Division of Research
Graduate School of Business Administration
The University of Michigan

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COMPETITION, REGULATION, AND BRIBERY

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Paul J. Beck
University of Illinois
and
Michael W. Maher
The University of Michigan

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Competition, Regulation, and Bribery

Bribery is commonly used to obtain contracts in many foreign countries. The Foreign Corrupt Practices Act of 1977 (FCPA) made it illegal for U.S. firms to pay bribes, even in the absence of regulation on the bribe-taking side of the transaction. Opponents of the law claimed it would put U.S. firms at a competitive disadvantage relative to foreign suppliers who were not subject to the same regulation. This paper models the effects of competition and regulation on bribery. Competition for the incumbent bribe-taker's position is shown to limit bribes, while competition among suppliers reduces the contract price but does not affect the equilibrium. Regulation of bribe takers reduces the disciplinary effect of competition and is ineffective in deterring bribery unless the penalties exceed the gains. The impact of regulation of bribe payers (i.e., suppliers) depends on whether the law is applicable to all bribe payers, firms' costs, and the existence of contract price constraints on the purchasing side of the transaction. The results raise questions about the effectiveness of the FCPA in reducing bribery.

1. INTRODUCTION

Recent public disclosures provide evidence that bribes have been paid to foreign government officials to obtain contracts for supplying aircraft, military hardware, drugs, and other goods.[1] In general, bribery persists when it is costly to monitor and control agents' behavior (see Becker and Stigler (1974), Pashigian (1975), Alchian (1977), Coase (1979), and Pauly (1979)). While bribery of government officials in the United States has been illegal for many years, bribery of foreign officials was not regulated by the United States government until 1977 when the Foreign Corrupt Practices Act (FCPA) was enacted. A unique feature of the FCPA is that U.S. firms are subject to U.S. prosecution for bribing foreign government officials even in countries which have no prohibitions of their own against bribery. This created controversy during congressional hearings, in that the regulation was viewed by opponents as placing U.S. firms at a potential disadvantage relative to their foreign competitors who were not subject to regulation. However, FCPA supporters argued that bribery by U.S. firms was inconsistent with the foreign policy interests of the United States and, in particular, the Carter Administration's "human rights" doctrine for foreign policy (see U.S. House of Representatives, 1977).

The purpose of this paper is to investigate anti-bribery regulations and compare their disciplinary effects with those of competition. In particular, we focus on bribes paid by suppliers to influence the awarding of government contracts. Bribery is modelled as a sequential process in which an incumbent government official administratively sets the contract parameters including price and then induces suppliers to compete for the rights to the contract by offering bribes. The model permits an investigation of the separate and joint effects of competition and regulation on both the supply and demand sides of the bribery transaction. Our analysis shows that supplier competition can either increase or have no effect upon the equilibrium level of bribery depending upon whether or not there is competition for the incumbent official's position on the demand side. The analysis also shows that the effects of regulating suppliers depend upon the existence of reciprocal regulation of bribe-taking and competition for the incumbent's position.

The remaining sections of this paper are organized as follows. Section 2 presents a model which predicts how the incumbent government official will structure the purchase contract parameters in response to competition for his position. In particular, we show that the incumbent government official will voluntarily constrain the total contract price and bribe in order to protect against displacement by a competitor. Increasing the number of potential competitors for the incumbent's position, however, does not necessarily make the incumbent more vulnerable to displacement. We show that, in some cases, both the contract price and equilibrium bribe actually rise when additional competitors are introduced. Suppliers' competitive responses to the contract offered by the government official are investigated in Section 3. We model competition among firms as a non-cooperative game and derive equilibrium bribery response functions. In the presence of competition for the incumbent official's position, we show that increasing the number of suppliers reduces the equilibrium contract price, but does not affect the equilibrium level of bribery. Section 4 introduces regulation of bribery recipients. The analysis indicates that regulating bribery recipients reduces the disciplinary effect of competition for the incumbent's position and, thus, is ineffective in deterring bribe-taking unless large penalties can be imposed. Section 5 completes our analysis of regulation by identifying the consequences of supplier regulation. In particular, we consider both uniform regulation under which all suppliers (i.e., bribe payers) are subjected to the same regulation and discriminatory regulation wherein only a subset of firms is regulated. Without constraints on the contract price which would occur under reciprocal bribe-taking regulation, we show that neither type of supplier regulation is effective. Furthermore, the two types of regulation can have different effects on the contract price. Under uniform supplier regulation, the contract price generally increases so the citizens in the purchasing country ultimately bear the cost of this regulation. However, discriminatory regulation can either increase or reduce the contract price depending upon the *ex ante* competitive position of the regulated firms vis-à-vis the non-regulated firms. Our findings raise questions about the potential effectiveness of bribery regulation such as the FCPA. Empirical implications of our study are presented in Section 6.

2. COMPETITION FOR THE OFFICIAL'S POSITION

We model bribery in a context where an incumbent government official has the authority to award governmental contracts administratively.[2] Since the incumbent's actions are costly to monitor and we temporarily assume that no effective regulations exist on either the demand or supply side of the sales transaction, there are opportunities for bribe-taking. These assumptions permit an assessment of the potential disciplinary effects of competition and also provide a benchmark for our subsequent analyses of various anti-bribery regulations.

The bribery process is modelled as a non-cooperative sequential game between an incumbent government official and n potential suppliers (see Figure 1 below). A time, t_0, the government official establishes the total contract price parameter and then induces the suppliers to compete for the contract by making bribe offers at time t_1. Subsequently, the government official awards the contract at t_2 and collects the bribe from the "winning" supplier at t_3. Finally, the purchasing government pays the agreed upon contract price to the supplier at t_4.

Insert Figure 1 Here

Initially, we focus upon the government official's contract pricing problem at t_0. This is followed in Section 3 by an analysis of suppliers' equilibrium bribery responses to the contract price. *Ceteris paribus*, increasing the total contract price at t_0 raises suppliers' expected gross profits and, thereby, enhances their ability to pay larger bribes (see Pauley, 1979). As the value of the bribes increases, however, the incumbent official's property rights eventually become sufficiently valuable to create incentives for others to incur the cost of monitoring and displacing the incumbent. Therefore, in setting the contract price parameter, the incumbent official must balance the increase in the value of bribes against the higher risk of displacement.[3]

Single Competitor

Initially we assume that there is one competitor for the incumbent government official's position. (In the following subsection, the multicompetitor case is analyzed.) We assume that, prior to the time (t_3) when the bribe is actually paid, the competitor has the ability to displace the incumbent by making an investment of θ.[4] The θ parameter can be interpreted either as the amount of resources which the competitor has available to spend fighting the incumbent or as the cost of displacing the incumbent. While the competitor is assumed to know θ prior to challenging the incumbent, the latter has imperfect information about θ at the time (t_0) when the contract price is determined. Accordingly, we denote the incumbent's beliefs about the competitor's costs by the probability distribution, $H(\theta)$. We also simplify further by assuming that the incumbent and competitor know the expected value of the bribe ($\overline{B}$) conditional upon the contract price parameter, P. (In Section III, the equilibrium relationship between $\overline{B}$ and P is derived endogeneously based upon an analysis of the bribery game between the official and suppliers.)

