Foreign Entry Deterrence by the Dominant Local Firm in the Existence of a Rent-Seeking Bureaucracy

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Abstract

In this paper the authors examine the relationship between local corruption and multinational investment. They construct a model of regulatory capture that highlights the interaction between a corrupt regulator, a local dominant firm and a multinational firm. The model suggests that entry by a multinational could have a variety of effects on corruption, both positive and negative. These include: decreasing corruption and regulatory distortion by reducing available rents and diluting incentives for paying bribes; increasing corruption and regulatory distortion by creating "competition" for regulatory bias; and increasing corruption while reducing distortion through dissipative competition for the regulator.

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1 Introduction

This paper examines a model of regulatory capture that highlights the interaction between a corrupt regulator, a local dominant firm and a multinational firm. We argue that studying corruption in the presence of multinational investment is important for at least three reasons:

First, while foreign direct investment (FDI) flows have the potential to make significant contributions to economic and social development, there exist widespread perceptions and anecdotal evidence that these flows are often distorted by corrupt practices of local or national government officials in different countries around the globe. In effect, corruption is considered as a barrier to entry by multinational corporations (MNCs) into new markets. However, there is a distinct possibility that MNCs as the leading players in the international business arena may also choose to influence the local authorities. As long as their national governments turn a blind eye and thus the company can wash its hands clean after a corrupt dealing, corruption in the host country may very well increase the likelihood of foreign direct investment[1].

Driven by the quest for profits, typical MNCs evaluate alternative locations for their production facilities abroad. Their decisions largely depend on the investment climates in these locations and have important implications for productivity, employment, poverty and growth in each location. The investment climate is defined as the set of location specific factors shaping the opportunities and incentives for firms to invest productively, create jobs, and expand (World Development Report 2005). Governments have not much to do with the geographical and market size aspects of the investment climate. However, they can exert a strong (positive/negative) influence on costs, risks and barriers to competition. Besides, firms are not blind to the gaps between formal rules and what happens in practice. In a way, it is inevitable that firms will try to (legally or illegally) influence policies in ways favorable to them. Thus, the interaction of formal policies and governance has a paramount importance in the investment climate assessment of firms and hence their strategic actions with one another and with the government.

Therefore, analyzing complex strategic actions of multinational firms, local incumbents and domestic bureaucracies and consequences of these actions might prove to be valuable, especially after considering the growth in the relative importance of MNCs in recent decades. About one quarter of world trade is intra-firm; for U.S. trade, it is above one third. About 80 percent of U.S. exports are connected to MNCs. A widely used measure of the scope of multinational activity is the flow of foreign direct investment (FDI). The average annual growth rate of FDI flows over the last 15 years exceeds 17 percent. In contrast, world trade has expanded by about 7 percent and world output has risen about 4.8 percent on average over this time period (UNCTAD, World Investment Report 2005 and earlier years).

Second, prevention of corruption, improvement of governance and creation of good investment climates around the globe are all high priority international goals nowadays. In a world where advanced communications make information accessible at a very fast speed and a low cost, economic agents all over the world — private and public alike — have become increasingly aware of costs (to the society) and sometimes benefits (to the parties involved) of corrupt dealings. Hence, in the last decade, corruption has become an eminent item on the agenda of many international institutions. According to the OECD Convention of Combating Bribery of Foreign Public Officials in International Business Transactions, which was signed in 1997, and went into effect in 1999, bribery of foreign officials by firms from

[1] Egger and Winner (2005) find a clear positive relationship between corruption and inward FDI for a sample of 73 developed and less developed countries and the time period 1995-1999.

member countries is a crime. The UN Convention against Corruption, adopted in Mexico in December 2003 and went in force in 2005, is the first global instrument embracing a comprehensive range of anti-corruption measures to be taken at the national level.

These attempts led by the United States to level the playing field represent an enormous step towards global anti-bribery standards. Motivated by the argument that companies of its closest allies have long benefited at the expense of American business in the aftermath of the passing of the Foreign Corrupt Practices Act (FCPA) in 1977, the United States diligently worked for the accession of these new international measures towards anti-bribery. Yet, less than a handful of the 36 countries that have ratified the OECD's anti-corruption convention have undertaken any investigations or prosecutions.

The Convention defines *a corrupt act* as any inducement to a foreign public official to act or refrain from acting in order to obtain or retain business or other improper advantage. The *level of corruption* has two dimensions: The frequency of corrupt undertakings and the total value of bribes paid — or the magnitude of influences traded — which go hand in hand, i.e. in countries where bribery is the rule of the game, more than a trifling proportion of firm revenues tend to represent the bribes paid. The investment climate surveys of World Bank show that majority of firms in developing countries expect to pay bribes. 43.1% of firms in Central and Eastern Europe, 50% in Sub-Saharan Africa, 68.8% in Latin America and the Caribbean, and 74.2% in South Asia reported bribes and the bribes as a share of their sales was reported to be 2.8%, 5.2%, 7% and 3.2%, respectively (World Development Report 2005, Table 2.1).

There is indeed a plethora of anecdotal evidence pointing out how commonly bribes are used in international business affairs. It is reported that a "healthy" number of companies have admitted paying bribes under a new World Bank disclosure program. In certain jurisdictions companies were paying bribes in order to get a contract, to get a contract amended and even to get paid. (Reuters, August 31, 2006). In the last two years the United States Securities Exchange Commission and the Department of Justice, found a number of multinational corporations guilty of bribery to achieve a number of different outcomes using diverse strategies[2].

Last but not least, research on corruption is conducted mainly to address politics, public administration, law and judiciary. The literature on the effects of corruption on foreign direct investment decisions is at its infancy and mostly empirical. There is indeed a paucity of theoretical work on determinants, mechanisms, and consequences of the strategic interaction among a potential foreign entrant, local incumbents and a rent-seeking regulator. Different

[2] "Diagnostic Products Corporation: $4.8 million (May 2005): Diagnostic Products Corporation ("DPC") and its wholly owned Chinese subsidiary, DPC (Tianjin) Co. Ltd. ("DPC Tianjin") agreed to resolve its potential liability with the SEC and DOJ regarding violations of the FCPA. DPC reached an agreement with the SEC to disgorge $2.8 million in net profit earned in China for the period of its alleged misconduct, plus prejudgment interest. DPC Tianjin separately pled guilty to DOJ charges and agreed to pay an additional criminal penalty of $2 million. DPC, through DPC Tianjin, allegedly made illicit payments of approximately $1.6 million to doctors and laboratory staff in China to induce them to purchase DPC products.

Titan Corporation: $13 million (March 2005): The Titan Corporation ("Titan") pled guilty to violating the FCPA and agreed to pay a criminal fine of $13 million. Titan is a California-based military intelligence and communications company. It reportedly paid more than $2 million in illicit payments to officials in the African nation of Benin towards the election campaign of Benin's then-incumbent President, in exchange for preferential treatment for projects in Benin.

