Impacts of Endogenous Bribes on Foreign Direct Investment*

(Work in Progress)

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Abstract

To examine the effects of corruption on foreign direct investment, we develop a cooperative Nash bargaining game to model the negotiation process between firms and corrupt officials. We first analyze a firm's decision to bribe corrupt officials either to pay smaller settlement fixed costs than legally prescribed ones or to benefit from illegal preferential tax treatment. Then, we examine a firm's performance in a differentiated market with Bertrand competition to determine how a foreign firm's decision of going multinational depends on the intensity of corruption in a host country. Finally, we investigate how alternative anti-corruption policies may have different impacts on attracting or discouraging foreign direct investment.

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1 Introduction

Corruption has always coincided with the growth of economic wealth (Nye, 1967). In certain situations, corruption can be the only way to overcome extremely cumbersome and virtually endless bureaucratic procedures that constitute solid barriers to entry. As globalization deepens and real income increases across countries, corruption has also taken an international dimension.

Frequently, foreign as well as local firms suffer the consequences of paying bribes to bureaucrats to get permits and licenses to enter markets in some developing countries. Once they are in these markets, entrepreneurs also have to follow the directions imposed on them by the corrupt officials in the process of fulfilling bureaucratic procedures. In these countries, both national and foreign investors have to confront additional undesirable costs as a consequence of bribing government officials. As a result, bribes have to be taken into account when determining the profitability of investment projects. Thus, the level of corruption in a host country plays an influential role on a firm's investment decision of going multinational.

The economic literature on corruption includes numerous studies that examine corruption from different perspectives. Many of these interesting studies – such as Shleifer and Vishny (1993), Ehrlich and Lui (1999), and Ades and Di Tella (1999) – use formal economic models to examine the emergence and theoretical effects of corruption. Others are empirical papers that measure the effect of corruption on the performance of macroeconomic variables such as aggregate production levels and growth rates.[1] More specifically, the economic literature on the relationship between corruption and foreign direct investment (FDI) has been based heavily on econometric models. Most of these empirical studies reach the commonly expected conclusion that corruption in a host country discourages FDI.

Using a sample of twelve source countries and forty-five host countries, Wei (2000a)

[1]Mauro (1995) and Tanzi and Davoodi (1997) provide an extensive discussion of this literature.

examines the effects of taxation and corruption on FDI. He regresses the two-year bilateral flows of FDI on a set of independent variables, including a measure of corruption. Two main results emerge from his work. First, the estimates indicate that a one-grade deterioration in corruption rating has the same negative impact on FDI as a 2.7 percentage point increase in tax. Second, this study further confirms the finding in an earlier work by Beck, Maher and Eschoegl (1991) that the US. Foreign Corrupt Practices Act does not make American investors more averse to corruption than non-American investors.

In another study, Wei (2000b) analyzes the effects of corruption on the composition of capital flows and the volume of FDI. By using survey data on countries' investment environment, he builds two indexes that capture external policies either restricting or encouraging FDI. After controlling for the effect of these policies, he finds that the negative effect of corruption on FDI is relatively large and statistically significant. Even more importantly, his study suggests that the reduction in FDI caused by corruption is larger than the negative impact that corruption has on other types of capital inflows such as foreign bank loans. In addition, Wei (2000b) claims that currency crises may be more likely to occur when corruption alters the structure of incoming capital flows.

Habib and Zurawicki (2002) analyze the negative effects of corruption on FDI by incorporating the absolute difference between the corruption levels in the source and host country in their analysis. They conclude that, in general, international investors try to avoid situations where corruption is clearly present because of the following two reasons: first, corruption is immoral; second, corruption may constitute an important source of inefficiency.

The work of Akcay (2001) provides one exception to the existing evidence of a negative relationship between FDI and corruption. He uses a cross sectional data from 52 developing countries with two different indexes of corruption. Akcay (2001) does not find evidence to support statistically the existence of a significant negative association between corruption and FDI. Moreover, the results of this study demonstrate that corporate tax rate, market

size, openness of the economy, and costs of labor are the most relevant economic variables that influence FDI.

Although empirical studies have shown that the level of corruption in a host country may affect both the total amount and the structure of FDI, there has not been much theoretical work done on the impact of corruption on FDI and hence how corruption exerts an impact beyond national borders, on international trade, FDI, and technology transfer. Also, the exact mechanism through which corruption influences a firm's decision on the choice of FDI versus other types of investment remains inadequately investigated. However, understanding this mechanism is essential for the design of effective policies to curtail corruption and encourage trade and FDI.

In this paper, we examine how corruption affects FDI by developing a formal economic model to capture the essential elements of corruption. Corruption emerges when firms bribe corrupt officials because of one or both of the following reasons: first, they bribe corrupt officials to pay smaller settlement fixed costs than those legally prescribed; second, they benefit from illegal preferential tax treatment. We first develop a cooperative Nash bargaining game to model the negotiation process between firms and corrupt officials. This game takes into consideration the risks faced by both firms and officials when they engage in corruption. Then, we analyze how corruption can influence FDI by affecting a foreign firm's profits resulting from going multinational. Hence, the analysis can provide some theoretical guidelines in interpreting both existing and future empirical results. Finally, we investigate how alternative policies aimed at curbing corruption may have different impacts on FDI.

This paper contributes to the existing literature by examining the process through which corrupt officials are bribed by foreign and domestic firms that produce differentiated products in a monopolistically competitive market. To our knowledge, there are no published studies to date that apply game theory to explain formally the endogenous bargaining outcome of bribery and hence its impact on FDI. The closest analysis to ours can be found in a working

paper by Glass and Wu (2002), which discusses the impact of corruption on the rates of innovation and imitation via FDI.

The study is organized as follows. In Section 2, we develop a dynamic game to determine the Nash bargaining equilibrium values of the two aforementioned types of bribes. The relationship between these equilibrium values and the relevant policy parameters relating to the effectiveness of anti-corruption policies is rigorously explained. Section 3 models the impact of corruption in a host country on inward FDI under Bertrand competition. In section 4, we analyze the effectiveness of anti-corruption policies on FDI. