Underdevelopment and the Economics of Corruption: 
A Game Theory Approach

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Summary. — Previous attempts to treat corruption are surveyed critically. A game theory approach is preferred on the grounds that it can most effectively explain the basis for decisions of reasonable men to be corrupt. A simple model is presented showing how bribery might be a dominant strategy. A prisoner's dilemma type of situation emerges with the added complication that the judge and jailer may be corrupt. Other conclusions are that one official will not accept bribes from more than one firm. It is impossible to predict which firm will win the contract. No obvious solution emerges and legal remedies are discounted. This paper then reviews the principal general equilibrium effects and concludes that their likely effect on economic development is negative.

1. INTRODUCTION

The debate on the topic of corruption and underdevelopment, in which Myrdal's (1968, 1970) classic contributions stood virtually unchallenged for a decade, has now shown signs of being reopened. Recent contributions include empirical analyses (Sarrassoro, 1980) and theoretical discussions based on a utility maximizing under uncertainty methodology (Rose-Ackerman, 1975; Beenstock, 1979). The present article attempts to contribute to the debate at a methodological level. In particular it proposes the thesis that if one is interested in answering the question, what is the basis for decisions of reasonable men to be corrupt, then a game theory approach would seem to provide a useful methodology. We argue that game theory can enable progress to be made where utility maximization falters and that useful conclusions can be derived from a minimum of assumptions.

That serious discussion of the influence of corruption on economic development is long overdue scarcely needs repeating. For developing countries, the object of the analysis here, corruption is of growing rather than declining importance. Myrdal (1968) makes the point that practically everything that has happened in the post-Independence era in South-east Asia has raised the incentive and opportunity for corruption. Recent surveys of selected African countries have confirmed its grip of the public sector and noted its increase in importance as the general level of economic development rises (Sarrassoro, 1980).

Although, as we shall see, economists and political scientists are divided over the overall influence of corruption on economic growth or development, political events speak more clearly. Corruption has been the principal argument used by the leaders of the recent coup d'état in Liberia to justify the overthrow of the régime of President Tolbert. In Syria many of the top Ministers were recently ousted as part of an intensive campaign against graft and corruption. Lack of serious analysis of the issues involved and of basic hard facts has also led to remedies which, to many, appear worse than the disease. The main elements of the Syrian solution are to raise the salaries of State servants and army officers by 50-100% and to try to seek out political leaders whose leading attribute is that they are sufficiently rich so as to avoid being tempted by the opportunities to turn aside public funds for private purposes (Le Monde, 16 January 1980).

These are only two recent entries in a long list of concrete examples where the topic to be discussed reveals itself to be of prime importance for the development prospects of much of the Third World today. Given the complex and wide-ranging influence of corruption on the allocation of resources, we have limited the discussion to a number of precise questions to be treated analytically. In particular, we shall be concerned with bribing by

* Independent Development Consultant, Paris. I am grateful to the journal for the valuable comments of the anonymous referees on an earlier draft of this paper.
oligopolistic firms or their agents in the context of contract tendering. In Section 2, we present our definition and a brief critical survey of previous methodological approaches. This leads us to prefer a game theory approach which is employed in Section 3 to answer the following questions. (1) Do all firms, or only some, have an interest in being corrupt? (2) What role do assumptions about rival behaviour play in this decision? (3) Is there any limit on the amount of corruption that can exist? Can bribes be extorted from everyone? What provides such limits? (4) What is the likely role of legal sanctions in discouraging corruption. In Section 4, we bring out some of the important general equilibrium effects such as the influence on technology choice, the composition of production and the distribution of income.

2. CORRUPTION: DEFINITION AND SURVEY OF METHODOLOGIES

To avoid the moralistic overtones associated with the term 'corruption', we shall use the term 'arrangement' whenever possible to define the object of our analysis. An arrangement is a private exchange between two parties (the 'demander' and the 'supplier') which: (1) has an influence on the allocation of resources either immediately or in the future, and (2) involves the use or abuse of public or collective responsibility for private ends. Whilst conclusion of an arrangement implies the expectation of a net gain for both parties, the form of the gain varies considerably as do the circumstances of the negotiation. If the most common form is probably monetary as a result of an arrangement contracted between private individual and public official, the payment for, or counterpart of, the arrangement may be political patronage, tutelage or some other type of barter.

(a) Traditional views and false analogies

The basic assumption adopted by this definition, and running through the models to be outlined later, is that corruption is part of a rational calculus and an integral and often deeply-rooted method by which reasonable men take decisions in the soft-states of the Third World. It thereby opposes the view of Myrdal who argues that it is in some way opposed to the operation of the profit-motive, being part of an amalgam of social attitudes which impede the introduction of natural decision-making along these lines into LDCs. In stressing, also, the exchange nature of corruption, it contradicts the views of those who consider it solely as a cost incurred by capital-rich countries in their lending to capital-poor ones. If the arrangement results in firms or nationals of capital-rich countries gaining projects or positions in capital-poor ones, it is not more in the nature of an investment yielding recurring benefits, rather than a cost, that the arrangement ought to be considered?