InVision Technologies: $800,000 (December 2004): InVision Technologies, Inc. ("InVision") agreed to pay a penalty of $800,000 to the United States for violating the FCPA. InVision is a California-based public company that sells airport security screening products. Investigations by the DOJ and the SEC revealed that InVision was aware that its agents and distributors in Thailand, China and the Philippines had paid or offered to pay money to foreign officials to increase the sales of its products." (Mondaq, August 19, 2006).

elements of this paper has been the subject-matter of well-established literature such as entry deterrence, regulatory capture, corruption and FDI. In the next section we present a brief survey of these literature and discuss what features we borrow from them and in what ways we extend some.

In this paper, we build a three player game between a corrupt regulator, a local dominant firm and a multinational firm. The firms first choose bribes for the regulator that are functions of their eventual profits. Given these bribes, the regulator chooses a regulatory variable by maximizing over an objective function of consumer welfare and the firm profits that is skewed in favor of the firms, according to their contributions.

We (will) consider two major cases. In the first case, the regulation in question is anti-competitive, but is not biased against the multinational firm. In this case bribes are strategic substitutes for the two dominant firms — each firm's bribe is decreasing in the level of the other's bribe. In the second case regulation is biased in favor of the local firm so that the multinational firm pays a bribe in order to reduce the level of protectionist regulation. In this case bribes may be strategic complements or substitutes.

Our preliminary analysis shows that the presence of the multinational could have a variety of effects. In the former case, these include a reduction in corruption due to decreased rents and a corresponding decrease in the ability and desire to subvert the regulator. In the latter case an increase in competition for the regulator's attentions could result in a higher level of distortional corruption as one party or the other bids to "win" the regulator to their side, or an increase in relatively benign dissipative corruption where each side bids to maintain the regulator's neutrality.

The paper proceeds as follows. Section 2 presents the background focusing on the relevant parts of entry deterrence, regulatory capture, corruption and FDI literatures. Section 3 introduces the model focusing on two cases in a static setting. The last section presents concluding remarks and directions for future work.

2 Background

There are four strands of literature that are relevant to our analysis. The *first* one is the literature on foreign direct investment, too vast to be addressed here at length (Markusen (2002), Feenstra (2003 Chapter 11) and citations therein). The *second* line of literature relevant for the current paper considers the causes and consequences of corruption in general. There is a voluminous theoretical literature on corruption. An excellent recent survey of this literature is provided by Jain (2001). The work spans many different areas such as the impact of corruption on regulatory discretion, existence of rents and opportunities for rent-seeking, and civil service wage policy.[3] There are also studies that consider the impact of corruption on various aspects of economic systems such as growth, military expenditure and procurement, delivery of public services, and inequality.[4]

The natural approach of the economist to corruption control is to reduce the imperfect competition to get rid of the economic rents which sustain the existence of bribery

[3] For the impact of corruption on regulatory discretion see Kaufmann and Siegelbaum (1997), Johnson, Kaufmann and Ziodo-Laboton (1999). For the existence of rents and opportunities for rent-seeking see Mixon et al (1994), Ades and DiTella (1997b), Goel and Nelson (1998), Jain and Titiroglu (2000). For civil service wage policy see Van Rijckeghem and Weder (1997).

[4] For the impact of corruption on growth see Mauro (1995), Ades and DiTella (1997a), Johnson et al (1997), Tanzi and Davoodi (1997), on military expenditure and procurement see Naylor (1998), Gupta et al (2000b), on delivery of public services see Gupta et al (2000a), and on inequality see Gupta et al (1998).

(Rose-Ackerman, 1978). However, Bliss and Di Tella (1997) argue that competition is not necessarily an exogenous parameter to be varied to see how corruption is affected. They show that even in the existence of perfect competition, at the expense of the exiting firms corruption generates its own surplus. They define two types of corruption: (i) Cost-reducing (The corrupt regulator can reduce the costs for the producer in return for corrupt payments.) and (ii) surplus shifting (If there are surpluses in production, it is better to let corrupt regulator to take part of it rather than losing it all.) To this list we add a third, competition suppression. In our model the corruption is the second and third kinds and part of the firm profits are captured by the regulator in return for favors made.

Lately corruption and its impact on FDI have brought forth a wide range of ideas in which the two may be related. A majority in the literature leans towards the idea that corruption and FDI are related. However, there is a considerable amount of disagreement in how these two are related. Wei (2000) examines a panel of bilateral FDI stocks from 12 source countries to 45 host countries and finds a statistically significant impact of host country corruption on inward FDI. Likewise, Wei (1997) shows that uncertainty in corruption levels negatively affects the inward FDI. Aizenman and Spiegel (2002) posit that domestic agents have a comparative advantage over foreign agents in overcoming some of the obstacles associated with corruption and weak institutions and suggest that corruption discourages FDI more severely than it does domestic investment. See also Habib and Zurawicki (2002) who analyze the relation between corruption and FDI in a cross-section of 89 countries and find that corruption acts as an impediment for FDI.

Egger and Winner (2006) propose a different aspect of the FDI and corruption relationship by suggesting that corruption may cause increases in both the revenues and the costs of the firm. They find a negative relationship between bilateral stocks of outward FDI and corruption, which implies that the cost effects tend to dominate the revenue effects. They find this negative relationship between FDI and corruption to be more prominent in developed economies as compared to less developed economies. In contrast, Hines (1995) finds no considerable impact of corruption on overall inward FDI in host countries. He investigates the effects of the Foreign Practices Act of 1977 on subsequent FDI growth in host countries originating in the United States. His study shows that the Act puts US firms at a competitive disadvantage in corrupt countries. In these countries FDI flows originating in the US were found to be significantly lower than those in the non-corrupt countries following the Act's passage.

In short, there are a few, mostly empirical, studies and the provided evidence is mixed. The literature on corruption and FDI connection is slender and even more so on the theoretical front. One of the contributions of our paper is to fill this gap in the literature by offering a theoretical analysis that takes into consideration not just how corruption may restrict FDI flows, but also how corruption may facilitate them.

The *third* line of literature relevant to our work is the one about regulatory capture. When regulating, governments face a basic tension between firm preferences and public interest and at a lower echelon a tension between preferences of different firms. For example, most firms would enjoy monopolies to increase their profits and to reduce the pressure of inventing, which is clearly against the public interest. If the government starts discussing reducing barriers to competition, the proposal will surely be resisted by the incumbents and supported by outsider firms and consumers (if they are organized). In this scenario, "the government intervenes to redress [a] market failure, and corruption emerges as an unpleasant side effect of necessary intervention" (Acemoglu and Verdier, 2000, p.196). This view is more in line with Pigou's (1938) public interest theory of regulation.

