, using an ordinal logit model. The findings of the empirical tests are consistent with the theoretical model. It is shown that as firms increase their level and quality of observable production inputs, their probability of being targeted by corrupt regulators increases significantly. Conversely, entrepreneurs that have multiple income sources dramatically reduce the probability of being targeted by regulatory officials.

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.

Furthermore, the small and microenterprise sector in Russia is disproportionately small compared to other transition economies or developing countries. It is arguable that the sector has been retarded in its growth due to the adverse regulatory environment and the existing disincentives for short and long-term investments. With the prevalence of unemployment and wage arrears in Russia, the need to foster opportunities for self-employment is of particular importance. Clearly, more supportive policies and a less parasitic approach to regulation would do much to encourage the growth of the microenterprise sector.

The scope for potential research and continued investigation into this problem is large. From a theoretical standpoint, one could extend the model from the simple two-period game to a more realistic infinite horizon model with learning, which would shed light on the long-term equilibrium outcomes when regulators either come to have full information on firm profits, or firms are forced to exit the sector. One could also extend the model to include uncertainty around profits in the second period or to include

borrowing and lending in the model to allow for strategic behavior on the part of the entrepreneur. Empirically, there could, and should, be further research done on survey design and administration techniques, to ameliorate the accuracy and credibility of statistics on bribery, extortion, and abused discretion of office. From a policy standpoint, policy-makers could direct more attention not only to corruption, which is beginning to receive more attention in the media, but to how corrosive the regulatory environment is for this particular cadre of firms.

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APPENDIX

MICROENTERPRISE SURVEY ADMINISTERED IN SAMARA, RUSSIA