1 Corruption with Small Corrupt Agents

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Abstract

Corrupt officials exact money from firms. Corruption affects the number of firms in a free entry equilibrium. The degree of deep competition in the economy increases with lower overhead costs relative to profits; and with a tendency towards similar cost structures. Increases in competition may not lower corruption, so that the effect on welfare is uncertain. The model explains why a rational corrupt official may extinguish the source of his bribe income by causing a firm to exit, and how and when increasing product market competition may limit the adverse effects of corruption on industrial variety.

1.1 Introduction

An approach to corruption control based on Economics suggests that increasing competition may be a way to reduce the returns to corrupt activities. The presumption is that no bribes can occur in markets where perfect competition prevails, when there are no excess profits from which to pay the bribes. This argument is over-simple, as will be seen. Moreover, practical experience seems to show that countries which have increased levels of competition in the economy have sometimes experienced upsurges in corruption. The important point is that even when competition policy is a simple instrument for controlling corruption, economists have still not fully identified the conditions under which an increase in competition will effectively reduce corruption.[1]

A fundamental reason why these issues are complex is that, depending on how it is defined, competition is not necessarily an exogenous parameter which one can vary in a model to see how corruption is affected. Corruption may itself affect the extent of competition. It is clearly wrong, for instance, to take the number of firms as an indicator of the level of competition in the market. This is because corruption affects the flow of returns to a particular investment, and thus the number of firms in a free entry equilibrium. This paper examines the theoretical relationship between competition and corruption and presents a model where both the equilibrium number of firms and the level of graft are endogenously determined by other, deeper competition parameters. We call these parameters *deep competition* to distinguish their effects from some measure of competition, such as the number of producers, defined from the

[1]The importance of further research on the relationship between competition and corruption was stressed by Rose-Ackerman in her entry on Bribery in The New Palgrave: A Dictionary of Economics [1988] where she argued that

> *"the role of competitive pressures in preventing corruption may be an important aspect of a strategy to deter bribery of low-level officials, but requires a broad based exploration of the impact of both organizational and market structure on the incentives for corruption facing both bureaucrats and their clients"*

equilibrium outcome, and which may itself be affected by both institutionally created opportunities for corruption and by deep competition.

Corruption always depends on power. That may be market power, as when a purchasing agent for a monopoly over-invoices his transactions and the lack of yardstick comparison disguises his corruption. Or it may be discretionary power created by legislation, as in the case of a tax inspector who connives in the under-reporting of the tax obligations of a farmer in exchange for a kick-back, or a health inspector who agrees to overlook the presence of cockroaches in a restaurant kitchen in return for a bribe. The health inspector's power comes from a law which gives him the power to close a cockroach-infested restaurant by order. Yet power does not have to spring from the law, or the abuse of law. We can extend the use of the term corruption to cover simple protection rackets by gangsters, whose power is that of completely illegal violence.

Illegality is essential to corruption. If the official simply applies regulations, or as a private agent acts within the law, then the effects with which we are concerned cannot be observed. This is true despite the fact that the agent's power may or may not depend upon a law. The gangster simply demands graft, contrary to the law. The victim fears to go to law and pays up. The health inspector can shut a cockroach-infested kitchen. He uses this power not to ensure that kitchens are clean but to extract bribes, even from the owners of clean kitchens. One can imagine that the regulations are intricate, so that the health inspector can always find some legitimate reason to close a kitchen, or at least this is what owners fear. Then it is tempting to say that regulations should be simple. As the example of taxation shows, however, simple regulations may suffer from drawbacks. It would be wrong to see corruption as always the consequence of excessive regulation, or to imagine that complete *laissez-faire* will always be the answer. Good laws may nourish corruption. When we sit down in a restaurant we may like to know that the kitchen is not crawling with cockroaches. Yet the law designed to give us that guarantee may prove to be the vehicle for corruption. In the present paper we simply take the power enjoyed by the corrupt agent as given. If it is based on laws and regulations, we do not investigate how these came to be. There may be a rent seeking motive but we do not throw light on it. Similarly, if gangsters enjoy criminal power we do not ask how and why[2].