Stigler (1971) in his theory of regulatory capture argues that the regulation of entry keeps out the new entrants rand raises incumbents' profits. It ultimately leads to greater market power and profits rather than benefits to consumers. De Soto (1990), on the other hand claim that politicians use regulation both to create rents and to extract them through campaign contributions, votes, and bribes. Both of these views address rent creation and extraction through the political process. The former underlines the benefits to the industry, while the latter focuses on the benefits to the politicians even when the industry is left worse off by regulation.

On the empirical front Djankov et.al. (2002) present new data on the regulation of entry of start-up firms in 85 countries. Their data cover the number of procedures, official time, and official cost that a start-up must bear before it can operate legally. They find that countries with heavier regulation of entry have higher corruption and larger unofficial economies, but not better quality of public or private goods. Evidence supplied by Djankov et.al is inconsistent with public interest theories of regulation, but supports the regulatory capture view that entry regulation benefits politicians and bureaucrats.

Based on the Business Environment and Enterprise Performance Survey of firms in transition economies Hellman et.al. (2002) find that foreign firms magnify the problems of state capture and procurement kickbacks, while paying a lower overall bribe burden than domestic firms. They also indicate that different types of foreign investors engage in particular types of corruption tailored for their specific needs.

In our general model, we remain agnostic about what kind of favors are provided by the regulator in return for a share of profits. Then, we supply case studies for different direct and indirect competition reducing strategies. An example of a direct competition reducing strategy can be putting a limit to the entry of new firms and charging a bribe from the incumbents. On the other hand, the rent-seeking bureaucrat in charge of enforcing the level of pollution, for example, may allow a different level in exchange for a bribe and hence indirectly hinder competition in that sector.

The *last* strand of literature relevant to our work is the strategic models of entry deterrence. Wilson (1991) provides an excellent survey of this voluminous literature and categorizes these models into three classes: (i) Preemption models stand on the existence of costly irreversible investments which provide entry deterring commitment and thus enhance incumbents' competitive strength. (ii) Signaling models explain how an incumbent firm credibly communicates that discourages entry sometimes via limit pricing and sometimes via attrition. (iii) Predation models involve battling a current entrant to deter subsequent entry by intimidation and sustaining a vicious reputation.

Preemption and predation models are more relevant for the purpose of the current paper. A capital intensive firm, for example, can induce its rivals to exit the industry by lobbying for higher wages and thus raising their labor-intensive rivals' costs. Product standards and other anti-competitive government regulations can effectively raise rivals' relative compliance costs and force them to exit. The term "government assisted predation" coined by Miller and Pautler (1985) is relevant for our paper. It is defined as the use of the coercive powers of government by incumbent firms in their favor against their rivals. In our model we not only consider the corrupt actions of the incumbents but also that of the entrant, too.

3 Model

In this section we present a general framework for studying how two firms — a local dominant firm and a multinational — would interact in the presence of a corrupt regulator. For simplicity, we consider a thoroughly corrupt regulator that only acts in response to bribes, and thus only directly cares about profits to the firms. The regulator faces penalties for accepting the bribe that are increasing in the action that the regulator takes.

The interaction between the firms and the regulator takes place in a principal(s)-agent framework. The firms simultaneously offer bribes to the regulator. Given the bribes, the regulator takes some action, and, finally, given that action and the previous bribes, the firms engage in market competition. In the general model, we focus on the first two stages of interaction. We then provide some examples where we specify functional forms and the type of market competition.

We do not examine contract choice here. As noted above, corrupt interaction takes many forms because of differing preferences and institutions. What we seek to model here is the coopting of the regulator's interests by the firms through payments. The simplest way to model this is to allow the firms to offer a fraction of their profits. Note that we do not make the claim that this is the standard form for bribes. Instead, we want to capture the idea that a firm will offer a variety of incentives to align the preferences of the regulator and the firms.

In the first stage, a local dominant firm (D) and a multinational firm (M) choose bribes $b_i \in [0,1]$, $i \in \{D, M\}$ for the local regulator R. These bribes are fractions of gross profit.

In the second stage, given the bribes, the regulator chooses a regulatory action k, where the possible k are given by a finite segment of real numbers $[0, \bar{k}]$. We assume k is a purely corrupt action, where the efficient k is zero. We first consider a symmetric case where the regulation affects the firms symmetrically and thus bribes are strategic substitutes.

In a a final stage the firms competes in a market using actions q_i. We assume that there are well defined best response functions and that there is a unique and stable Nash equilibrium that depend smoothly on k, yielding equilibrium actions $q_i^*(k)$. These in turn yield profits as continuous and differentiable functions of k.

Gross profits are given by $\pi_i^N(k)$ where N is the number of dominant competitors in the market, $N \in \{1, 2\}$. Profits net of bribes are $U_i^N = (1 - b_i)\pi_i^N(k)$ for $i \in \{M, D\}$. Profits are initially increasing in the regulator's action k and concave:

$$\left.\frac{\partial \pi_i^N(k)}{\partial k}\right|_{k=0} > 0, \quad \text{and} \qquad (1)$$
$$\frac{\partial^2 \pi_i^N(k)}{\partial k^2} < 0$$

for all i, N, $i \in \{D, M\}$ and $N \in \{1, 2\}$.

The regulator's payoff functions are weighted sums of profits:

$$U_R^1 = (\lambda_D b_D^1)\pi_D^1(k) + \phi(k), \qquad (2)$$
$$U_R^2 = (\lambda_D b_D^2)\pi_D^2(k) + (\lambda_M b_M^2)\pi_M^2(k) + \phi(k),$$

where $\phi(k)$ is some regulator specific value of k. We will generally be assuming that this is negative. Note that the λ_i measures the marginal utility of firm i's bribe (effectively, how willing the regulator is to be subverted by each firm). We assume that there is some unique and locally stable $k^*(b)$ that is smooth and finite over $b \in [0,1] \times [0,1]$.

We restrict our attention to sub-game perfect equilibria.

3.1 Local monopoly

As a baseline, we consider corruption with a single local firm and a completely venal and uninhibited regulator. In this case the first order condition for the regulator is:

$$\frac{\partial U_R^1}{\partial k} = \lambda_D b_D \frac{\partial \pi_D^1}{\partial k} = 0. \tag{3}$$

For any strictly positive bribe, the regulator simply chooses the local dominant firm's preferred level of k.

The optimal bribe in this case is the smallest possible positive bribe. The marginal benefit to the dominant firm of bribing is $(1 - b_D^1)(\pi_D^1(k^*) - \pi_D^1(0))$, whereas the cost is $\pi_D^1(0)$. If $\pi_D^1(0)$ is sufficiently low, then the firm will bribe.

Obviously, adding a countervailing force to the regulator's objective function, from some marginal cost of distorting k would mean that the regulator could extract a larger bribe from the firm because the firm would need to offset those costs. We explore this cost in the duopoly case below.