The evident similarity between official market exchange and the 'shadow' market for arrangements has been accepted by some authors of the 'political science school' as the basis for an argument that such 'open' corruption is an optimal means of bypassing bureaucratic inertia and is even conducive to economic growth. There are two critical points which can be made about this form of analysis. First, it is based on a false analogy. The similarity between the official and unofficial markets is in fact more apparent than real. Second, the conclusion suffers from the fallacy of composition. Regarding the first point, there are at least three factors which dominate the market for arrangements but which are absent from a competitive official market (we treat imperfect markets later). First, whereas the competitive market is based on full information to competing parties, the market in arrangements is based on secrecy, i.e. the segmentation of information amongst different parties. Second, there is the importance of rival behaviour. In the market for arrangements there will be no 'bidding' process for if all are bidding then they will cancel each other out (Section 3). Last, there is the heavy element of both risk, for instance of discovery, and uncertainty as to the final outcome associated with an arrangement. In a competitive market, ex post, there is no uncertainty as to the outcome, but in the case of arrangements this uncertainty will always exist for there is no guarantee that the arrangement will 'work': there are other uncontrolled factors at work. The treatment of risk has been at the centre of recent economic theories of corruption [see Section 2(b)].

It is the need of authority, in its thousand and one forms, to vet or decide over the conditions under which economic activity can be undertaken, that confers on the official what Beenstock (1979, p. 16) describes as 'conferred monopoly status'. This situation implies an analogy with the imperfect market functioning of traditional microeconomics, but this analogy is also debatable. Often the analysis is made that the arrangement price is like a tax which is passed on to the consumer with all the normal consequences such as changes in producers' and
consumers’ surpluses. But whether the arrangement cost will be passed on will depend on, amongst other things, the assumptions made about rival behaviour by the party seeking the arrangement. Arrangements, in the context of contract negotiations for important ‘one-off’ projects in LDCs are more a reflection of the presence of intense competition amongst rivals rather than the absence of it and the arrangement cost may well be absorbed as part of a strategy to gain the contract rather than passed on. The fact still remains that traditional microeconomics is fairly unsuited for analysing the bargaining dynamics of this sort of situation where rival reactions are important and supply and demand curves can scarcely be held to exist (Shubik, 1970). This is where a game theory approach can score, but first consider the problem noted earlier of the fallacy of composition.

Corruption, it is argued, may promote bureaucratic efficiency by quickening the process of decision-making and the execution of these decisions, but delays are no more the cause of corruption than they are the consequence of it. Delays provide an indication of the ‘shadow price’ of an arrangement. There will be delays before the arrangement is negotiated, but the contracting of the arrangement will presumably bring these delays to an end. Although bribery by one individual or firm may lead to a more efficient resolution of that individual’s or firm’s problem, this cannot be so for everyone. If everyone resorts to bribery, no one will gain much, yet the underlying problems motivating the bribing – queues, greed for monopoly profits, impatience in front of structural inefficiencies – all remain. More importantly, who ultimately pays for the cost of the arrangement? Only a full-scale general equilibrium analysis can answer this question and it seems unlikely that even then any clear answer will emerge, so complex are the various factors at work. We shall try to point out the most important of these general effects on the overall pattern of development in Section 4.

(b) Expected utility maximization and differential arrangement prices

The question of what determines the level of the arrangement price is naturally one that concerns economists and is at the centre of recent economic analysis of corruption. It is possible to distinguish, a priori, four sets of factors which lead to different arrangement prices: (1) the level of the hierarchy at which the arrangement is concluded; (2) the degree of risk associated with the contracting of the arrangement and the attitude towards risk taking; (3) what rivals are prepared to offer for their parts; and (4) official settlement costs, i.e. the level of fines etc. We shall concentrate first on factor (2). Differential arrangement prices may be thought to reflect the different degree of riskiness involved in concluding an arrangement, with those higher up in the hierarchy receiving greater compensation for they risk more important positions. However, using a utility-maximizing approach, first adopted by Rose-Ackerman (1975), Beenstock (1979) shows that the relationship between risk and the arrangement price is not a straightforward one. At higher levels the chances of detection are plausibly greater. Consequently a contracting party, seeking to maximize his expected utility, may choose a lower than maximum level of bribe. This seems scarcely a realistic empirical case, however, for the risk of discovery would appear to be in general quite low [Section 2(c)].

In order to be able to manipulate utility functions, the actors involved in this model are the buying and selling representatives of multinational companies, and if a ‘corruptibility condition’ (Beenstock, 1979, p. 20), which largely depends on the degree of their risk aversion, is satisfied, then an arrangement will be struck. Its price is determined by the equation of the marginal utilities of the individual buying and selling representatives with their respective expected gains at the margin. However, if the arrangement demander (the selling representative) explicitly incorporates a consideration of his company’s profitability into his decision, this is not the case for the arrangement supplier who bases his decision entirely on a personal financial reward. The corrupt buyer in this case must be acting clandestinely with respect to his employer. But is the seller as well acting independently? This is not clear. Is it realistic in effect to analyse the behaviour of company representatives independently of their employing institutions? Will not the attitudes of these institutions influence the degree of risk aversion of their agents and hence the likelihood of entering an arrangement in the first place? And what, therefore, determines the likely attitude of these institutions? It is here that the importance of assumptions regarding rival behaviour enter in.

The utility-maximizing approach would appear more suited to answering the question ‘what level of unit arrangement price is likely to be offered?’ rather than ‘why does a decision to be corrupt occur in the first place?’. As we
Participants noted earlier, it attempts to answer this latter question by postulating a corruptibility condition which must be satisfied if a corrupt decision is to be possible. However, the specification of such a condition is incomplete. It does not incorporate the likely gains under the alternative assumptions—corrupt or not corrupt—nor, for each of these cases, varying assumptions about rival behaviour which will surely influence a decision to make or take bribes. It is for dealing with such situations where anticipation of rival strategies is important that game theory is particularly suited.9

3. THE GAME THEORY APPROACH

For the purpose of analysis, we place ourselves in the institutional context, certainly the most commonly exposed in the contemporary media, of an overseas corporation considering the rationale for bribing a local official as part of an attempt to gain a contract. Whereas Beenstock (1979) uses the mean-variance model to explore the relationship between a single seller and buyer, in the approach which follows we assume a situation with several possible sellers or arrangement demanders, confronting a single buyer. We use this approach to answer the following three questions. (1) Do all rival firms or only the most ambitious have an interest in seeking arrangements? (2) Are there any limits to the amount per firm and the aggregate income per contract sought that will be paid to the official or is his likely remuneration from this source in effect unbounded? (3) What is the role of legal sanctions in influencing the decision to adopt a corrupt strategy? Question (1) approaches the problem from the perspective of the arrangement demander, assuming the determinants of the supplier's behaviour as given. Answering questions (2) and (3) however involves taking jointly into account the perspectives of both demander and supplier.

Firm A is one of a number of rival firms (N in total) tendering for a project worth P units in value. Each firm offers a slightly different product but this is not essential to the analysis since disguising of the kickback could still occur even if the product offered was homogeneous. It is certainly a more realistic assumption and makes a corrupt outcome more likely since the extra payment involved can far more easily be concealed. In the analysis that follows, the chance of A getting the contract in a corruption-free environment will, however, be approximated by 1/N or p, i.e. we assume that the importance of the special characteristics cancel each other out at this stage.

The role of the corruptible official is to enhance the probability p of firm A getting the contract. We shall assume that his capacity to do this is reflected by the value of the parameter 'a'. In terms of absolute values, 0 ≤ a ≤ 1, and a and p are related as follows:

\[ p' = p + a(1 - p). \]  (1)

Here the probability p' is the chance A has of getting the project, if he accepts and succeeds in bribing the official. The official acts to lower the chance of A not getting the project \([(1 - p)], if everyone else remains honest. If the official has a zero shadow price (a = 0), then p' = p and there is no gain to be had from offering to bribe him.

Note, however, that equation (1) holds only under *ceteris paribus* assumptions regarding rival behaviour. If others are offering bribes, then this will alter the chance of A getting the project, even if he is bribing. Furthermore, all competitors cannot, if corrupt, expect to get p' for then the sum of these p' values may exceed unity, which is clearly impossible. We assume, therefore, that 'a' is the maximum premium that the official can offer and if there is more than one demander this premium has to be shared out between them. The official has every interest to offer the maximum premium, but the existence of arrangement-seeking rivals will mean that 'a' will not reflect the real shadow price of the arrangement to the individual firm, except in a special case where he is the only demander. Exactly what chance each will have if others are corrupt too, is determined by the further requirement that the probability of getting the project for a firm that is not in the market for arrangements, but that everyone else is, must be greater than zero. If it is zero, then no-one will be interested in being not corrupt, and hence all will cancel themselves out in their attempts to get the contract. This probability will also exceed zero on account of the slightly heterogeneous nature of the product offered. The innocent rival's bid has therefore a chance of being accepted for this reason.

We call this probability, i.e. that of an innocent rival getting the contract with all others corrupt, p'. For the \((N-1)\) rivals, we define \(p'_b\) as the probability of A getting the contract if all \((N-2)\) others are corrupt, and \(A\) follows a corrupt strategy too. Therefore, p' and \(p'_b\) are related as follows:

\[ p'_b = p + \frac{a(1 - p)}{N - 1}, \]  (2)
Given one arrangement we meet a limit to the aggregate amount of arrangement income. We shall soon see that it is a very significant one.