Either corrupt payments may be made because the corrupt agent can reduce costs for the producer but demands payment in return, as happens with the tax inspector. We call this *cost reducing corruption.* Or they may be made because there is a surplus in the business and it is better to allow the corrupt agent to take part of it than to lose everything, as happens with the protection racket. We call this *surplus shifting corruption,* and that is the main concern of this paper. It is tempting to suppose that surplus shifting corruption cannot happen when there is perfect competition as there will be no surplus to divert. That is true within a partial equilibrium analysis. In general equilibrium, however, corrupt payments may become built into the cost structure. In this case corruption does not need any pre-existing rents or imperfect competition, as the prospective excess profits from which to pay bribes may be created by inducing exit. It is fatal to the understanding of the consequences of corruption to overlook this point.

The idea that corruption may generate surplus is illustrated with two examples. The first involves perfect competition. In a certain city poor people sell boxes of matches on the street. This occupation has free entry and earns the sellers the reservation price for the lowest skill labour. There is certainly no surplus. Then large threatening men demand that some match sellers hand over part of their takings for "protection". As a result some sellers exit; the eventual equilibrium is one in which there are fewer match sellers; each one earns more but pays the extra to the gangster. Corruption has generated its own surplus. To clarify the precise nature of that eventual equilibrium requires definite assumptions, as will be shown below.

In another example one corrupt official can grant or withhold the license to

[2]Obviously huge areas of interest are set aside here. In particular, criminal corruption often involves bribing the police. Equally, corruption may not be reported for fear that the courts will be ineffective, perhaps becuase judges will be bribed.

operate a bar in a city. There are many bars and free entry, so there will be no surplus if the official is honest. The unique right to award licenses, however, has placed the official in the position of a monopolist. Having full information, let the official calculate that monopoly profit from bars will be maximized at Π when N bars will operate. Then he demands a payment of $\frac{\Pi}{N}$ from any bar in return for the license to operate. This imposes the monopoly equilibrium and the official takes Π. Corruption converts perfect competition to monopoly. The second example makes a clear a point which is obscure in the case of the first. If corruption can generate a surplus where none previously existed, where does this tendency expend itself? Will a monopoly price level always result even if there are many corrupt agents?

Our model is designed with the last question in mind. We ignore the interaction of competition with the official's incentive scheme.[3] Instead we assume that the officials have the power to exact a sum of money from existing firms and focus on the process of bribe demands. No direct reduction of cost is offered in return for the bribe. It is a simple case of pay up or be closed down. We present a model in which corrupt officials are able to obtain permanent flows of graft (corrupt payments) from a group of producers (called *firms* without loss of generality) despite the fact that:

1. The officials are many in number and do not coordinate their actions;

2. The officials are uncertain about the type of firm which they face;

3. The business has no barriers to entry.

The key to the argument, in summary, is that differences in the cost structure of firms creates surpluses which an individual corrupt official can milk. This gives a motivation to all officials to demand bribes. This will drive the most inefficient firms out of business, enhancing the profitability of other firms. That in turn makes it possible for corrupt officials to demand larger bribes, and so on. This does not lead to the eventual extinction of all firms, because when

[3] Related issues appear in the literature on product market competition and managerial slack. See Hart [1983] Scharfstein [1988] and Schmidt [1994].

the flow of payments from firms to officials reaches a high level, the officials are no longer willing to risk the source of their bribe income exiting.[4] We next introduce three ways to capture the degree of deep competition: as a tariff on international competition, as a tendency towards lower overhead costs relative to profits and as a tendency towards more similar cost structures. We then perform some comparative statics. In general, we cannot say that an increase in deep competition will lead to lower levels of corruption. Our results show that, even in this simple model, everything depends on the structure of the uncertainty about costs that faces the corrupt official.

Furthermore, if deep competition may increase corruption, and corruption decreases welfare, it is not clear what is the effect of deep competition on welfare. Romer [1994] has emphasized that one of the main contributions of research based on models of monopolistic competition (e.g. Dixit and Stiglitz [1977]) is to model explicitly the limit to the set of goods available from the level of fixed costs in the economy. He suggests that corruption introduces large welfare costs by driving firms out of the market. But how could it be rational for a corrupt official to induce exit of a firm under his control that constitutes his only source of bribe income? There is a similar puzzle in the behaviour of trade unions as they sometimes push up wages to the extent of inducing exit of the firms that provide employment, hence extinguishing their source of income.[5] Our model explains when that behaviour may be rational and how increasing product market competition may limit the adverse effects on industrial variety of trade unions and corruption.

Modern research into the economics of graft begun with Rose-Ackerman [1975] but, despite the topic's practical importance, studies of corruption have remained rare in the profession. An early attempt to link corruption with competition is Rose Ackerman [1978, pg. 137-66]. She analyses a bureaucracy

[4] Aghion and Bolton [1987] exploit a related uncertainty structure to explain why contracts may be used as barriers to entry.

[5] In the classic models of trade unions (e.g. Oswald [1985]) firms react to higher wage demands by restricting employment. Higher expected wages compensate workers for the possibility of separation. In this setting, however, restricting employment does not imply a loss of product diversity.

dispensing a scarce benefit and notes that the existence of a small number of honest officials induces honesty in all the bureaucracy by introducing the possibility that applicants reapply if they are asked for bribes. Shleifer and Vishny [1993] analyse a bureaucracy issuing complementary permits to perform some economic activity in exchange for bribes. They note that if the officials do not coordinate to extract bribes, they fail to internalize the effect of their bribe demands on other official's income.[6] This is likely to be more damaging for growth than the existence of an organized and disciplined system of corruption. Ades and Di Tella [1994] analyse empirically the relationship between competition and corruption, and find evidence that exogenous increases in product market competition reduced corruption in the bureaucracy. For a fascinating account of the workings of the mafia and the business of private protection the reader is referred to Gambetta [1993].

It is interesting to note the connection of our paper with the rent-seeking literature. Two extremes are usually emphasized in that literature, depending on the level at which rent seeking occurs. In the first extreme, a regulation that affects the level of competition in an industry is set up by a benevolent government, and a lower rank bureaucrat abuses his powers to extract bribes. A typical example is an industry regulator who is in charge of enforcing the level of pollution allowed by the legal system, and allows a different level in exchange for a bribe. In the second extreme, the bureaucrat directly affects the level of competition, e.g. by introducing a tariff or by putting a limit to the entry of new firms, and charges a bribe to those directly benefiting from his action (the incumbent firms). In our model, the bureaucrat is of the first kind and does not affect the degree of competition in the industry directly. However, his actions affect the rate of return on capital investment and thus the long-run equilibrium number of firms. Thus he still affects the level of competition indirectly.[7]

[6] It is formally close to the problem of the extraction of renewable resources by competing players in the classical fishing game; for an exposition see Fudenberg and Tirole [1991].

[7] The classic papers in the rent-seeking literatutre are Tullock (1967), Krueger (1974) and Bhagwati (1982).

In section 2 we introduce the model and the equilibrium with corruption. Section 3 presents our comparative static results, while section 4 analyses some of the model's welfare implications. Section 5 explores an example with perfect competition. Section 6 concludes.

1.2 The Model

Firms are all the same except for their overhead costs, expressed as a flow. There is a large number of potential firms. Their overhead costs are independently drawn from a cumulative distribution which measures the probability that a particular firm will have overhead costs no greater than C:

$$F(C) \tag{1}$$

Here $F(0) = 0$, $F(\infty) = 1$, and $F(\cdot)$ is an increasing function of C.

Our equilibrium will be one in which firms will operate if and only if their overhead costs (C values) are less than or equal to a critical value C_0. Then the proportion of firms operating - called the abundance of firms and denoted A - is given by:

$$A = F(C_0) \tag{2}$$

Firms which operate compete with each other as symmetric actors. The root property which the model requires is embodied in the following assumption:

Assumption 1: The operating profit of any firm is a monotonically decreasing function of abundance.

Notice that the assumption is equally consistent with *either* the assumption that firms operate as price taking perfect competitors, selling essentially the same output on a single market; *or* the assumption that firms compete as monopolistic competitors selling a differentiated product or service. In the first case, the effect of density is analogous to the influence of the number of similar farmers with upward sloping supply curves supplying a market for an agricultural good with a downward-sloping demand curve. More producers means more supply, a lower equilibrium price and lower profit for each producer. In the second case, higher density shifts the producer-specific demand curve to the left, as alternative firms offer more closely competing services, and profit falls[8].

To each firm one corrupt official is attached. While he cannot observe C for his firm, he does know the operating profit which all firms are making, denoted P. By Assumption 1, P depends uniquely on abundance. However in deciding how much graft to demand the corrupt official does not need to use information about A. Given P and the distribution $F(\cdot)$ he can decide how much graft to demand. If the corrupt official is only interested in the expected value of his return[9] he will face the following program:

$$Max_G \qquad G \cdot F(P-G) \tag{3}$$

The maximand is the product of the amount demanded and the probability of obtaining that amount.