3.2 Foreign entry

3.2.1 Symmetric regulatory treatment

With both firms in the market, and given the proposed bribes b_D^N, b_M^N, the first order conditions for the regulator is:

$$\frac{\partial U_R^2}{\partial k} = \lambda_D b_D^2 \frac{\partial \pi_D^2}{\partial k} + \lambda_M b_M^2 \frac{\partial \pi_M^2}{\partial k} = 0$$

With symmetry between the firms the marginal profits will be identical. In addition, we set $\lambda_i = 1$. Thus, we can write:

$$\frac{\partial U_R^2}{\partial k} = (b_D^2 + b_M^2) \frac{\partial \pi_i^2}{\partial k} = 0 \tag{4}$$

The second order condition is negative by assumption on the shape of profit:

$$\frac{\partial^2 U_R^2}{\partial k^2} = \lambda_D b_D^2 \underbrace{\frac{\partial^2 \pi_D^2}{\partial k^2}}_{-} + \lambda_M b_M \underbrace{\frac{\partial^2 \pi_M^2}{\partial k^2}}_{-} < 0. \tag{5}$$

If the firms are symmetric, then both will prefer the same k^*. Again, because the amounts of the bribes above zero do not matter if there is no cost to the regulator, the problem devolves into a coordination game with equilibria where one, and only one firm offers the smallest possible positive bribe.

This might be the case if, for example, the regulator needed to be prodded to provide the physical or legal infrastructure necessary for business, but could not act as a gatekeeper for access to that infrastructure. Each firm would prefer to free ride on the other.[5]

[5] Note that we can endogenize the minimum bribe by creating fixed costs of acting for the regulator. If there is some minimum threshold then the bribes must sum to meet that threshold, and we have a more serious problem, one of a "public" good. But with symmetry this just implies a continuum of possible equilibria.

The addition of competition does not change the overall "level of corruption" as defined in the policy literature, but it may affect the distortion caused by that corruption. Whether competition in this case increases or decreases k rests on how competition affects the regulator's preferences. That is, assuming that we can find profit as a function of the number of competitors N, we need to find the sign of:

$$\frac{\partial^2 \pi_i^1(k,N)}{\partial k \partial N}.$$

In the case where the regulator has no cost in k the total amount of bribe does not change from ϵ, but the overall "distortion," measured as the change in k from zero, may increase or decrease depending on the nature of competition and the nature of the distortionary action.

If we add a countervailing force to the regulator's objective function, $\phi(k)$ where $\phi'(k) < 0$ and $\phi^{''} \leq 0$, for example from consumer surplus concerns or from penalties from accepting bribes, then the magnitude of the bribes matter. Whether competition results in more or less corruption/distortion now depends both on whether the marginal profit with respect to the regulator's action k increases or decreases as discussed above, but also on whether the total amount of bribe-share increases or decreases when we move from monopoly to duopoly. That is, again assuming that we can write functions as sufficiently smooth functions of N, we need to find the sign of the derivative of the sum of the bribe-shares Nb_i with respect to N:

$$b_i + N\frac{\partial b_i}{\partial N}.$$

Method1. In the general case we can show that for an invariant marginal profit in N, then the overall amount of bribes and the overall distortion from corruption will increase with competition. This is dependent on showing that the absolute value of $\frac{\partial b_i}{\partial b_j}$ is less than 1.

To see this, we first note that from the implicit function theorem (IFT) the action of the regulator $k^*(b)$ is increasing monotonically in either bribe b_i:

$$\frac{\partial k^*(b)}{\partial b_i} = \frac{-\frac{\partial \pi_i^2(k)}{\partial k}}{(b_i)\frac{\partial^2 \pi_i^2(k)}{\partial k^2} + \frac{\partial^2 \phi(k)}{\partial k^2}} > 0. \tag{6}$$

The second derivative is negative at $k^*(b)$ and equal to the cross partial:

$$\frac{\partial^2 k^*(b)}{\partial (b_i)^2} = \frac{\partial^2 k^*(b)}{\partial b_i b_j} = -\left(\frac{\partial k^*(b)}{\partial b_i}\right)\left(\frac{\frac{\partial^2 \pi_i^2(k)}{\partial k^2}}{\left(b_i \frac{\partial^2 \pi_i^2(k)}{\partial k^2} + \frac{\partial^2 \phi(k)}{\partial k^2}\right)}\right) < 0$$

Firm i's first order condition is:

$$\frac{\partial U_i^2(b_i)}{\partial b_i} = -\pi_i^2(k^*(b)) + (1-b_i)\left(\frac{\partial \pi_i^2(k)}{\partial k}\frac{\partial (k^*(b))}{\partial b_i}\right) = 0. \tag{7}$$

The second order conditions are:

$$\frac{\partial^2 \pi_i^2(b_i)}{\partial b_i^2} = \overbrace{-2\left(\frac{\partial \pi_i^2(k)}{\partial k}\frac{\partial k^*(b)}{\partial b_i}\right)}^{-} + (1-b_i)\left(\underbrace{\frac{\partial \pi_i^2(k)}{\partial k}}_{+}\underbrace{\frac{\partial^2 k^*(b)}{\partial b_i^2}}_{-} + \underbrace{\frac{\partial^2 \pi_i^2(k)}{\partial k^2}}_{-}\underbrace{\left(\frac{\partial k^*(b)}{\partial b_i}\right)^2}_{+}\right) < 0.$$

The cross partial is:

$$\frac{\partial^2 \pi_i^2(b)}{\partial b_i \partial b_j} = \overbrace{-\left(\frac{\partial \pi_i^2(k)}{\partial k}\frac{\partial k^*(b)}{\partial b_i}\right)}^{-} + (1-b_i)\left(\underbrace{\frac{\partial \pi_i^2(k)}{\partial k}}_{+}\underbrace{\frac{\partial^2 k^*(b)}{\partial b_i^2}}_{-} + \underbrace{\frac{\partial^2 \pi_i^2(k)}{\partial k^2}}_{-}\underbrace{\left(\frac{\partial k^*(b)}{\partial b_i}\right)^2}_{+}\right) < 0.$$

Symmetry implies that we can simplify the latter to:

$$\frac{\partial^2 \pi_i^2(b)}{\partial b_i \partial b_j} = -\left(\frac{\partial \pi_i^2(k)}{\partial k}\frac{\partial k^*(b)}{\partial b_i}\right) + (1-b_i)\left(\frac{\partial \pi_i^2(k)}{\partial k}\frac{\partial^2 k^*(b)}{\partial b_i^2} + \frac{\partial^2 \pi_i^2(k)}{\partial k^2}\left(\frac{\partial k^*(b)}{\partial b_i}\right)^2\right) < 0$$

Then from $\left|\frac{\partial^2 \pi_i}{\partial b_i^2}\right| > \left|\frac{\partial^2 \pi_i}{\partial b_i \partial b_j}\right|$, and the IFT, we have:

$$-1 < \frac{\partial b_i}{\partial b_j} < 0. \tag{8}$$

Not surprisingly, in the the case where both firms benefit from the regulation, an increase one firm's bribe will decrease the other firm's bribe. However, it is also the case that if increased competition does not change the appetite of the firm for distortionary regulation, the sum of bribes will increase, and therefore the distortion in the market increases.