Given the above assumptions, a competitor would not have incentives to incur the cost of displacing the incumbent unless:

$$\theta < \overline{B}. \tag{1}$$

The probability of being displaced (as assessed by the incumbent official) for a given $\overline{B}$, therefore, is $H(\overline{B})$. If the competitor is successful (i.e., displacement occurs prior to time, t_3), the incumbent loses the property rights to the bribe; otherwise, the incumbent collects the bribe in our model. Accordingly, at t_0 the incumbent's expected utility from the bribe is given by:

$$EU^I = H(\overline{B})U(0) + (1 - H(\overline{B}))E[U(B)]. \tag{2}$$

where the expectation is taken with respect to the value of the bribe conditional upon the contract price, P.

The incumbent's vulnerability to displacement in the above model clearly depends upon the competitor's cost distribution. For example, suppose that P* represents the optimal solution to the incumbent's contract pricing problem in (2). Now consider the effect of shifting the cost distribution, H(•), downward in the sense of first-order stochastic dominance. Such a shift would increase the probability of displacement (conditional upon P*), thereby, reducing the expected utility from bribes. Hence, the incumbent would have to lower the contract price below P* to reduce the probability of displacement. A parallel analysis, of course, would show that an upward shift in the competitor's cost distribution would increase the incumbent's choice of P* and $\overline{B}$. The competitor's cost distribution, thus, predictably affects both the contract price and the expected bribe collected by the incumbent government official.

Multi-Competitors

A priori, one might speculate that introducing additional competition for the incumbent's position, *ceteris paribus*, would further increase the probability of displacement and, thus, create incentives for an incumbent to respond by reducing P*. We show in Proposition 1 that increasing the number of competitors under certain circumstances, however, actually can reduce the probability of displacement and, thus, induce the incumbent to increase the contract price and bribes.

As a starting point for the analysis, we now assume that there are n potential competitors who have an opportunity to vie for the incumbent's position. Consistent with our previous assumptions, each competitor knows $\bar{B}$ and its own available resources, but has imperfect information about competitors. Accordingly, each competitor's θ is modelled as a realization from a common underlying distribution, $H(\theta)$. This modelling framework maintains comparability with our previous analysis, while permitting differences among competitors.

When deciding whether to challenge for the incumbent's position, each competitor must compare the expected value of bribes (discounted by the probability of winning) against the associated cost. In the present model, we assume that competitors behave independently and that the probability of prevailing against other competitors is an increasing function of θ. The former assumption prevents explicit modelling of coalition formation within the model, but does not preclude coalition formation per se since the competitors can be viewed as coalitions of various interest groups.[5] The latter assumption is not essential, as results similar to those presented below can be demonstrated for other cases in which the probability of winning is independent of θ.

Assuming that the ith competitor decides to incur a cost of θ_i, the (*ex ante*) probability of actually winning is equivalent to the probability that the other n-1 competitors incur costs which are lower than θ_i. Given our previous assumptions, this probability is $H(\theta_i)^{n-1}$. Assuming rationality, the ith competitor would be unwilling to challenge the incumbent unless:

$$\theta_i < \bar{B}H(\theta_i)^{n-1}. \tag{3}$$

Displacement of the incumbent can occur, therefore, only when (3) holds for at least one of the competitors. Accordingly, the incumbent will successfully avoid displacement when $\bar{B}$ is established (via P) such that $\theta_i > \bar{B}H(\theta_i)^{n-1}$ for i=1,n.

The calculation of the probabilities for either event is potentially complex. When $1 > (n-1)\bar{B}H(\theta)^{n-2}h(\theta)$ for all θ, however, the problem is simplified greatly, because when the lowest cost competitor is deterred, all other (higher cost) competitors also would be deterred. Accordingly, the probability that the minimum θ competitor would be deterred is given by $Pr(\theta_{min} > \bar{B}H(\theta_{min})^{n-1})$. Rearranging terms, one can verify that:

$$Pr(\theta_{min} > \bar{B}H(\theta_{min})^{n-1}) = Pr(1/\bar{B} > H(\theta_{min})^{n-1}/\theta_{min}) \tag{4}$$

$$= Pr(H(\theta_{min})^{n-1}/\theta_{min} < 1/\bar{B}). \tag{5}$$

Since both the probability distribution for θ_{min} and $H(\theta_{min})^{n-1}$ depend upon n, conclusions about the effect of the number of competitors on the incumbent's probability of displacement are not possible without further assumptions about $H(\theta)$. Accordingly, we now assume that θ is uniformly distributed on the interval, $(0,\theta^*)$. Given this assumption, $H(\theta) = \theta/\theta^*$, so

$$Pr(H(\theta_{min})^{n-1}/\theta_{min} < 1/\bar{B}) = Pr(\theta_{min}^{n-1}/\theta^*/\theta_{min} < 1/\bar{B}) \quad (6)$$

$$= Pr(\theta_{min} < \sqrt[n-2]{\theta^*/\bar{B}}). \quad (7)$$

The event that a particular θ_i is the smallest among the n competitors (i.e., $\theta_i = \theta_{min}$) is equivalent to the event that the other n-1 competitors simultaneously have θ values which exceed θ_i which has probability $(1 - H(\theta_i))^{n-1}$. Thus, the probability of maintaining incumbency, given $\bar{B}$ is:

$$Pr(\theta_i = \theta_{min} < \sqrt[n-2]{\theta^*/\bar{B}}) = [1 - H(\sqrt[n-2]{\theta^*/\bar{B}})]^{n-1} \quad (8)$$

$$= [1 - \frac{\sqrt[n-2]{\theta^*/\bar{B}}}{\theta^*}]^{n-1}. \quad (9)$$

Equation (9) indicates that the probability of maintaining incumbency depends jointly upon θ^*, $\bar{B}$, and n. Furthermore, introducing additional competitors can either increase or decrease the probability of maintaining incumbency. As an example of the latter, we now demonstrate that the probability of maintaining incumbency and expected bribe both can be higher with multiple competitors than with a single competitor.

Proposition 1:

The equilibrium contract price and the expected value of the bribe received are not necessarily reduced by the introduction of additional competitors.