The first order condition for the maximization of (3) is:

$$F(P-G) - G \cdot F_1(P-G) = 0 \tag{4}$$

where the subscript denotes differentiation. The first term denotes gain: a marginal increase in graft increases graft income by $F(.)$ if the firm stays in business. The second term represents the risk of losing all graft income G if graft demands induce exit. For a regular maximum, the second derivative of (4) with respect to G should be strictly negative. Denote that second derivative by S. Then:

$$S = -2F_1(P-G) + G \cdot F_{11}(P-G) < 0 \tag{5}$$

[8] Imperfect competition might be due to spatial location. Then all firms would produce the same output, but each would have its own downward sloping demand curve because a lower price would draw in customers from greater distances.

[9] This assumption has the appealing implication that the setup can be extended so that a corrupt official may control many firms, when maximizing total expected return implies maximizing expected return from each firm.

To see the effect of profitability on graft, totally differentiate (4) to obtain:

$$S \cdot \frac{dG}{dP} + F_1 (P - G) - G \cdot F_{11} (P - G) = 0 \tag{6}$$

Or:

$$\frac{dG}{dP} = \frac{S + F_1 (P - G)}{S} = 1 + \frac{F_1 (P - G)}{S} < 1 \tag{7}$$

Therefore higher profits lead to less than proportionate demands for graft (the marginal rate of gross profits taxation imposed by corruption is less than 1).

1.3 Existence

There is a unique equilibrium, which may be demonstrated as follows. Assume a value for equilibrium density - think of it as a guess - and call it A_1. Then profit will be $P(A_1)$ and graft will be $G[P(A_1)]$. A firm will stay in business if:

$$C < P(A_1) - G[P(A_1)] \tag{8}$$

Therefore the density implied by the assumption of density A_1 is:

$$A_2 = F[P(A_1) - G[P(A_1)]] \tag{9}$$

Consider the relation between A_1 and A_2 implied by (9). If A_1 is larger, profit will be smaller before graft and smaller (though to a lesser extent) after graft. Therefore A_2 will be larger. Figure 1 in appendix 2 illustrates. There must exist an equilibrium. Equilibrium corresponds to the intersection between the downward sloping line AA, which shows the function mapping A_1 into A_2, and the 45^o line. To determine the value of A_2 corresponding to $A_1 = 0$ care must be taken. When no firm is operating there is no profit level with which to test what proportion of firms could pass the entry test. We decide the height of the curve at $A_1 = 0$ by taking the limit of the height as $A_1 \rightarrow 0$ from above. When firms are extremely sparse, profit is very high and remains so even after graft. Therefore it cannot be the case that graft so high that very few firms choose to operate. There is no degenerate equilibrium at zero density. That is why Figure 1 shows the curve which gives A_2 as a function of A_1 (drawn as a straight line for convenience) with a positive intercept at $A_1 = 0$. Then sloping downwards it cannot avoid intersecting the 45^o line once. That intersection must occur for A$<$ 1.

1.4 Comparative Statics

In this section we establish some comparative statics relating corruption and deep competition.

1.4.1 Competition 1: Lower Tariffs

Call α a competition parameter (we can think of α as an elasticity or as the inverse of the tariff rate), where we have $\frac{\partial P(A,\alpha)}{\partial \alpha} < 0$. The equilibrium can be described by the following implicit system

$$A - F\left[P(A,\alpha) - G\right] = 0 \tag{10}$$

$$F\left[P(A,\alpha) - G\right] - G \cdot F_1\left[P(A,\alpha) - G\right] = 0 \tag{11}$$

Proposition 1: An increase in competition decreases the proportion of firms operating and has an ambiguous effect on corruption.

Proof. The system satisfies the condition required by the implicit function theorem: both implicit functions have continuous derivatives and the endogenous variables Jacobian is non-zero when evaluated at the equilibrium. Use of the implicit function theorem leads to

$$\frac{dA}{d\alpha} = \frac{-F_1^2 \cdot \frac{\partial P(A,\alpha)}{\partial \alpha}}{S + \frac{\partial P(A,\alpha)}{\partial A} \cdot F_1^2} \tag{12}$$

which is always negative as the denominator is negative. The effect of competition on graft is given by:

$$\frac{dG}{d\alpha} = \frac{(F_1 + S) \cdot \frac{\partial P(A,\alpha)}{\partial \alpha}}{S + \frac{\partial P(A,\alpha)}{\partial A} \cdot F_1^2} \tag{13}$$

which is negative only as long as $GF_{11} \notin [F_1, 2F_1])$. More precisely, we have $GF_{11} > 2F_1$ from the second order condition for a maximum in the corrupt official's maximization problem, while the sign of $GF_{11} - F_1$ signs the expression. ■

Remark 1A: In the limit as $GF_{11} \to [F_1, 2F_1]$, increases in competition always increase corruption.