We cannot tell in the general case what the marginal effect of competition would be on the marginal profit of the distortionary action. It may be that competition intensifies or mitigates this effect. Therefore, when the distortionary preferences of the firms are fully aligned, and firms are symmetric, static "entry" by an MNC could increase or decrease the amount of corruption.

Method 2. We can determine the overall effect of an increase in the number of firms on k by examining the effect of N on the bribes and on profit. The effect on bribes, from the implicit function theorem, will rest on the sign of:

$$\text{sign}\frac{\partial b_i}{\partial N} = \text{sign}\left[\underbrace{-\frac{\partial \pi_i^N}{\partial N}}_{+} + (1-b_i)\left(\underbrace{\frac{\partial^2 \pi_i^N}{\partial k \partial N}}_{?}\underbrace{\frac{\partial k}{\partial b}}_{+} + \underbrace{\frac{\partial \pi_i^N}{\partial k}}_{+}\underbrace{\frac{\partial^2 k}{\partial b \partial N}}_{?}\right)\right] \tag{9}$$

In general we can assume that the first term is positive. In the second term, we know that $k'(b)$ is positive and $\pi'(k)$ is positive at $k^*(b)$ if there is a countervailing force. We cannot necessarily claim to know the signs of the other two partials, and as we show below, these can vary.

In order to examine this question more concretely, and to show that both cases are possible, we consider two stylized models of corruption where the local dominant firm and the multinational firm engage in Cournot competition in the final stage. In one model, we examine the case of a regulator that can influence industry-wide production costs, by, for example, suppressing labor costs. In the other, we consider the use of a fixed cost "licensing fee" to suppress fringe competition in favor of large firms with economies of scale. Both are based on a linear demand where the regulatory action effectively increases the ability of the firms to extract surplus from that demand.

We show that in both cases, the amount of the distortionary action is less in the duopoly case than in the monopoly case because the nature of competition decreases the ability of the firm to internalize the benefits from the regulator's action. Conversely, the cases differ as to the "level of corruption." In the case of distorted marginal costs, the level of corruption is *greater* in the duopoly case than in the monopoly case, while in the licensing fee case this relationship is reversed.

"Licensing" fees and other fixed cost barriers to entry The regulator sets an entry fee k that each firm must pay to enter the market. Firms with economies of scale — the local dominant and multinational firms — benefit from a positive licensing fee that suppresses fringe competition.

We assume a continuum of non-atomic, price-taking fringe firms with heterogeneous costs. The overall fringe supply is given by $q_f = (\beta - \sqrt{k})$ for a given k. A linear inverse demand for a given k is then $P = \alpha - (q_f + Q)$, where Q is the residual demand for the dominant firms.

Starting in the third stage with quantity competition, gross profits for the firm(s) from monopoly/Cournot competition are , given some k and b, $U_i^N = (1-b_i)\frac{(\alpha-q_f)^2}{(N+1)^2} - k$. Marginal production costs are zero.

Then:

$$\begin{aligned}\frac{\partial \pi_i^N(k)}{\partial k} &= \frac{\alpha - \beta + \sqrt{k}}{(N+1)^2\sqrt{k}} - 1, \quad \text{and} \\ \frac{\partial^2 \pi_i^N(k)}{\partial k^2} &= -\frac{\alpha - \beta}{2k^{3/2}(N+1)^2} < 0\end{aligned} \tag{10}$$

Note that profit is initially increasing in k.

We use a simple cost to the regulator where that cost is linearly increasing in k: $\phi(k) = -tk$, where t is the marginal, possibly expected, penal**t**y of action k.

Given these profit functions and given bribes $b = \sum_{i=1}^N b_i^N$, the regulator will choose k. The first order condition for the regulator is, assuming symmetry between bribes:

$$\frac{\partial U_R^N}{\partial k} = Nb\frac{\alpha - \beta + \sqrt{k}}{(N+1)^2\sqrt{k}} - Nb - t = 0. \tag{11}$$

Then solving for $k^*(b)$,

$$k^*(b) = \left(\frac{b(\alpha - \beta)}{bN(2+N) + (N+1)^2 t}\right)^2 \tag{12}$$

$$\frac{\partial k^*(b)}{\partial b_i} = \frac{2b(\alpha-\beta)^2(1+N)^2 t}{(bN(2+N) + (1+N)^2 t)^3} > 0. \tag{13}$$

Note that b is the sum of all bribes.

In the first stage, given $k^*(b)$, the firms choose their bribes by maximizing their net profit:

$$U_i^N = (1-b_i)\pi_i(k^*(b)) = (1-b_i)\left(\frac{(\alpha - \beta + \sqrt{k^*(b)})^2}{(N+1)^2} - k^*(b)\right) \tag{14}$$

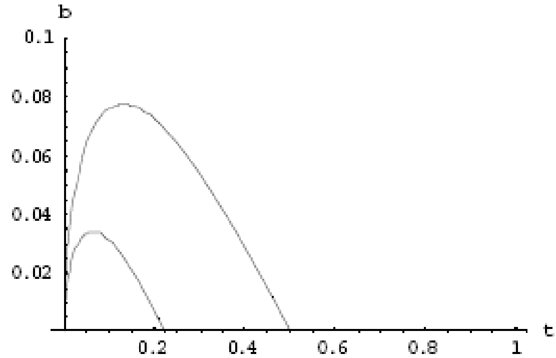

Figure 1: Monopoly and Duopoly Bribes (b)

Solving the first order condition yields a single real root. This real root maximizes profit with the following equilibrium bribes. The bribe for the monopolist is:

$$b_i^1(t) = -\frac{1}{3}\left(\left(\frac{2}{3}\right)^{\frac{1}{3}}\left[\left(\frac{2}{3}\right)^{\frac{1}{3}} f(t) - \frac{2t^2}{f(t)}\right] - 4t\right). \tag{15}$$

$$f(t) = \left(27t^2 + 36t^3 + t^2\sqrt{3(243 + 648t + 436t^2)}\right).$$

The equilibrium bribes for the duopolists are:

$$b_i^2(t) = \frac{1}{16}(3^{2/3}(16t^2 + 9t^3)^{1/3} - 9t). \tag{16}$$

In considering these bribes, first note that they are only functions of t, the marginal cost to the regulator. This means that the bribe is independent of demand characteristics. Because the bribe is formulated as a proportion of overall profits, the regulator internalizes the correct response to changing demand. The bribe serves as a scaling factor to the marginal benefit.