Proof:

Suppose initially that there is a single risk-neutral competitor and the optimal (interior) solution to the incumbent's decision problem in (4) is to choose $\overline{B}$ (via P) such that, conditional upon $\overline{B}$, the probability of a raid, $H(\overline{B}) = \alpha$. Since θ is uniformly distributed on the interval, $(0,\theta^*)$, this would imply that $\overline{B} = \alpha\theta^*$.[6] Now consider a case in which: (i) there are four competitors, (ii) θ is uniformly distributed on the interval $(0,\theta^*)$, (iii) $1 > (n-1)\overline{B}H(\theta)^{n-2}h(\theta)$ for all θ, and (iv) $\theta^* < \sqrt{\alpha}/(1 - \sqrt[3]{1-\alpha}$. Assuming for the moment that $\overline{B} = \alpha\theta^*$, (9) can be used to compute the probability of maintaining incumbency with four competitors,

$$\Pr(\text{Incumbency}) = (1 - \frac{\sqrt{\theta^*/\alpha\theta^*}}{\theta^*})^3 \tag{10}$$

$$= (1 - \frac{1}{\sqrt{\alpha\theta^*}})^3. \tag{11}$$

Note that, if $\theta^* < \sqrt{\alpha}/(1 - \sqrt[3]{1-\alpha})$, as assumed above, (11) is larger than $1-\alpha$ which implies that the incumbent's probability of being displaced is now less than α. Accordingly, in the four competitor case, the incumbent would be able to increase $\overline{B}$ above $\alpha\theta^*$ while still maintaining the risk of displacement at the initial α level. Since the incumbent's expected payoff would be larger if $\overline{B}$ were increased, the equilibrium contract price P (and $\overline{B}$) would be higher in the four-competitor case than in the single competitor case.

Q.E.D.

The basic implication of Proposition 1 is that increasing the number of competitors has two divergent effects. First, additional competitors increase the probability that (at least) one of the competitors will have a θ realization lower than $\overline{B}$. Ceteris paribus, this would seemingly increase the incumbent's risk of displacement and imply that his best response would be to lower $\overline{B}$ via a contract price reduction to reestablish equilibrium. Increasing the number of competitors, however, also diminishes the probability that any one competitor will prevail in the competition and, thereby, reduces the expected value of the property rights assessed by the competitors. Since competitors' incentives to attempt displacement are attenuated, the actual probability of displacement need not decrease. In fact, Proposition 1 has shown that, under certain conditions, the probability of displacement can decrease, so the incumbent's optimal response would be to increase the contract price and, thereby, secure a larger expected bribe.

A final point regarding Proposition 1 concerns the assumptions that competitors know their own costs and are risk-neutral. While these assumptions simplify our proof, they are not essential for our results. In fact if risk aversion were assumed and competitor's costs also were assumed to be uncertain, our results would be strengthened as the expected utility of the (uncertain) property rights to the incumbent's position would be less than the utility of their expected value.

3. BRIBERY GAME AMONG SUPPLIERS

Having analyzed the government official's contract pricing problem, we now investigate suppliers' equilibrium bribery responses to P, so that $\overline{B}$ can be derived endogeneously. In particular, we assume that the incumbent official solicits bribes from suppliers and then awards the contract to the firm offering to pay the largest "commission."[7] Without loss of generality, the negotiations between the governmental official and suppliers are assumed to be private so firms do not know the commission bribe offers of the other firms.[8] Hence, the bribery game among suppliers is modelled as noncooperative. The following notation is adopted in the bribery response model:

P:	The total contract price.
c:	The cost of supplying the product (excluding bribes).
$z = P - c$:	The gross profit from the contract.
B:	The bribe to be paid to the government official or third party intermediary.
F(z):	The cumulative probability distribution for z, defined over the interval $[\underline{z}, \overline{z}]$.
n:	The number of firms competing for the contract.

Consistent with our previous assumptions and without loss of generality, each supplier is assumed to know the total contract price P and its own cost before offering bribes.[9] However, suppliers have incomplete information about other firms' costs and potential gross profits. Accordingly, the bribery process is modelled as a game of incomplete information (see Harsanyi 1967, 1968). As a further simplification, the analysis is restricted to games in which all suppliers have the same beliefs about firms' gross profits which are modelled by the distribution, F(z). We assume that F(z) is twice differentiable and that the bribe paid is an increasing and differentiable function of z and, therefore, write $B = B(z)$ where $dB(z)/dz = B'(z) > 0$. Given these assumptions, B(z) has an inverse which is denoted by $\pi(\cdot)$ and, by definition, $\pi(B(z)) = z$.

Since all firms possess the same amount of information, we focus on symmetric Nash equilibria in which all firms employ a common (bribery) strategy in response to the contract price parameter. As the contract is awarded to the firm offering the largest bribe in our model, the event that a representative (*i*th) firm will obtain the contract with a bribe of B will occur when the other n-1 competitors have z's that are smaller than z_i and the associated probability is $F(z_i)^{n-1}$. Given that $F(z_i)^{n-1} = F(\pi(B))^{n-1}$, the *i*th firm's expected payoff from submitting the bribe can be expressed as:

$$E[\phi(B)] = [z_i - B]F(\pi(B))^{n-1}, \tag{12}$$

where E denotes the expectation operator and $\phi(B)$ is the payoff from bribe B.

Proposition 2:

Given the above assumption, the (symmetric) equilibrium bribery strategy for the *i*th supplier is

$$B(z_i) = z_i - \int_{\underline{z}}^{z_i} F(t)^{n-1}\, dt/F(z_i)^{n-1}, \quad (i = 1,n) \tag{13}$$

where t is a dummy variable of integration.

Proof: (See Appendix A).

Proposition 2 indicates that, in equilibrium, each supplier computes its own potential gross profit on the contract and then submits a bribe offer which represents a markdown from z. The markdown term can be analyzed further by manipulating equation (13) (see (A7) and (A8) in Appendix A) to obtain the following equivalent expression:

$$B(z_i)F(z_i)^{n-1} = (n-1)\int_{\underline{z}}^{z_i} t\cdot F(t)^{n-2}f(t)dt. \tag{14}$$

Since $B(z_i)$ is the bribe paid contingent upon winning the contract and $F(z_i)^{n-1}$ is the probability of winning, the left side of (14) is the expected value of the bribe paid by the _i_th supplier. The right side of (14) is the expected value of the gross profit accruing to the firm submitting the second largest bribe (given that the _i_th firm submits the largest bribe). Thus, the _i_th firm's expected bribe is effectively bounded by the expected gross profit of the second lowest cost firm (given that the _i_th firm is the lowest cost supplier among the set of n firms). An important comparative statics property of the equilibrium bribery response function is now identified.

Proposition 3:

For a given contract price, the expected bribe paid to the governmental official is a nondecreasing function of the number of competing suppliers.

Proof: (see Appendix A)

The intuition underlying Proposition 3 is that, as the number of suppliers increases, the probability of including the lowest cost supplier who can pay the largest bribe also increases. Furthermore, firms are forced to bribe more aggressively, so the government official can extract a larger share of producers' surplus in the form of a bribe. While these consequences are both intuitive and consistent with results in the auction literature, in our bribery context, they are based upon the assumption that the contract price remains fixed. In the presence of competition, however, our previous analysis in Section 2 indicates that an increase in the expected value of the incumbent's bribe would increase the risk of displacement. The incumbent official would therefore have to reduce the contract price to restore the equilibrium relationship between the expected value of bribes and the risk of displacement. Hence, given competition for the incumbent's position, the ultimate effect of increasing the number of suppliers would be to reduce the contract price, but not change the equilibrium level of bribes paid by suppliers.