The intuition for the result on the proportion of firms operating follows from the fact that as competition increases gross profits are lower, so that exit must occur (so that the marginal firm's overhead cost is lower) if the free entry condition is to be observed. In the interpretation of monopolistic competition we also have higher gross profits through reduced price competition. The second result can be reinterpreted as follows: as long as costs are somewhat sparsely distributed, competition will reduce graft. If however the increase in competition leads the marginal firm to a region in the cost support where there is a large concentration of firms, then graft may actually increase with competition. The intuition is that when $GF_{11} \epsilon [F_1, 2F_1]$, the probability of facing the marginal firm is lower, so that it is unlikely that further graft demands will induce exit of the firm under the official's control and extinguish the source of graft income for the official.

1.4.2 Competition 2: Higher Overhead Costs (shifting the support)

In deriving this result we make two assumptions:

1. The support of F is $[C_{\min} + \phi, C_{\max} + \phi]$, so that ϕ acts as a support shifter.

2. F is uniform.

This specification intends to capture the idea that uncompetitive industries may be characterized by a heavy structure of overhead costs. We use the uniform distribution to separate the effects of shape from other aspects of the distribution (note that under the uniform we always have $GF_{11} \notin [F_1, 2F_1]$).

Proposition 2: A decrease in competition characterized by higher fixed costs always decreases graft and the proportion of firms operating.

Proof. The system satisfies the condition required by the implicit function theorem: both implicit functions have continuous derivatives and the endogenous variables Jacobian is non-zero when evaluated at the equilibrium. Use of the implicit function theorem leads to

$$\frac{dA}{d\phi} = \frac{1}{-2(C_{\max} - C_{\min}) + \frac{\partial P(A,\alpha)}{\partial A}} \tag{14}$$

which is always negative as the denominator is negative.

$$\frac{dG}{d\phi} = \frac{C_{\max} - C_{\min}}{-2(C_{\max} - C_{\min}) + \frac{\partial P(A,\alpha)}{\partial A}} \tag{15}$$

which is always negative ■

1.4.3 Competition 3: More Similar Costs (compressing the support)

In deriving the next result we make two assumptions:

1. The support of F is $[C_{\min} + \delta, C_{\max} - \delta]$, so that increases in δ shrink the support of the distribution.

2. F is uniform.

This specification intends to capture the idea that competitive market environments tend to be characterized by relatively similar productive units.[10]

Proposition 3: An increase in competition characterized by a compression in the support of overhead costs has uncertain effects on the proportion of firms operating and the level of graft charged by each official.

[10] Both assumptions, that lower fixed costs and more similar productive units imply increases in competition, may be questioned. One could think examples of industries where competition and fixed costs go together. But the point that it is a way of characterizing competition still holds.

Proof. The system satisfies the condition required by the implicit function theorem: both implicit functions have continuous derivatives and the endogenous variables Jacobian is non-zero when evaluated at the equilibrium. Use of the implicit function theorem leads to

$$\frac{dA}{d\delta} = \frac{C_{\max} + C_{\min} - 2P}{-2(C_{\max} - C_{\min} - 2\delta)^2 + \frac{\partial P(A,\alpha)}{\partial A} \cdot (C_{\max} - C_{\min} - 2\delta)} \tag{16}$$

where the numerator has uncertain sign and the denominator is negative.

$$\frac{dG}{d\delta} = \frac{C_{\max} + C_{\min} + 4G - 2P - \frac{2G \cdot \frac{\partial P(A,\alpha)}{\partial A}}{(C_{\max} - C_{\min} - 2\delta)}}{-2(C_{\max} - C_{\min} - 2\delta) + \frac{\partial P(A,\alpha)}{\partial A}} \tag{17}$$

where the numerator has uncertain sign and the denominator is negative. ■

This is quite surprising as one would expect that such a simplified setting would allow a more intuitive result. It is instructive to see why this happens. Call Δ the difference between the marginal firm's overhead cost and the overhead cost of the average firm (equal to the median under the uniform).[11]

Remark 3A: If $\Delta < G - \frac{G \cdot \frac{\partial P(A,\alpha)}{\partial A}}{(C_{\max} - C_{\min} - 2\delta]}$, an increase in competition characterized by a shrinking support, always has the effect of increasing corruption.