Second, direct comparison of the two bribes as shown in Figure 1 shows that not only is the individual firm's bribe less under duopoly than under monopoly, but the sum of the duopoly bribes is still less than the monopoly bribe. Given that the sum of duopoly profits in Cournot is necessarily less than monopoly profits, this means that the level of corruption falls as competition increases from monopoly to duopoly.

Third, for a given bribe, the incentives of the regulator to manipulate k fall in the number of firms (as competition rises). To see this, we compare the optimal k under duopoly and monopoly for a fixed bribe b. The change in $k^*(b)$ with respect to a change in N is:

$$\frac{\partial k^*(b)}{\partial N} = -\frac{4(\alpha - \beta)^2 b^2 (1+N)(b+t)}{(bN(2+N) + (1+N)^2 t)^3} < 0. \tag{17}$$

For a given bribe, increased competition will decrease the incentive of the regulator to distort k. Together with the decrease in the total share of profits offered to the regulator, this means that competition between the firms decreases the overall effect of corruption on the market. Figure 2 shows this relationship.

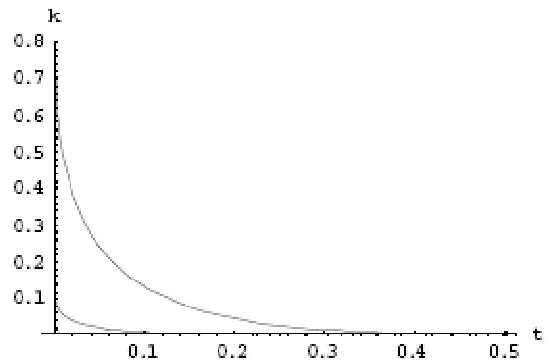

Figure 2: Distortion (k) in Monopoly and Duopoly

Marginal cost reducing regulatory action In this exercise the regulator sets k which is some action intended to lower marginal costs for the industry. This can be practiced in a number of ways. For example, the regulator may choose to suppress the labor union if the production in the industry is labor-intensive or reduce per unit tariffs imposed on intermediate goods if the production is imported-input-intensive.

We assume a linear inverse demand $P = \alpha - Q$ and a linear marginal cost structure $c_D = c_M = c(k)$ which is symmetric across firm. We assume that $c(k)$ is decreasing in k and convex.

Starting in the third stage with quantity competition, gross profits for the firm(s) from monopoly/Cournot competition are , given some k and b, $\pi_i^N = \frac{(\alpha - c(k))^2}{(N+1)^2}$. For the sake of concreteness, let $c(k) = e^{c-k}$. Fixed costs are assumed zero. We assume complete symmetry across firms.

Then:

$$\frac{\partial \pi_i^N}{\partial k} = \frac{2}{(N+1)^2} e^{c-k} \left(\alpha - e^{c-k}\right) > 0, \quad \text{and} \tag{18}$$

$$\frac{\partial^2 \pi_i^N}{\partial k^2} = \frac{2}{(N+1)^2} \left(e^{2(c-k)} - e^{c-k} \left(\alpha - e^{c-k}\right)\right) < 0$$

As long as there is production (i.e., $q_i^N > 0$ which requires $\alpha - e^{c-k} > 0$) and $e^{c-k}\left(\alpha - e^{c-k}\right) > e^{2(c-k)}$, profits will be increasing and concave in k. We end up with this last condition because profits are quadratic in $c(k)$. There might be cases where $c(k)$ can decline so fast in k, when squared, it might dominate the marginal decline of $c(k)$ in k, namely c''. In other words, it is sufficient for us to have a $c(k)$ which is not "too convex" in k to achieve the desired result.

In the second stage, given these profit functions, $\phi(k) = -tk$, and some bribes $b_D = b_M = b$, the regulator will choose k. Assuming symmetry $\lambda_D = \lambda_M = 1$, the first order condition for the regulator is, :

$$\frac{\partial U_R^N}{\partial k} = \frac{2Nb}{(N+1)^2} e^{c-k} \left(\alpha - e^{c-k}\right) - t = 0. \tag{19}$$

Then,

$$k^*(b) = c - \ln\left(\frac{\alpha b - A}{2b}\right) \qquad \text{where } A = \sqrt{\alpha^2 b^2 - \frac{2(N+1)^2}{N} bt} \tag{20}$$

and

$$\frac{\partial k^*(b)}{\partial b} = \frac{(N+1)^2 t}{NA\,(\alpha b - A)} > 0. \tag{21}$$

In the first stage, given $k^*(b)$, the firms choose their bribes by maximizing their net profit:

$$U_i^N = (1 - b_i)\pi_i(k^*(b)) = (1 - b_i)\left(\frac{\alpha - e^{c-k}}{N+1}\right)^2 \tag{22}$$

Maximizing:

$$\frac{\partial U_i^N}{\partial b} = -\frac{t\,(\alpha b + A)\left(\alpha b^2 - \alpha b + A\right)}{N^2 b^2 A\,(\alpha b - A)} = 0 \tag{23}$$

This is equivalent of solving $\alpha^2(b-2)b^2 + \frac{2(N+1)^2}{N}t = 0$ for b. The solution to this polynomial in b involves three roots of which we restrict our attention to the real ones only. As long as $b \in (0, 4/3)$ and $t \in (0, \widehat{t})$ where $\widehat{t} = \frac{16N\alpha^2}{27(N+1)^2}$, we know that all three roots are real. The smallest one is always negative and therefore ignored. Among the positive ones the smaller one is the optimal bribe. In what follows we will look at this middle root in more detail.

First, notice that the optimal bribe in this exercise is a function of α, the market size and t, the marginal cost to the regulator. As shown in Figure 3, for a given t, bribes are decreasing in the market size because -independent of the competition- the marginal effect of the regulatory action on profits, $-\pi'(k)$ is positive at $k^*(b)-$ is larger in bigger markets.

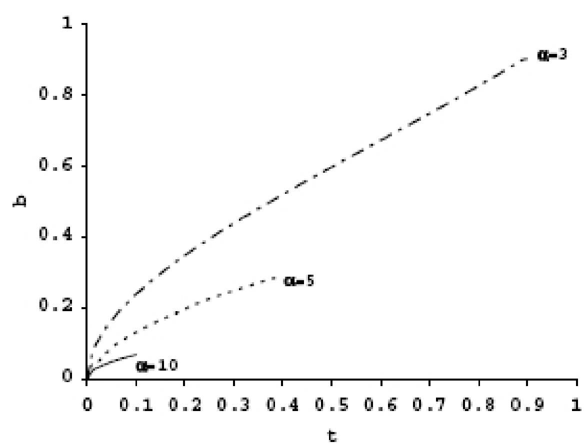

Figure 3: Bribes (b) as the Market Size(α) Changes

Second, given α, the market size, direct comparison of the two bribes, as shown in Figure 4, shows that the duopoly bribes are more than the monopoly bribes. Recall that the overall effect of an increase in the number of firms on the bribes will rest on the sign of:

$$\operatorname{sign}\frac{\partial b_i}{\partial N} = \operatorname{sign}\left[\underbrace{-\frac{\partial \pi_i^N}{\partial N}}_{+} + (1-b_i)\left(\underbrace{\frac{\partial^2 \pi_i^N}{\partial k \partial N}}_{-}\underbrace{\frac{\partial k}{\partial b}}_{+} + \underbrace{\frac{\partial \pi_i^N}{\partial k}}_{+}\underbrace{\frac{\partial^2 k}{\partial b \partial N}}_{0}\right)\right] \tag{24}$$

We know that the first term is positive. In the second term, the last term vanishes in this particular case. An increase in the number of firms has no bearing on the marginal effect of bribes on corruption. Therefore, the sign of the above term depends on the relative pulls of the first two terms. Then, in this particular case of marginal cost reducing regulatory action with convex production costs, it must be the case that first term dominates the second one.