Having shown that bribery persists in the presence of competition on both sides of the purchase transaction, a question arises about whether regulation can eliminate bribery. In the following sections, we investigate several possible forms of regulation.

4. REGULATION OF BRIBE-TAKING

In this section, we investigate the effects of regulating bribe taking by imposing penalties on government officals who are caught (and/or convicted) of bribe taking. While such penalties could include prison sentences in addition to monetary fines, our analysis is confined to the latter type of penalty.[10] In particular, we assume that the incumbent official faces a monetary penalty of $r = r(P,B(P),\phi)$ (i.e., r depends upon the contract price, bribe, and an (exogeneous) parameter, ϕ, whose probability distribution, $G(\phi)$ is common knowledge).[11]

Given these assumptions, a competitor would have incentives to displace the incumbent only when $\theta < \overline{B-\bar{r}}$, where $\bar{r}$ is the expected value of monetary penalties (conditional upon P). Hence, the probability of displacement becomes $H(\overline{B}-\overline{r})$ and the incumbent's expected utility from soliciting bribes in (2) is modified as follows:

$$EU^{Iq} = H(\overline{B}-\overline{r})U(0) + (1-H(\overline{B}-\overline{r}))E[U(B-r)]. \tag{15}$$

The expected utility expression in (15) indicates that incentives to solicit bribes are affected in two interrelated ways by regulation. First, regulation reduces the official's net payoff from bribery in the incumbency state. However, the competitor's incentives to displace the incumbent also are attenuated for the same reason. Hence, the incumbent's probability of being displaced is reduced from $H(\overline{B})$ to $H(\overline{B}-\overline{r})$. This increases the expected payoff from bribes and, thus, opposes the first effect. Since both effects are mediated by the functional form and specific parameters of the competitor's cost distribution and incumbent's utility function, general conclusions about the ultimate effectiveness of such regulation are not possible without further assumptions. Note, however, that as $\overline{r} \to \overline{B}$, the incumbent's expected payoff from bribery in (15) is eliminated irrespective of the particular cost distribution and utility function. When the expected penalty is smaller, however, such regulation will not necessarily eliminate bribery as we now illustrate in the following example.

Assuming that the competitor's cost distribution is uniformly distributed over $(0,\theta^*)$ and that the incumbent is risk-neutral, the expected payoff from soliciting bribes is

$$EU^{Iq} = (1 - \frac{\overline{B}-\overline{r}}{\theta*})(\overline{B}-\overline{r}). \tag{16}$$

Differentiating (16) with respect to P, the necessary condition for an interior solution to the incumbent's contract pricing problem is that:

$$-\frac{1}{\theta*}(\frac{d\overline{B}}{dP} - \frac{d\overline{r}}{dP})(\overline{B}-\overline{r}) + (1 - \frac{\overline{B}-\overline{r}}{\theta*})(\frac{d\overline{B}}{dP} - \frac{d\overline{r}}{dP}) = 0. \tag{17}$$

Upon simplification, (17) can be reduced to the following:

$$\overline{B} = \theta*/2 - \overline{r}. \tag{18}$$

The incumbent's optimal response to regulation, therefore, is to set P such that the expected bribe is equated with the mean of the competitor's cost distribution less the expected value of the penalty. Thus, if the expected penalty equals or exceeds the mean of the competitor's cost distribution, the incumbent will not have incentives to solicit bribes. To the extent that the expected penalty is less than the cost mean, however, our example shows that bribery can persist in the presence of regulation.

5. SUPPLIER REGULATION

Having examined the effects of bribe-taking regulation, we now investigate the consequences of two types of supplier regulations. Our initial focus is on uniform regulation in which all suppliers are subjected to the same penalty as would be the case, for example, if U.S. firms commit bribery domestically or the product to be sold in a foreign country is manufactured only by U.S. firms. This is followed by an analysis of a second type of supplier regulation in which only a subset of suppliers is regulated. Such "discriminatory" regulation is representative of a situation in which U.S. firms compete against foreign firms which are not subject to similar supplier regulations in their own countries. The analysis will show that the consequences of supplier regulation depend upon the concurrent existence of effective bribe-taking regulation and/or competition for the incumbent's position. Furthermore, in the case of discriminatory regulation, the relative profitability of the regulated and non-regulated firms also has an effect.

Uniform Supplier Regulation

All firms in our model are assumed initially to bear a cost, q, after imposition of supplier regulation. This regulatory cost can be interpreted as a composite of monetary penalties, legal fees to defend management, commissions paid to third party intermediaries who conceal the payment of bribes, and damages to firms' reputations resulting from adverse publicity.[12] Accordingly, the specific consequences of supplier regulation on the equilibrium level of bribery can be identified by comparing firms' equilibrium bribery strategies before and after the imposition of regulation. Assuming that $0 < q < \underline{z}$, the gross profit of the $\underline{i}$th representative firm is $z_i^* = z_i - q$ and the revised profit distribution for the industry is $F^*(z^*)$.[13] Hence, the equilibrium bribery strategy is:

$$B_1(z_i^*) = z_i^* - \int_{\underline{z}-q}^{z_i^*} F^*(s)^{n^*-1}\, ds/F^*(z_i^*)^{n^*-1}, \tag{19}$$

where the range of integration is now over the interval $[\underline{z} - q, z_i^*]$ and n^* denotes the number of firms competing, where $n^* \leq n$.

A comparison of the equilibrium bribery strategies in (13) and (19) indicates that $B_1(z_i^*) < B(z_i)$ and leads to Proposition 4 below.

Proposition 4:

The equilibrium bribe paid to the government official is reduced when the contract price is held constant and uniform penalties are imposed on all potential suppliers.

Proof: (see Appendix A)

Proposition 4 demonstrates that, for a fixed contract price as would be the case when bribe-taking is regulated, supplier regulation predictably reduces bribes. When the incumbent can increase the contract price, however, this result does not necessarily hold. From our previous analyses in Sections 2 and 4, it is apparent that, without effective bribe-taking regulation or other constraints on the contract price, the incumbent could increase P by exactly q to maintain suppliers' profits at their old levels. Under such circumstances, the expected value of bribes and the probability of displacement also would remain at their existing (equilibrium) levels. An important implication is that supplier regulation is not effective unless there are reciprocal anti-bribe taking regulations or other constraints on the contract price.

Discriminatory Supplier Regulation

The uniform regulation model is now modified by assuming that only a subset of firms is subjected to regulatory costs. The latter would be representative of the case when U.S. firms are subjected to the Foreign Corrupt Practices Act, but their foreign competitors are not regulated. Once again, the contract price initially is assumed to be fixed as would be the case when bribe-taking regulation constrains the contract price.