Proof. Assume the marginal firm has lower overhead costs than the median, so that $\Delta < 0$. Then

$$P(A) - G(A) < \frac{C_{\min} + C_{\max}}{2} \tag{18}$$

Then we must have

$$C_{\max} + C_{\min} + 4G - 2P - \frac{2G \cdot \frac{\partial P(A,\alpha)}{\partial A}}{(C_{\max} - C_{\min} - 2\delta)} > 0 \tag{19}$$

so that from the proof of proposition 3 we have $\frac{dG}{d\delta} > 0$. ■

To provide the intuition for this result recall that the first order condition for the corrupt official is the distribution minus the density times the level of graft. The effect of shrinking the support is to always increase the density (at the marginal firm) so that the official would always tend to reduce graft

[11]That is $\Delta = \{P - G\} - \{\frac{C_{\min} + C_{\max}}{2}\}$.

demands on this account. The effect of competition on the distribution is uncertain however. It has the same sign as the expression $-C_{\max}-C_{\min}-2G+2P$. But this is exactly the expression that signs the distance to the median. If it is positive, and the marginal firm has higher overheads than the median, then higher competition increases graft from the official's maximization. A third effect comes from the fact that if we are above the median, the free entry condition implies that higher competition will induce entry (the proportion of firms that enter is equal to the distribution function, which has increased). But that reduces profits which, in turn, reduces corruption. Thus the condition of remark 3.

1.5 Welfare Effects of Corruption

Traditional economic analysis of corruption points out that bribes constitute transfers between economic actors and, therefore, have only redistribution effects. Some authors, starting with Leff [1964], have argued that corruption may lead to improved economic outcomes, basically because bribes might serve as piece rates to motivate badly paid bureaucrats and because it may be a way to avoid cumbersome regulations. Others, starting with Myrdal [1968], argue that corruption distorts incentives and provides a prize to introducing further regulations, so that it is detrimental to growth and investment.[12] The argument of Romer [1994] implies that this might grossly underestimate the costs of corruption by overlooking its effect on the number of products available. By acting like a tax on ex-post profits, corruption induces exit of firms causing the loss of consumer surplus associated with the consumption of each product exiting (what Romer calls a Dupuit triangle). The same principle is applied by Romer when evaluating the welfare costs of trade restrictions which are underestimated by the relatively minor Harberger triangles. Both corruption and trade restrictions are assumed to introduce an exogenous cost to conducting business associated to a reduced capacity of firms to generate a high enough revenue to cover the fixed costs.

[12] Mauro [1994] shows that the empirical evidence is consistent with Myrdal's hypothesis.

In this paper we point out that corruption is endogenous, so that both the number of products and corruption are determined by deeper competition parameters. For instance, when evaluating the welfare costs of trade restrictions we should also consider the impact on and through corruption. On that broad topic we confine ourselves to a few remarks. First, assume that both a tariff is in place and that corruption is to some extent tolerated in the country. Then because the effect of trade restrictions on corruption is ambiguous, it is unclear if a lower tariff would increase welfare. There is a positive direct effect of a tariff on the number of products available (Dupuit triangle) and the traditional allocative distortions (Harberger triangle). But there is also the indirect effect as changes in trade restrictions change the equilibrium amount of graft. By proposition 1, the sign of this last term is ambiguous, so the total effect of trade restrictions on welfare must remain ambiguous.

Secondly, suppose that importers are not subject to corruption, while domestic producers may enjoy a cost advantage. Then competitive imports increase both product variety and consumer welfare. Domestic firms add to the variety of goods available, impose overhead costs on the local economy and provide surpluses of revenue over cost which form part of net domestic income. Corrupt agents will still take bribes and cause some firms to exit. There will be a negative effect on welfare induced by the loss of variety. The net effect on the sum of overhead costs and surpluses is ambiguous. If a tariff is imposed, it may well happen, as Romer argues, that foreign sellers will provide less variety, only some of which will be replaced by domestic firms. Unlike Romer's discussion, because we are taking into account the entry of domestic producers, welfare loss from variety reduction will be moderated. A cost of this is that domestic overhead costs increase. So also will net profits earned by domestic firms. The total completed effect on home welfare is ambiguous. However Romer's arguments remains correct to the extent that it asserts that simple Harberger triangles do not decide the welfare cost of protection.