However, the real source of uncertainty for A is that he does not know whether his rivals are corrupt or not. He has to undertake his calculations under the alternative assumptions that they may or they may not be. We define the proportion of rivals who are corrupt as x. Firm A's problem is to compare the expected income (EY) from the project under both assumptions or strategies, namely that he accepts to be corrupt (EY_1) and that he is non-corrupt (EY_2).

To complete our model, we assume that, in the light of what we saw in Section 7, a firm which has decided to follow a non-corrupt strategy will have its life made harder by the frustrated official. These costs, in the form of delays and difficulties of formalities, are represented by the variable 'd', and must be deducted from the expected net gain under a non-corrupt strategy. The arrangement price is 'c', so if payment is according to opportunity cost d = c, but as we have suggested earlier, 'c' is also likely to be related to the arrangement premium 'a'. We assume that legal sanctions on the demander exist and that the probability of their being actually imposed [we take the sanction here to be expressed in monetary terms, i.e. a fine (F)] is p_F. The two basic equations expressing the expected net incomes from a successful bid for the project (P) are as follows:

EY_1 = p(x)P + p'(1-x)P - p_F F - c, \hspace{1cm} (4)

EY_2 = p''(x)P + p(1-x)P - d. \hspace{1cm} (5)

To simplify the arithmetic, we put c = d and set F in relation to [by a proportionality factor (v)] the aggregate project benefits:

F = vP. \hspace{1cm} (6)

So we may write p_F F as:

p_F F = p_1F(x) p + p_2F(1-x) p, \hspace{1cm} (7)

where p_1F is the probability of being fined given that all rivals are also involved in bribing, and p_2F is the conditional probability given innocent rivals.

Setting \( \hat{p}_{1F} = (vp_{1F}) \) and \( Y'_i = Ey_i + c, i = 1, 2 \) we write equations (4) and (5) as:

\[ \hat{Y} = \hat{X} A, \]

where \( \hat{Y} = [Y'_1, Y'_2], \hat{X} = [(x), (1-x)], \)

\[ A = \begin{pmatrix} (p - \hat{p}_{1F})P & p''P \\ (p' - \hat{p}_{2F})P & pP \end{pmatrix}. \]

Clearly, unless the values of \( \hat{p}_{1F} \) are quite high, then the corrupt strategy will always dominate because \( p > p' \) and \( p > p'' \). Furthermore, if \( \hat{p}_{1F} \) is not greatly different from \( \hat{p}_{2F} \) then the scene is set for co-operative strategies. To demonstrate this, consider the following example.

(a) An arithmetic example

We assume the following values for the model's variables and parameters. \( N = 6, P = 10, a = \frac{1}{6}, \hat{p}_{1F} = \frac{2}{6}, \hat{p}_{2F} = \frac{1}{2} \). Hence in this case:

\[ A = \begin{pmatrix} \frac{1}{6} & \frac{5}{6} \\ \frac{2}{3} & \frac{1}{3} \end{pmatrix}. \]

To analyse the strategies, let us assume also that firm A's rivals two have decided not to be corrupt - they may be ultra-conservative or 'irrational' in Myrdal's sense, but this is not important for the analysis since the conclusions hold irrespective of the value of x chosen. Two others have decided to be corrupt. So the game played between A and B, the only undecided rival, yields the following pay-offs. By substituting first \( x = \frac{2}{3} \), then \( x = \frac{1}{3} \), into equation (8) and calculating \( \hat{Y} \) we get the following pay-offs, and the pay-off matrix as follows:

\[ x = \frac{2}{3}; \hat{Y} = (1\frac{1}{3}, 1\frac{1}{3}); \]

\[ x = \frac{1}{3}; \hat{Y} = (1\frac{1}{3}, 1\frac{1}{3}). \]

If \( c = d \), then \( \hat{Y} \) also represents the relative pay-offs net of these costs: The first entry is A's pay-off, the second B's.

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<th>B's strategies</th>
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Clearly the C strategy is dominant. Whatever B does, A is best to be corrupt. Even the most
honourable of competitors will be led, if they follow the track of rational self-interest, to be dishonest. This is another example of the classic 'prisoner's dilemma'. The response to a situation of this kind emerging has generally been to suggest regulation by outside authority of firm or individual behaviour in an effort to ensure that private and public interests are brought into line. But this solution is of doubtful applicability in this case for it is the very behaviour of these authorities that has been made an integral part of the game. The shock that the formulation of the problem in the above way provides is that there may be no effective 'independent' agent to implement public fines or other sanctions for these agents are already engaged in taking bribes themselves.

(b) The case for co-operation

If we analyse the nature of the solution more carefully, various questions are posed. First, apart from 'irrational' motives mentioned earlier, why would any firm be interested in being honest? Will the official be able, then, to pick up his arrangement from all of them, and will this be a stable long-run situation?