The potential consequences of discriminatory regulation are illustrated by two polar cases. In Case I, the regulated (e.g., U.S.) firms have lower costs (higher gross profits) excluding regulatory costs than their non-regulated (e.g., foreign) competitors, while in Case II, the regulated firms initially have higher costs (lower gross profits). A separate analysis of both cases is performed, because the effects of regulation on the expected bribe paid to government officials depend upon the relative profitability of the regulated and non-regulated firms.

Case I: Low Cost Regulated Firms

Prior to supplier regulation, we assume the gross profits of non-regulated firms are distributed on the lower subinterval $[\underline{z}, z_A]$, while regulated firms' gross profits are distributed on the upper sub-interval, $(z_A, \bar{z}]$. By definition, z_A represents the gross profit of the non-regulated firm having the lowest cost (highest gross profit). Assuming temporarily that the contract price remains fixed, but that a cost, q, is now imposed on the low cost firms that commit bribery, the potential gross profits of regulated firms would be distributed on the interval, $(z_A-q, \bar{z}-q]$, while non-regulated firms' gross profits would not be altered. The presence of the penalty-cost effectively truncates the upper end of the industry gross profit distribution at the Max $\{\bar{z}-q, z_A\}$. Since bribe offers are inherently constrained by total gross profit, in the absence of a countervailing contract price increase, the expected value of bribes collected by the incumbent official will predictably decline as in the uniform case.

One important difference between the two types of regulation, however, is that the identity of the winning firm can change under discriminatory regulation depending upon the magnitude of the regulatory cost. If $q < \bar{z}-z_A$, the gross profits of the regulated firms would be shifted downward, but the most profitable regulated firm would remain the most profitable overall (see Figure 2). Hence, for small regulatory costs, the consequences of discriminatory supplier regulation are essentially the same as those of uniform regulation discussed above. However, when the regulatory cost is larger (i.e., $q \geq \bar{z}-z_A$), then some non-regulated firms would become more profitable than the most profitable regulated firms in the aftermath of regulation and, thus, be able to obtain the contract by paying larger bribes. Note that this result is not sensitive to the incumbent's contract pricing decision; increasing P would increase all firms' profits and help to sustain the equilibrium level of bribes collected by the incumbent official, but would not alter the relative profitability of the regulated and non-regulated group of firms.

Insert Figure 2 Here

Case II: High Cost Regulated Firms

In contrast with Case I, we now assume that, prior to regulation, the regulated firms have gross profits which are distributed on the interval, $[\underline{z}, z_A)$, while the gross profits of non-regulated firms are distributed on the interval, $[z_A, \bar{z}]$. Provided that the contract price remains fixed, a regulatory cost of q effectively shifts the profits of the regulated firms downward over the interval, $[\underline{z}-q, z_A-q)$ as depicted in Figure 3.

Insert Figure 3 Here

While supplier regulation reduces firms' ability to compete and, thus, might appear to have exactly the same consequences as in Case I, examples can be constructed in which, for a given contract price, the expected value of bribes paid actually increases. For example, suppose that $q = z_A$ so that all regulated firms have negative profits and, thus, are driven out of the market. Since the gross profits of the non-regulated firms are not altered, the lowest gross profit of the n* non-regulated firms which are able to pay bribes is now z_A, rather than $\underline{z}$. Under these conditions, the non-regulated firms will modify their bribery strategies, so that the equilibrium bribery strategy for the *ith* non-regulated firm becomes:

$$B_3(z_i) = z_i - \int_{z_A}^{z_i} F(t)^{n^*-1}\, dt/F(z_i)^{n^*-1}, \qquad (20)$$

where $B_3(\cdot)$ designates the modified bribery strategy and n* denotes the number of non-regulated firms competing for the contract.

Two important differences between firms' bribery strategies in (20) and (13) are that $n^* \leq n$ and the integral is now evaluated over the interval $[z_A, z_i]$, rather than $[\underline{z}, z_i]$. Ceteris paribus, a reduction in the number of firms competing increases the markdown and, thus, reduces the equilibrium bribe offered by each firm (see Proposition 3). However, raising the lower range of the distribution of gross profits from $\underline{z}$ to z_A in (20) reduces the markdown. Hence, the ultimate effect cannot be determined without making further assumptions about $F(z)$ and the relevant parameter values.

Many of the examples analyzed by the authors suggest that, in the absence of an offsetting contract price increase, the expected value of bribes is predictably reduced by such regulation. However, exceptions can exist when z_A is substantially larger than $\underline{z}$, but n^* is relatively close to n. Readers familiar with the Riley and Samuelson (1981) study of auctions will recognize that such exceptions arise under essentially the same conditions wherein the imposition of a reservation price can be shown to increase the seller's expected revenue.[14] The parallel between discriminatory regulation in the present example and the reservation price in auctions is that the firms with the lowest gross profits (or object values in auctions) are effectively excluded without affecting the firms whose gross profits (values) are higher. This latter consequence also distinguishes the present example from those considered previously and, thus, provides another reason (apart from ineffective or non-existent bribe-taking regulation) of why the expected value of bribes received by the government officials may not be reduced by the discriminatory regulation of suppliers.[15]

6. IMPLICATIONS

The analysis in this paper has several implications for the conditions under which bribery can be expected to prevail as an exchange mechanism and for the effects of bribery regulation such as the Foreign Corrupt Practices Act. First, based upon our analysis, we would predict bribery to be more prevalent in countries in which the expected penalties for bribe-taking are small and the costs of monitoring and displacing an incumbent official are high due to protection by military forces, limited freedom of the press, and/or a diffuse opposition. This may explain why bribery appears to be a common practice in many Third World Countries having military dictatorships.[16]

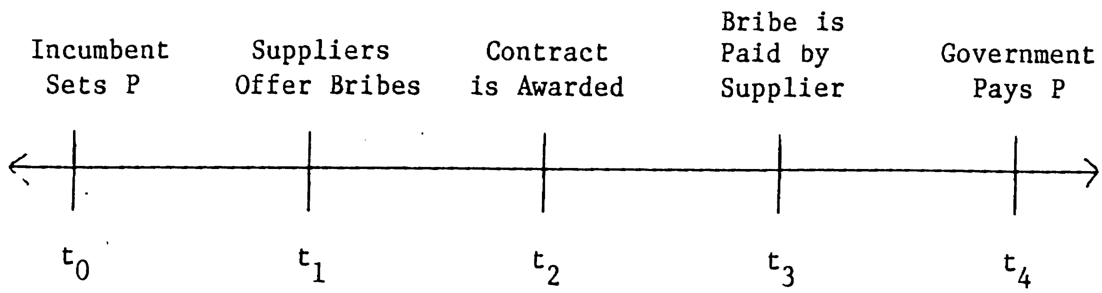
A second implication of the analysis is that competition for the incumbent's position constrains the equilibrium bribe level, but does not eliminate bribe-taking. Furthermore, the effects of supplier competition also depend upon circumstances on the demand side of the bribery transaction. Specifically, we showed that, without competition for the incumbent government official's position, increased supplier competition does not affect the contract price, but raises the equilibrium level of bribery. In the presence of competition for the incumbent's position, however, the gains from increased supplier competition are dissipated. Hence, the equilibrium level of bribery remains constant, while the contract price is reduced.