1.6 The Model with Perfect Competition

We show an example to emphasize our claim that the model developed in this paper can be applied to a market for a single good characterized by perfect competition. This is important since most people associate corruption with situations where firms enjoy some degree of market power. To do this, we assume that the price of farm output is determined by demand and supply equality as:

$$A \cdot N^* \cdot \frac{dR(p)}{dp} = D(p) \tag{20}$$

where $R(p)$ is the revenue function of a single farm (common to all farms and not including overhead costs), N* is the maximum number of farms that could operate, A is the proportion of farms producing, and $D(p)$ is the market demand curve. Notice that equillibrium will be defined for a given population of potential farms. If all operated A would be 1. Otherwise A will be < 1. Farms which exit cannot re-enter. In any case, if the eventual equilibrium involves positive profit, this will not cause entry to eliminate those profits. One might say that farms earn rents and corrupt agents help themselves to these rents.

We assume that overhead costs are distributed uniformly as:

$$F(C) = \frac{C}{C^{\max}} \tag{21}$$

$$F_1(C) = \frac{1}{C^{\max}} \tag{22}$$

Where variable profit exceeds $C^{\max}$, corrupt agents will take all of the excess, as collecting it induces no risk of exit. However the certain gain of that surplus has an effect on the agent's decision. If more is demanded, everything may be lost. This is a special case of an important principle which may be stated here.

High profits relative to overhead costs will be removed by corrupt agents. However, their presence will discourage higher graft tending to induce exit. As that *second higher level graft is welfare reducing, because it causes exit, high profits relative to overhead costs protect consumer welfare.*

Assume that profit will exceed $C^{\max}$. Denote by g graft in excess of $R(p)$-$C^{\max}$. Then the corrupt official solves:

$$Max_g \qquad (R(p) - C^{\max} + g) \cdot \frac{C^{\max} - g}{C^{\max}} \tag{23}$$

which gives:

$$\frac{C^{\max} - g}{C^{\max}} - \frac{(R(p) - C^{\max} + g)}{C^{\max}} = 0 \tag{24}$$

$$g = C^{\max} - \frac{R(p)}{2} \tag{25}$$

Consider a farmer with overhead costs $C \leq C^{\max}$. Then his total profit after graft will be:

$$C^{\max} - g - C = \frac{R(p)}{2} - C \tag{26}$$

And:

$$A = Min\left[\frac{R(p)}{2C^{\max}}, 1\right] \tag{27}$$

This shows that graft may cause no exit. If it does cause exit, $R(p) < 2C^{\max}$, equilibrium is defined by:

$$\frac{R(p)}{2C^{\max}} \cdot N^* \cdot \frac{dR(p)}{dp} = D(p) \tag{28}$$

1.7 Conclusion

This paper presents an analysis of the relationship between competition and corruption. The setting is one where a group of corrupt officials have the power to exact a sum of money from firms under their control. We cannot use the number of firms as an exogenous indicator of the degree of competition as it is affected by the level of corruption in a free entry equilibrium. Instead we introduce three ways to capture the degree of deep competition in the economy: as a tariff on international competition, as a tendency towards lower overhead costs relative to profits and as a tendency towards more similar cost structures. We then perform some comparative statics. In general, we cannot say that increases in competition lead to lower levels of corruption. Our results show that, even in this simple model, everything depends on the structure of the uncertainty about costs that the corrupt official has.

Furthermore, if deep competition may increase corruption, and corruption decreases welfare, it is not clear what is the effect of increases in deep competition on welfare. Romer [1994] has emphasized that one of the main contributions of research based on models of monopolistic competition is to model explicitly the limit to the set of goods available from the level of fixed costs in the economy. He suggests that corruption introduces large welfare costs by driving firms out of the market. But how could it be rational for a corrupt official to extinguish the source of his bribe income by causing a firm under his control to exit the market? This model explains why such behaviour may be rational and how and when increasing product market competition may limit the adverse effects of corruption on industrial variety.

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