In the earlier example, both the maximum and the minimum gain fall for A as x rises from 0 to 1. Would it not be reasonable to suggest the interest of A in excluding B, C, D etc. from being corrupt - i.e. to collaborate with the official who, as part of the deal, would refuse arrangements from A's rivals? Would the official be interested in such co-operation?

Following Von Neumann and Morgenstern (1944), there are two conditions which must hold if a co-operative solution is to be found, namely: (1) that the negotiated solution must be Pareto optimal, and (2) that the co-operative strategies must yield pay-offs at least as great as could be had by both parties without co-operation. To establish whether a negotiation set exists, we display graphically the 'convex hull' of the mixed (C/NC) strategies (Figure 1) (Bacharach, 1976). We assume $c = d = \frac{1}{2}$, and plot the relevant pay-offs to A ($U_A$) and the total arrangement price to the official or his pay-off ($U_O$) as follows. Only points along $BC$ are Pareto optimal, and of these, point $B$ is a solution, given $c = \frac{1}{2}$, i.e. the arrangement price is kept at its initial level, for otherwise $U_O$ would exceed $\frac{1}{2}$. The security level condition is also satisfied. Here A's security level ($S_A$) is 1 because this is his minimum alternative gain, given by the net expected income of a non-corrupt strategy with the official concluding a successful co-operative agreement with one of his rivals ($x = \frac{1}{2}$, $Y_1 = 1$; $Y_2 = 1$). The official's security level here is zero ($S_O$).

Is B the only feasible solution? What if the official is greedy and bargains with A for a higher ($c > \frac{1}{2}$) price? Ought the firm to concede? The answer is 'no'. For as soon as A begins to trade some of its net expected gain (up to a maximum of $\frac{1}{2}$ for $S_A = 1$) along $Bt$, the final outcome is not Pareto optimal. We are thus forced to the conclusion that the aggregate arrangement price does have an upper limit, provided by the initial value of 'c' which we expect to be directly related to 'a'. Entering into a co-operative agreement, although in the official's interest, will not have any influence on his aggregate income from a particular arrangement. The burden of adjustment falls on the official who cannot expect more than his initial asking price.

Let us summarize the conclusions that we have reached so far. (1) If the circumstances exist for corrupt strategies to dominate, firms and officials will seek to co-operate. (2) We will not in general observe multiple co-operation. (3) Unless we assume differential willingness to
pay, then economic considerations will not help us to determine which of the rivals the official will choose to collaborate with. This will have to be determined on grounds of ethnicity, nepotism, social contact or some other 'parochial' consideration. (4) The burden of adjustment falls on the official rather than the firm which stands to gain relatively more from co-operation. The upper limit to the latter's arrangement price is determined by his influence parameter (a); and since co-operation occurs, this also provides the upper limit to the official's arrangement income from a given deal. Empirical evidence points to (2) being verified. There are well-known examples (Scott, 1972, Chaps. 4 and 5) of firms bribing officials separately for a given service, but we have not come across, in our research so far, any case of multiple bribing as understood here.

To what extent are these conclusions dependent on the particular assumptions we have made? We have already touched on the importance of the legal sanctions parameters ($p_{1F}$, $p_{2F}$, $v$, $F$). Let us consider these in more detail.

(c) The role of legal sanctions

It has been assumed that legal sanctions may be represented by a monetary value, $F$, or may be given a monetary equivalent form. In some cases this may not be very reasonable. In a recent case of bribery in Iraq the death sentence was imposed on the official and life imprisonment in the business representative. We have not taken into account, in the earlier analysis, the risk of sanctions on the official, which as the earlier example shows, do exist and are sometimes effectively implemented, even in the context of 'soft-states'.

In terms of the model, effective sanctions of a monetary nature, whether imposed on supplier or demander or both, operate in general to shrink the convex hull, and to reduce the likelihood that a corrupt solution will dominate. Their role is crucial in determining whether there is a game to be played, and what the likely outcome will be. Taking first sanctions on the arrangement demander, raising $p_F$ or $F$ or both, will, in the example given earlier, serve to lower the vector BC in Figure 1 ($EY_1$). When it coincides with $AD$, then at this value of sanctions there is a 'cross-over point' such that, with higher sanctions or more effective implementation of these non-corrupt strategies will become dominant.

The effect of introducing sanctions on the arrangement supplier is more complex. The official's expected pay-off ($U_O$) will now equal his gross arrangement income minus the expected value of the monetary sanction which he would have to pay if discovered, i.e.:

$$U_O = Rc - p_{OF}F_O$$  \hspace{1cm} (9)

where $R$ is the number of corrupt rivals paying 'c', $p_{OF}$ is the probability of the official being fined and $F_O$ the amount of the fine. Both $p_{OF}$ and $F_O$ have, up till now, been taken as zero.