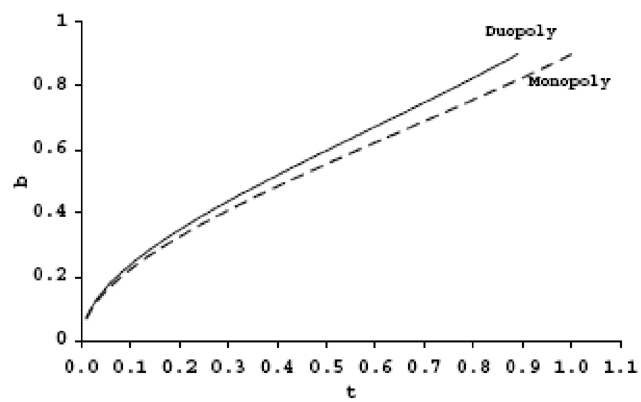

Figure 4: Monopoly and Duopoly Bribes (b)

Third, for a given bribe, the incentives of the regulator to manipulate k in the number of firms (as in the licensing fee case). To see this, we compare the optimal k under duopoly and monopoly for a fixed bribe b. The change in $k^*(b)$ with respect to a change in N is:

$$\frac{\partial k^*(b)}{\partial N} = -\frac{N^2-1}{N^2 A\left(\alpha b - A\right)} < 0. \tag{25}$$

For a given bribe, increased competition will decrease the incentive of the regulator to distort k. Even though the total share of profits offered to the regulator increases in N, competition between the firms decreases the overall effect of corruption on the market because the marginal gain from increasing the distortion are much reduced, and thus outweigh the increase in the share. Figure 5 shows this relationship.

3.2.2 Asymmetry in regulatory treatment (preliminary)

Suppose now that D and M differ in their preferred level of k. What we would like to do is set this up so that there is one parameter that takes in symmetry and some range of asymmetry.

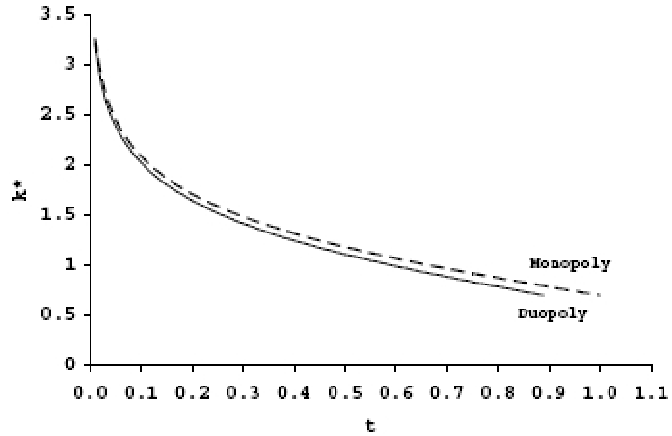

Figure 5: Distortion (k) in Monopoly and Duopoly

We will assume, without significant loss of generality that $k_D^* > k_M^*$.

Once this heterogeneity occurs, the local dominant and multinational firms are vying to shift the weight that the regulator puts on their profit.

We could set this up either as a single payer auction, an all pay (winner take all) auction, or an all pay **nonauction**.

This last is the interpretation we are most interested in. Especially with asymmetric players, a firm may be willing to pay to ameliorate the negative impact of another firm's bribe.

In this case bribes will be strategic complements or strategic substitutes. In general, if any countervailing force from consumer preferences is low or nonexistent, then the bribes will be complements. But for a strong countervailing force, such that both firms are pulling in the same direction would mean that an increase in one firms bribe would result in a decrease in the other's. However, this situation would still likely end up with a net increase in distortion and bribery.

In the former case (symmetry), a credible protestation by the regulator of consumer harm would increase bribes, whereas that is not necessarily the case here. Only if the regulator

In this case, we assume asymmetry in the effect of the regulator's action: it is positive for the local dominant firm and negative for the multinational. We also assume that the positive effect is diminishing and the negative effect increasing (in magnitude).

$$\frac{\partial \pi_D}{\partial k} > 0, \quad \text{and}$$
$$\frac{\partial^2 \pi_D}{\partial k^2} < 0$$
$$\frac{\partial \pi_M}{\partial k} < 0, \quad \text{and}$$
$$\frac{\partial^2 \pi_M}{\partial k^2} < 0$$

The first order condition for the regulator is now:

$$\frac{\partial U_R}{\partial k} = \lambda_D b_D \underbrace{\frac{\partial \pi_D}{\partial k}}_{+} + \lambda_M b_M \underbrace{\frac{\partial \pi_M}{\partial k}}_{-} + \underbrace{\frac{\partial \phi(k)}{\partial k}}_{?} = 0$$

We assume that there is some unique and locally stable $k^*(b_i)$.
The second order condition is:

$$\frac{\partial^2 U_R}{\partial k^2} = \lambda_D b_D \underbrace{\frac{\partial^2 \pi_D}{\partial k^2}}_{-} + \lambda_M b_M \underbrace{\frac{\partial^2 \pi_M}{\partial k^2}}_{-} + \underbrace{\frac{\partial^2 \phi(k)}{\partial k^2}}_{-} < 0$$

If the dominant firm pays a bribe to the regulator it will tend to increase the level of k as before. But now if the multinational firm pays a bribe it will tend to decrease the level of k,

$$\frac{\partial k^*(b)}{\partial b_M} = \lambda_M \frac{\partial \pi_M}{\partial k} \frac{1}{-\frac{\partial^2 U_R}{\partial k^2}} < 0.$$

The magnitude of this effect is again decreasing for both bribes:

$$\frac{\partial^2 k^*(b)}{\partial b_D^2} = \lambda_D^2 \frac{\partial \pi_D}{\partial k} \frac{\partial^2 \pi_D}{\partial k^2} \frac{1}{(-\frac{\partial^2 U_R}{\partial k^2})^2} < 0,$$

and

$$\frac{\partial^2 k^*(b)}{\partial b_M^2} = \lambda_M^2 \frac{\partial \pi_M}{\partial k} \frac{\partial^2 \pi_M}{\partial k^2} \frac{1}{(-\frac{\partial^2 U_R}{\partial k^2})^2} > 0.$$

Note that because k is decreasing in b_M, the positive second derivative means that the magnitude of the effect of increasing b_M on k is decreasing.