Further implications of our analysis are related directly to supplier regulation in markets where all suppliers are subject to similar regulation as would be the case if foreign firms were also regulated or they were not viable competitors against U.S. firms. As noted previously, one of the objectives of the Foreign Corrupt Practices Act was to reduce bribe payments by U.S. firms to foreign government officials in line with the Carter Administration's "human rights" foreign policy. Managers of U.S. firms and reports by government agencies, however, claimed that the law would reduce U.S. firms' abilities to export to bribery prevalent countries. The analysis in this paper implies that certain conditions must be met before such regulation actually would affect bribery and exports to foreign countries. In particular, the uniform regulation analysis showed that, even in markets in which there are no foreign competitors (or foreign firms face similar regulations), U.S. firms would continue to compete by paying bribes unless the regulatory costs made the transactions unprofitable. However, in the absence of reciprocal bribe-taking regulation in the foreign country or other price constraints, our analysis predicts that this would be unlikely to occur, because the incumbent government official would have incentives to raise the contract price to maintain the equilibrium bribe level. Hence, our analysis predicts that the FCPA and similar foreign supplier regulations will help to curb bribery when the purchasing country has effective bribe-taking regulation, but have little impact other than to raise prices on exports to countries which lack such regulations.

In markets where un-regulated foreign suppliers compete, however, the consequences of the FCPA are potentially more complex as they also depend upon the comparative cost structures of the U.S. and foreign firms. If U.S. firms had lower profits (higher costs) than foreign firms before the FCPA, then the added regulatory cost would make U.S. firms even less competitive and, in the limit, drive them completely out of the market. While the FCPA would achieve its objective of discouraging U.S. firms from offering bribes, the equilibrium level of bribes collected by foreign government officials would not be expected to decline, when the government official can increase the contract price. Furthermore, even when the contract price is constrained, the expected value of bribes may still increase due to the reservation price phenomenon in Section 5. In either situation, however, a decline in U.S. firms' participation in such markets would not necessarily be accompanied by a reduction in the equilibrium level of bribes paid to foreign government officials.

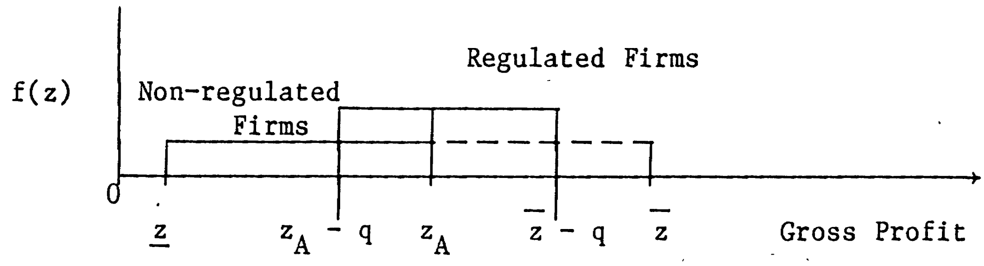
Based upon our analysis, the FCPA is likely to have the greatest potential impact on bribery when U.S. firms' profits (excluding regulatory costs) are higher than foreign competitors and reciprocal anti-bribe taking regulations or other price constraints exist on the purchasing side of the transaction. Under such circumstances, the incumbent government official would be unable to increase P to maintain the equilibrium bribe. While the expected value of bribes would decline, the competitive position of U.S. firms would be adversely affected if the regulatory cost is sufficiently high to alter their relative profitability vis-à-vis foreign competitors.

The export market for aircraft provides an interesting illustration of the economic consequences of political policy. Since foreign aircraft suppliers were in a relatively weak competitive position vis-à-vis U.S. firms before enactment of the FCPA, this market provides an empirical counterpart to our models of uniform regulation (or Case I discriminatory regulation). Based upon our analyses we would predict that, in the absence of high regulatory costs, U.S. aircraft suppliers would continue to pay bribes and sell goods after the enactment of the FCPA. Not surprisingly, this industry had four (Boeing, Lockheed, Northrup, and Grumman) of the five firms reporting paying the largest and most highly publicized bribes in filings with the SEC (Heldack, 1978, p. 52) and also attracted the earliest U.S. government investigations of bribery of foreign government officials. Yet our analysis predicts that, given the lack of foreign competition, the aircraft industry would be one of the least affected by the FCPA. Whether our predictions are actually supported by foreign export data, however, must await subsequent empirical research.



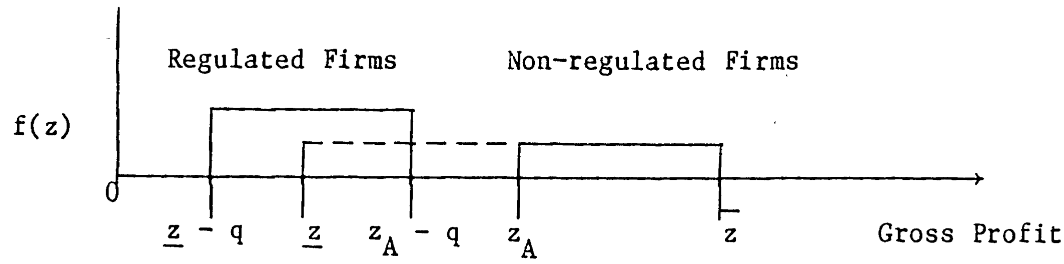
Event Sequence in the Bribery Process

Figure 1



Distribution of Firms' Profit When Regulated Firms Have Low Costs and Penalties

Figure 2



Distribution of Firms' Profit When Regulated Firms
Have High Costs and Penalties

Figure 3

Footnotes

[1]Detailed descriptions of these bribery activities can be found in U.S. Securities and Exchange Commission (1976), filings on 8-K and 10-K forms with the Securities and Exchange Commission, and in Greanias and Windsor (1982).

[2]The government official in our model effectively represents a surrogate for the government itself. In a large government organization, there are possibilities for lower level officials to collect small bribes on a routine basis without the knowledge or approval of their superiors. Such grease payments, however, are not subject to the FCPA and we do not explicitly model them herein.