The effect of this type of sanction may be illustrated by referring again to Figure 1. Positive values for $p_{OF}$ and $F_O$ will reduce the official's expected pay-off for each value of $R$, but, unlike sanctions on the agreement demander, their introduction affects the expected income gains under both the corrupt and non-corrupt strategy. Point A remains fixed but other co-ordinates along both BC and AD will be shifted to the left by the amount of the expected value of the fine. The pay-off set can therefore be displaced into negative $U_O$ pay-off space, if this expected value is high enough.

Figure 2 shows the influence of the introduction of legal sanctions. AEFGH represents the adjusted convex hull of Figure 1 after sanctions with expected value $= \frac{1}{2}$ have been introduced. The pay-off set has been reduced but a co-operative game solution with a corrupt strategy dominating is still likely. To change this result appears to depend on introducing high absolute values of $p_{OF}$ and $F_O$. It is possible to point out here that the value of $p_{OF}$ probably rises with $R$, the number of rivals with whom the official deals, because the risk of detection rises. Combining high values of $p_{OF}$ (rising also with $R$), and $F_O$ would give the extreme case illustrated in Figure 3. Here $p_{OF}F_O$ is high enough to yield [by equation (9)] negative values of $U_O$ for low values of $R$.

Effective legal sanctions at this level of severity do now change the likely outcome of the game profoundly. For instance co-operation with any one rival at a given level of 'c', the unit arrangement price, is now no longer feasible,
for the official's security level \( U_Q = 0 \) is not satisfied. The official may seek to co-operate with a subset of firms so as to raise his minimum likely pay-off above his security level, but such a strategy has its own risks and only further empirical research will show whether it is a realistic possibility.

One important question that is raised in this context is how, in the presence of corrupt officials and multinational corporations whose activities are not subject to any clearly defined national jurisdictional authority, such legal sanctions can be established and, in practice, implemented. In the models outlined earlier the sanction is assumed to be a monetary amount known in advance, e.g. a traffic fine. What is not known is how well it will be implemented. But in practice there are many factors (including corruption itself) which will determine the nature and amount of a fine that a guilty party may be required to pay. It will rarely be the case that the 'official settlement cost' will be known in advance. Specialist studies have shown that in most LDCs no special apparatus exists for the treatment of corruption. Recourse is occasionally taken to mass media campaigns in an effort to mobilize public opinion. One jurist who has studied the problem intensively in the Central African context is deeply pessimistic about the value of legal sanctions, at the national level, to cope with the phenomenon of corruption (Sarrassoro, 1980).

Moreover, nation-states jealously guard the right to adjudicate all cases of penal law infringement committed on their territory, so little in the nature of an 'international' solution may be expected. It is significant that the International Court of Justice has not yet treated a single case of corruption as defined here. In sum, therefore, no clear limits to the level of the arrangement price is likely to be provided from a legal standpoint. Whilst the potential role of sanctions is very great, for various reasons their actual role is ineffective in discouraging the widespread espousal of corrupt strategies.

4. GENERAL EQUILIBRIUM EFFECTS

(a) Production and price effects

If we accept as a general definition of a distortion, any factor, whether policy imposed or not, incompatible with the operation of the economy at a Pareto optimal equilibrium, then corruption belongs within this definition (Corden, 1974). If only normal profits were to be gained from a project, no one would be willing to offer an arrangement price which would result in a lower rate of profit. Although the general theory of distortions is now a core element of modern development theory, one can read through the key contributions on the subject without encountering one substantial discussion of the role of corruption in influencing the patterns of resource allocation and use in LDCs (Little et al., 1970; Healey, 1972; Magee, 1973). Corruption is analogous to an overvalued exchange rate or a border tax on commodities in the sense that it affects the entry cost into a given market. But since it does not necessarily fall only on foreign suppliers, but is in principle payable by domestic producers as well, then it does not have the same effect on the composition of production as a border tax which will discriminate in favour of locally produced substitutes.

It is generally argued that distortions have operated to lower the relative price of capital in LDCs thus serving to encourage the use of capital-intensive technology. Corruption on the other hand tends to raise the relative cost of capital. If nominal interest rates are low, effective interest rates in LDC's have to include the arrangement price payable to the relevant bank manager in order to be able to get loans or credits. It is the arrangement-inclusive price which is in effect the means by which scarce capital is rationed out. If arrangement charges are taken into account, will the so-called gap between 'organized' and 'unorganized' sector interest rates still be found to exist in fact, as the thesis continues to exist in the textbooks? (Yotopoulos and Nugent, 1976; Ghatak, 1978).

Corrupt practices also affect the validity of arguments based on the hypothesis of overvalued exchange rates as a factor determining unsuccessful development performance (Power and Sicat, 1971; Klock, 1972). Corrupt practices in the allocation of scarce foreign exchange, e.g. through the private distribution of import licences at a given arrangement price, will work in the direction of raising the domestic price of foreign exchange and may cancel out the initial
impact of the overvalued exchange rate on the level of domestic prices of importables. In cases such as these, the arrangement charge operates to correct distortions at the level of production or consumption decisions, certainly at the expense of distributional equity (see later).