Finally, the cross effect of b_M on $\frac{\partial k^*(b)}{\partial b_D}$ will be negative. An increase in the multinational's bribe will decrease the marginal effect of the local firm's bribe:

$$\frac{\partial^2 k^*(b)}{\partial b_D \partial b_M} = \lambda_D \lambda_M \frac{\partial \pi_D}{\partial k} \frac{\partial^2 \pi_M}{\partial k^2} \frac{1}{(-\frac{\partial^2 \phi(k)}{\partial k^2})^2} < 0.$$

Conversely, an increase in the local firm's bribe will increase the effect of the multinational firm's bribe:

$$\frac{\partial^2 k^*(b)}{\partial b_M \partial b_D} = \lambda_D \lambda_M \frac{\partial \pi_M}{\partial k} \frac{\partial^2 \pi_D}{\partial k^2} \frac{1}{(-\frac{\partial^2 U_R}{\partial k^2})^2} > 0.$$

Both of these effects follow from the declining marginal benefit of the regulator's actions on the firms' profits. They are simply moving in opposite directions.

Firm i's first order condition is still the same:

$$\frac{\partial \pi_i}{\partial b_i} = -\pi_i(k) + (1 - b_i) \left(\frac{\partial \pi_i}{\partial k} \frac{\partial k}{\partial b_i} \right)$$

Or, substituting in from above,

$$\frac{\partial \pi_i}{\partial b_i} = -\pi_i(k) + (1 - b_i)\lambda_i \left(\frac{\partial \pi_i}{\partial k} \right)^2 \frac{1}{-\frac{\partial^2 U_R}{\partial b_i^2}}$$

Again, the firm is willing to pay a positive bribe as long as the regulator cares enough about the multi-national's bribe and profit is effected strongly by k.

The second order conditions are, for the dominant firm:

$$\frac{\partial^2 \pi_D}{\partial b_D^2} = \overbrace{-\left(\frac{\partial \pi_D}{\partial k}\frac{\partial k}{\partial b_D}\right)}^{-} + (1-b_D)\left(\underbrace{\frac{\partial \pi_D}{\partial k}}_{+}\underbrace{\frac{\partial^2 k}{\partial b_D^2}}_{-} + \underbrace{\frac{\partial^2 \pi_D}{\partial k^2}}_{-}\underbrace{\left(\frac{\partial k}{\partial b_D}\right)^2}_{+}\right) < 0,$$

and for the multi-national firm,

$$\frac{\partial^2 \pi_M}{\partial b_M^2} = \overbrace{-\left(\frac{\partial \pi_M}{\partial k}\frac{\partial k}{\partial b_M}\right)}^{-} + (1-b_M)\left(\underbrace{\frac{\partial \pi_M}{\partial k}}_{-}\underbrace{\frac{\partial^2 k}{\partial b_M^2}}_{+} + \underbrace{\frac{\partial^2 \pi_M}{\partial k^2}}_{-}\underbrace{\left(\frac{\partial k}{\partial b_M}\right)^2}_{+}\right) < 0.$$

What we are interesting in is how the two bribes interact.

From the IFT, we have:

$$\frac{\partial b_D}{\partial b_M} = \overbrace{-\underbrace{\frac{\partial \pi_D}{\partial k}}_{+}\underbrace{\frac{\partial k}{\partial b_M}}_{-}}^{+} + \underbrace{(1-b_D)}_{+}\underbrace{\left(\overbrace{\underbrace{\frac{\partial \pi_D}{\partial k}}_{+}\underbrace{\frac{\partial^2 k}{\partial b_D \partial b_M}}_{-}}^{-} + \overbrace{\underbrace{\frac{\partial^2 \pi_D}{\partial k^2}}_{-}\underbrace{\frac{\partial k}{\partial b_D}}_{+}\underbrace{\frac{\partial k}{\partial b_M}}_{-}}^{+}\right)}_{?}\frac{1}{-\frac{\partial^2 U_R}{\partial b_D^2}} ?0$$

$$\frac{\partial b_M}{\partial b_D} = \overbrace{-\underbrace{\frac{\partial \pi_M}{\partial k}}_{-}\underbrace{\frac{\partial k}{\partial b_D}}_{+}}^{+} + \underbrace{(1-b_M)}_{+}\underbrace{\left(\overbrace{\underbrace{\frac{\partial \pi_M}{\partial k}}_{-}\underbrace{\frac{\partial^2 k}{\partial b_M \partial b_D}}_{+}}^{-} + \overbrace{\underbrace{\frac{\partial^2 \pi_M}{\partial k^2}}_{-}\underbrace{\frac{\partial k}{\partial b_M}}_{-}\underbrace{\frac{\partial k}{\partial b_D}}_{+}}^{+}\right)}_{?}\frac{1}{-\frac{\partial^2 U_R}{\partial b_M^2}} ?0$$

3.3 Reputation

There are considerable reputation costs of engaging in bribery for the multinational corporations in particular. It is a widely accepted fact that even allegations of paying bribes in a foreign country can reduce consumer demands for corporate products, plunge the company's share price, make it difficult to recruit outstanding new staff, spark political and media investigations, and massively divert top management from crucial operational work.

So far we have not carefully examined the role of reputation in this paper. As currently formulated, reputation effects serve to reduce the multinational firm's ability to compete for the corrupt regulator's favors, but should not affect the overall framework that we have constructed.

4 Conclusion and Directions for Future Work

This paper examined a model of regulatory capture that highlighted the interaction between a corrupt regulator, a local dominant firm and a multinational firm. We built a three player game between a corrupt regulator, a local dominant firm and a multinational firm. We considered two major cases. In the first case, the regulation in question was anti-competitive, but was not biased against the multinational firm. In this case bribes were strategic substitutes for the two dominant firms — each firm's bribe was decreasing in the level of the other's bribe. In the second case regulation was biased in favor of the local firm so that the multinational firm would pay a bribe in order to reduce the level of protectionist regulation. In this case bribes may be strategic complements or substitutes.

Our preliminary analysis showed that the presence of the multinational could have a variety of effects. In the former case, these include a reduction in corruption due to decreased rents and a corresponding decrease in the ability and desire to subvert the regulator. In the latter case an increase in competition for the regulator's attentions could result in a higher level of distortional corruption as one party or the other bids to "win" the regulator to their side, or an increase in relatively benign dissipative corruption where each side bids to maintain the regulator's neutrality.

The future version of the paper will address the issues incomplete information and reputation costs in a dynamic setting.

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