[3]Another form of bribery is for sellers to pay an entry fee to get on bidding lists. Once on the bidding list, the seller competes with other sellers using bidding procedures. A key difference between the commission bribe model and the entry fee model is that only the winner pays the bribe in the commission bribe model, while all competitors who are on the bidding list pay in the entry fee model. We have derived the equilibrium bribery strategy for the entry fee model and found the comparative statics properties of the latter model are essentially consistent with those of the commission bribe model presented below. The practice of deferring the payment of the bribe until after the sale is made protects the supplier against losses in the event that the government official were to renege on the purchase contract. Furthermore, since the supplier's profit is protected, ceteris paribus, a larger bribe can be paid to the governmental official. Thus, both the government official and supplier benefit when the payment of bribes is in the form of a commission.

[4]This is similar, in certain respects, to management's response to the threat of a corporate takeover in the Grossman and Hart (1980) model.

[5]The cost of displacing an incumbent will depend upon extant circumstances (e.g., the size of the country, cost of monitoring related to the freedom of the press, and loyalty of the military).

[6]The presence of collusion would effectively reduce the number of competitors. We abstract from the explicit modelling of collusion sub-games by defining competitors either as individuals or groups of individuals.

[7]If the incumbent is also risk-neutral, the optimal level of expected bribes can be determined explicitly. Given risk-neutrality,

$$EU^I = (1 - \frac{\bar{B}}{\theta^*})\bar{B} = \bar{B} - \bar{B}^2/\theta^*$$

Differentiating with respect to P, the first order condition is:

$$\frac{d\overline{B}}{dP} - (2/\theta^*)\overline{B}\,\frac{d\overline{B}}{dP} = 0$$

After simplifying, the first order condition can be written as:

$$\overline{B} = 1/2\theta^*.$$

Thus, a risk-neutral incumbent will choose P so that the expected value of the bribe equals the mean of the competitors' cost distribution. A risk-averse incumbent obviously will set $\overline{B}$ below the mean of the cost distribution to reduce the risk of displacement.

[8]The government official does not have incentives to reveal the bribe offers of other firms, because the suppliers would alter their bribery strategies. One can show that the bribery game among suppliers is equivalent to a sealed bid (first-price) auction in which the contract is awarded to the firm who submits the largest bid. Hence, we can appeal to the bidding literature (e.g., Vickrey 1961) which has shown that the seller's expected revenue in a sealed bid (first-price) auction is the same as in an English ascending auction in which the bids of other firms are observed.

[9]Any uncertainty about the price at the time the bribes are paid would diminish the value of the contract to risk-averse suppliers. Hence, there are obvious incentives for the government official to announce the price at the time bribes are solicited. If the government official were unable to convince suppliers that the actual contract price will be equal to (or greater) than the announced price, the bribe offers obviously would be decreased.

[10]Block and Lind (1975) have argued that it may be inappropriate to monetarize criminal penalties. The omission of criminal penalties from our model does not alter, in any way, the qualitative features of our results as will become apparent shortly.

[11]One possible interpretation of the ϕ parameter is that it represents the probability that bribe-taking will be discovered _ex post_.

[12]In addition to the non-compliance costs discussed above, firms may bear various compliance costs related to monitoring employee behavior and other internal control activities.

[13]We temporarily assume that $\underline{z} - q > 0$. Otherwise, the profit of the firms remaining in competition would be distributed over the interval $[0, \overline{z} - q]$, because the firms for which $q > z$ would be unable to

pay bribes. Later, in Case II, we relax this assumption and demonstrate different results.

[14]In our model, such a larger $\bar{B}$ would increase the incentives for a competitor to displace the incumbent. Since the probability of displacement would be elevated, the incumbent would have to reduce the price to reestablish equilibrium vis-a-vis competitors. Hence, the presence of competition for the property rights to the bribes would prevent the incumbent from capturing the total windfall gain.

[15]Introducing stochastic penalties would not change our results, provided that firms know the expected value of their potential penalties, or have identical posterior distributions for the penalty. If firms have different posterior distributions, however, then Proposition 3 will not necessarily hold. Wilson (1977) has analyzed competitive bidding games and shown that firms will adopt conservative bidding strategies in a first-price auction to protect against over-estimating the value of the object being purchased (i.e., the "winners curse"). Hence, increasing the number of firms actually has been shown to reduce the expected revenue to the seller for certain posterior distributions. Since our model of suppliers' bribery response is isomorphic to bidding models, it should be apparent that the bidding results will generalize to our bribery context. Therefore, for certain supplier cost distributions, reducing the number of firms competing for the contract (n) actually could further increase the expected bribe collected by government officials. Hence, the potential effectiveness of discriminatory (and uniform) regulation would be further reduced.

[16]Virtually all of the non-communist countries on the U.S. Department of Commerce (1980) list of countries in which bribery is a common means of exchange are governed by military dictatorships. Data on the use of bribery in communist military dictatorships are not available.

Appendix A

Proof of Proposition 2

The equilibrium bribery strategy can be determined by differentiating equation (14) with respect to B,

$$\frac{d}{dB} E[\phi(B)] = -F(\pi(B))^{n-1} + [z_i - B](n-1)F(\pi(B))^{n-2}f(\pi(B))\pi'(B). \quad (A1)$$

Since $B = B(z)$ and $\pi(B(z)) = z$, one can verify that $\pi'(B(z)) = 1/B'(z)$.

After making the appropriate substitutions, (A1) is equivalent to the following expression:

$$E[\phi'(B)] = -B'(z_i)F(z_i)^{n-1} + [z_i - B(z_i)]F(z_i)^{n-2}f(z_i). \quad (A2)$$

The necessary condition for an interior optimum is that:

$$-B'(z_i)F(z_i)^{n-1} + [z_i - B(z_i)]F(z_i)^{n-2}f(z_i) = 0. \quad (3A)$$

Note that (A3) is a linear differential equation whose solution can be obtained readily by making use of the fact that:

$$B'(z_i)F(z_i)^{n-1} + B(z_i)(n-1)F(z_i)^{n-2}f(z_i) = \frac{d}{dz_i} [F(z_i)^{n-1}B(z_i)]. \quad (A4)$$

Thus, (A3) is equivalent to:

$$\frac{d}{dz_i} [F(z_i)^{n-1} B(z_i)] = (n-1)F(z_i)^{n-2} f(z_i). \quad (A5)$$

Integrating both sides of (A5) over the interval $[\underline{z}, z_i]$ where firm i has a positive probability of winning,

$$F(z_i)^{n-1}\ B(z_i) = \int_{\underline{z}}^{z_i} (n-1)F(t)^{n-2}\ f(t)t\ dt + k, \tag{A6}$$

where k is a constant of integration.