Despite its impact on the cost of capital raised locally, corruption may distort the choice of investment project in favour of capital as opposed to labour intensive projects. This has been confirmed, for example, in a recent survey of managerial practices regarding technology choice in Nigeria (Winston, 1979). Winston's (1979) survey showed that the risks of a particular arrangement for the purchasing manager ('the supplier' of the arrangement) rose with the number of transactions, the number of people involved and the complexity of the material purchased. These biases in cost per dollar of the kickback create incentives for the opportunistic manager to choose capital-intensive, technically sophisticated, imported equipment when strictly above-board calculations of strictly above-board costs would recommend less capital, less sophistication, less foreign exchange and more small units from domestic suppliers' (Winston, 1979, p. 841).

But bribes received by officials often exceed, in absolute terms, the entire annual turnover of indigenous smaller-scale enterprises. Overseas firms can raise finance overseas on non-corrupt terms, but local firms have to go through the local banking system and the costs which that implies. Large capital-intensive firms, using methods that give rise to lumps of fixed capital being advanced at particular stages of the project's completion have a greater chance of being able to conceal the arrangement price than does a labour-intensive contractor. The labour-intensive contractor with a heavy demand for circulating or working capital may have difficulty in finding a sufficient amount of reserves at any one time to meet the arrangement price which is usually payable in advance.

Another serious influence which needs to be more deeply researched, is the effect of corruption on the allocation of labour, especially skilled labour, in the LDC. The spreading of corruption into the universities and other institutions of higher education in the Third World (Myrdal, 1970, p. 231) and the consequential awarding of formal educational qualifications where these have not been properly earned, results in the placement of graduates in jobs which are beyond their actual competence and inefficiency is the inevitable result. This misallocation of resources is even more evident in the case of jobs being allocated according to political or parochial considerations. In these circumstances, where there is a dominance of 'institutional' methods in determining the allocation of jobs, the negative effects of corruption are likely to be the greatest.

(b) Distributional effects

From our analysis in Section 3 we have seen that the payment of the arrangement represents a reduction in the net rate of profit earned by the successful rival, and a transfer from the rival to the official. In the case of an unsuccessful corrupt rival a transfer also occurs to the official. In so far as this transfer represents a shift in the distribution of income from reinvestible profits to consumption by the official, overall growth rates will suffer. However, we have also seen that corruption biases the choice of techniques in favour of capital. Factor income distribution will therefore shift in favour of capital (generally overseas capital) by a greater amount than the arrangement will transfer income in favour of local LDC officials. Moreover, there is the fact that the arrangement revenues will generally be spent on high import content luxury goods, or deposited in a foreign bank account, so having virtually no multiplier effects within the LDC, probably negative balance-of-payments effects, and a loss of tax revenues to the LDC government on account of the unofficial nature of the transactions involved.

Since the supply price of the arrangement rises with the level of the hierarchy, so that larger amounts are shared amongst smaller numbers of individuals, the distributional consequences at the level of the distribution of personal incomes are disequalizing. Both the gap between rich and poor and the inequality of the post-tax distribution of incomes will increase, the latter arising from the untaxable nature of the gains from corruption and the fact therefore that the rich will gain both absolutely and relatively more. One way around the difficulty of actually measuring the extent of this influence on the real distribution of personal incomes, since the gains will never be recorded in the official statistics, would be through surveys of consumption levels or holdings of real wealth, i.e. after the arrangement price has been transferred into the form of some fixed asset (villa, car etc.), in which form it is often provided in the first case. A properly administered wealth tax combined with an expenditure tax would be preferable on equity grounds to the income tax or general sales tax as a means of
correcting the inequalities arising from this source of private gain in LDCs.

There is lastly the real-income effect to consider, arising from the need to pay arrangement-inclusive prices for all goods, services, primary inputs etc. subjected to corrupt practices regarding their allocation. The poor will be subjected to this effect in the same way as the rich. The poor urban dweller will have to pay the arrangement price to have a plot of land individualized in his name as part of a process which will also tax the richer man. Indeed the rich may have to pay more as a result of corruption than the poor, for example on account of their patterns of expenditure, so that it is obviously impossible to say a priori what the overall effect on the distribution of real income will be. It is simply not true to say, however, that the gains from corruption are concentrated solely within ‘the tiny new upper-class’. The reality is more complex and it is the net gains that have to be analysed.

5. CONCLUSIONS

All economic undergraduates today know about the Scitovsky criterion that for any change to increase welfare the losers must not be able to bribe the gainers to oppose the change; but who knows about the economics of bribery in the real world today? In this world it is not the losers who aim to do the bribing in most cases, but those who are going to gain, and the importance of bribery is not limited to the redistribution of a given amount of gain between consumers. It has complex and wide-ranging effects on the composition of production, consumption, factor prices, the distribution of real income, balance of payments, the price level etc. in an LDC today. Our approach in this article has concentrated on explaining the omnipresence of corruption by illustrating a logical basis on which decisions to be corrupt may be taken. From this, we deduced certain consequences for the pattern of economic development. It appeared that the balance of these effects, especially at the level of distribution, was strongly negative.