The integral of the right hand side of (A6) can be integrated by parts. Letting u = t and dv = $(n-1)F(t)^{n-2}\ f(t)\ dt$,

$$\int_{\underline{z}}^{z_i} (n-1)tF(t)^{n-2}\ f(t)\ dt = [tF(t)]_{\underline{z}}^{z_i} - \int_{\underline{z}}^{z_i} F(t)^{n-1}\ dt. \tag{A7}$$

$$= z_i F(z_i) - \int_{\underline{z}}^{z_i} F(t)^{n-1}\ dt. \tag{A8}$$

Substituting (A8) into (A6) and dividing by $F(z_i)^{n-1}$,

$$B(z_i) = z_i - \int_{\underline{z}}^{z_i} F(t)^{n-1}\ dt/F(z_i)^{n-1} + k/F(z_i)^{n-1}. \tag{A9}$$

One can verify that the constant of integration in (A9) must be zero by taking the limit as $z_i \to \underline{z}$. The first term on the right side has a limit of $\underline{z}$ and the second term can be shown to have a finite limit using L' Hospital's rule. Therefore, a nonzero k would result in an infinitely negative bribe for $k < 0$ or violate the monotonicity property for $k > 0$. That the resulting bribery strategy is consistent with a Nash equilibrium, is verified by showing that $B(z_i)$ is a best-response when competitors are assumed to employ, $B(\cdot)$.

Proof of Proposition 3

Since all firms employ the same bribery strategy, Proposition 2 is established by showing that the equilibrium bribery strategy is a non-decreasing function of the number of suppliers (n). Given the equilibrium strategy in (2), one can verify that $B(z_i)$ is a non-decreasing function of n since

$$\int_{\underline{z}}^{z_i} F(t)^{n-1}\, dt/F(z_i)^{n-1}$$

is a nonincreasing function of n.

The equilibrium bribery strategy is

$$B(z_i) = z_i - \int_{\underline{z}}^{z_i} F(t)^{n-1}\, dt/F(z_i)^{n-1}. \tag{A10}$$

Given that the first term does not involve n, $B(z_i)$ is a nondecreasing function of n, when $\int_{\underline{z}}^{z_i} F(t)^{n-1}\, dt/F(z_i)^{n-1}$ is a nondecreasing function of n. Since $F(t)^{n-1}$ is differentiable, the Mean Value Theorem indicates that there exists a $z_o \in [\underline{z}, z_i]$ such that

$$\int_{\underline{z}}^{z_i} F(t)^{n-1}\, dt = F(z_o)^{n-1}\, [z_i - z_o] \tag{A11}$$

Thus,

$$\int_{\underline{z}}^{z_i} F(t)^{n-1}\, dt/F(z_i)^{n-1} = [F(z_o)/F(z_i)]^{n-1}\, [z_i - z_o] \tag{A12}$$

Since $F(z_o)^{n-1} \leq F(z_i)^{n-1}$ for all $z_o \in [\underline{z}, z_i]$, $\int_{\underline{z}}^{z_i} F(t)^{n-1}\, dt/F(z_i)^{n-1}$ is a nonincreasing function as claimed. Q.E.D.

Proof of Proposition 4

By definition, the cumulative probability distribution, $F(z_i) = Pr(z < z_i)$. Since $Pr(z < z_i) = Pr(z - q < z_i - q)$, it follows that $F(z_i) = F^*(z_i^*)$. Therefore, assuming that $n^* = n$, the markdown terms in (19) and (13) are equal. Given that $q > 0$, $z_i^* < z_i$, so $B_1(z_i^*,n) < B(z_i,n)$, where we explicitly denote the dependence of the equilibrium strategies on the number of firms competing. Finally, the proof is completed by considering the case in which $n^* < n$. Note that $B_1(z_i^*,n)$ can be shown to be a non-decreasing function of n using the same proof as in Proposition 3. Hence $n^* < n$ implies that $B_1(z_i^*,n^*) \leq B_1(z_i^*,n)$. Thus, by transitivity, $B_1(z_i^*,n^*) < B(z_i,n)$. Q.E.D.

REFERENCES

Alchian, A. A., "Electrical Equipment Collusion: Why and How," Economic Forces at Work (Indianapolis: Liberty Press, Inc., 1977), 259-269.

Becker, G. S. and Stigler, G. J., "Law Enforcement, Malfeasance, and Compensation of Enforcers," The Journal of Legal Studies, Vol. 3, No. 1 (January 1974) pp. 1-18.

Block, M. K. and R. C. Lind, "Crime and Punishment Reconsidered," Journal of Legal Studies, Vol. 4 (Spring 1975), pp. 241-247.

Coase, R. H., "Payola in Radio and Television Broadcasting," The Journal of Law and Economics, Vol. 22, No. 2 (October 1979) pp. 269-318.

Greanias, G. C. and Windsor, D., The Foreign Corrupt Practices Act (Lexington, Ma: D. C. Heath and Co., 1982).

Grossman, S. and Hart, O., "Takeover Bids, the Free-Rider Problem, and the Theory of the Corporation," Bell Journal of Economics, Vol. 11, No. 1 (Spring 1980) pp. 42-64.

Harsanyi, J. C., "Games with Incomplete Information Played by Bayesian Players," Parts I; II; III, Management Science, Vol. 14, 159-182 (November 1967, January 1968, March 1968), pp. 321-334 and 486-502.

Heldack, J. M., "A Study of Questionable Foreign Payments by American Multinational Corporations," Ph.D. dissertation, University Microfilms International, Ann Arbor, Michigan, 1978.

Kugel, Y. and Gruenberg, G. W., International Payoffs (Lexington, Ma.: D. C. Heath and Co., 1977).

Lockheed Corporation, Form 8-K, U.S. Securities and Exchange Commission, February 1979.

Pashigian, B. P., "On the Control of Crime and Bribery," The Journal of Legal Studies, Vol. 4, No. 2 (June 1975) pp. 311-326.

Pauly, M. V., "The Ethics and Economics of Kickbacks and Fee Splitting," The Bell Journal of Economics, Vol. 10, No. 1 (Spring 1979), pp. 344-352.

Riley, J. G. and Samuelson, W. F., "Optimal Auctions," The American Economic Review, Vol. 71, No. 3 (June 1981), pp. 381-392.

Rose-Ackerman, S., Corruption: A Study in Political Economy (New York: Academic Press, Inc., 1978).

Securities and Exchange Commission v. Lockheed Aircraft Corporation, et. al, U.S. District Court for the District of Columbia, No. 76-0611, April 13, 1976, Fed. Sec. Law Reporter 99, 569.

U.S. Department of Commerce, Report of the President on Export Promotion Functions and Potential Export Disincentives, Washington, D.C., U.S. Department of Commerce, 1980.

U.S. House of Representatives, Unlawful Corporate Payments Act of 1977: Hearings on H.R. 3815, 95th Congress, First Session, 1977.

U.S. Securities and Exchange Commission, Report on Questionable and Illegal Corporate Payments and Practices, Washington, D.C., Securities and Exchange Commission, May 1976.

Vickrey, W., "Counterspeculation, Auctions, and Competitive Sealed Tenders," Journal of Finance, Vol. 16, No. 1 (March 1961), pp. 8-37.

Wilson, Robert, "A Bidding Model of Perfect Competition," Review of Economic Studies, Vol. 44 (October 1977), pp. 511-518.