We have argued that legal solutions are unlikely to be effective in solving a problem which has its roots in the day-to-day operation of society from the lowest to highest levels of decision-making. What limits, then, do exist? The only ones to emerge from our analysis are provided by the ‘hidden hand’ of calculated self-interest, e.g. in limiting the value of ‘c’ and the number of firms actually paying ‘c’. What then of the role of well-selected economic policies? Certainly some measures aimed at the reinforcement of market constraints may assist in limiting corruption and distributing gains more evenly. Increasing N, the number of rivals tendering, will as we have seen reduce the premium \((p' - p)\) that a corrupt official can provide to any one arrangement seeker. Open auctioning of licences would also help, but very soon limits to the effective implementation of such policies will be met. No solution to the problem is anywhere in sight and it remains as true today as it was 14 years ago that in most LDCs ‘before the power structure has been changed by evolution or revolution, it will be difficult to decrease corruption or even to hinder its continual increase’.

NOTES

1. What represents ‘use’, what ‘abuse’? Only the social mores of the particular context being discussed can determine this. In many LDCs corruption is more the accepted ‘use’ of power, a sort of reward for success. To the outside (DC) observer, the same actions appear ‘abusive’ since he views them from a different moralistic perspective. For a relevant discussion of the pre-Revolutionary Chinese case, see Needham, (1974, pp. 243–245).

2. Beenstock (1979) adopts a taxonomic approach to distinguish between five different ‘cases’ of corruption: extortion, subversion, political and judicial corruption, gratuitous and benign corruption. However, in most countries, only the first three cases are corrupt according to his definition which stresses illegality or secrecy. In all these cases, an exchange element exists. The distinction between case 3 and cases 1 and 2 is largely a matter of the form of this exchange (votes vs dollars). The distinction between extortion and subversion is, according to Beenstock (1979), that for the former the applicant is, ex ante, not intent on undertaking a corrupt deal but in the case of subversion he is, but, ex post, both are engaged in a presumably illegal act and the significance of the distinction is not clear. For example, Beenstock (1979, pp. 22–23) argues that extortion is likely to be more harmful to allocative efficiency than subversion, but in fact this conclusion depends on what additional assumptions are made about initial conditions. See Section 4(a).


5. See in particular Scott (1972, p. 70). Morgan (1975, p. 370) and Myrdal (1970, p. 238) provide summaries of these arguments.

7. See Myrdal (1969, p. 950) for references.

8. One might argue that the queues will move more rapidly due to the better paid and now motivated official. This remains uncertain.

9. Beenstock (1979, p. 21) notes the need for this approach to answer questions of 'bargaining dynamics' which his expected utility-maximizing approach is unable to deal with.

10. We have noted earlier that 'a' lies in the interval $0 < a < 1/N$. 1. If 'c' is assumed to be proportional (h) to the difference $(p' - p) = a(1 - p)$, i.e. $c = ha(1 - p)$, then 'c' will lie within the limits $0 < c < h/N$. In this range, therefore, the utility-maximizing approach may be applied to solve for the optimal level of 'c', by incorporating attitudes to risk taking. See Section 2(b). But the range as determined earlier is not very significant because the absolute value of $h$ is left undefined. Note, lastly, that raising $N$, the number of rivals allowed to bid, will reduce the range for 'c'.

11. Since the risks of exposure are likely to be greater when rivals are innocent, we expect $\hat{p}_2 > \hat{p}_1$. But if $\hat{p}_2$ is too high then it will outweigh the differential gain from bribing $(p' > p)$.

12. We are at this stage ignoring the existence of legal sanctions on the arrangement supplier. See Section 3(c).

13. It may be shown that in the alternative case where $(p' - p) > (p' - \hat{p}_2)$, the conditions for cooperation do not exist. See Note 11. This result is not pursued here.

14. This conclusion provides one answer to the question raised by Beenstock (1979, p. 21) regarding the possible process of adjustment that will be followed when buyer and seller have different 'ideal bribes'.

15. It is therefore not very helpful to compare corrupt solutions with Pareto optimal ones in a general equilibrium context since corrupt solutions will always come off worse ( Beenstock, 1979, pp. 22-23).

16. In Cameroon, a small-scale entrepreneur quotes this price as 200,000 CFA for a bank credit of 1 million CFA (100 CFA = US$0.33).

17. The most celebrated example of this is the Ghanaian Minister of Foreign Trade, who at the end of the 1960s 'sold' import licences to Lebanese importers at the price of £210,000 sterling per licence. See Domain l'Afrique (1980).


REFERENCES


Demain l'Afrique, 'La fonction publique malade de la corruption?', No. 44 (January 1980).


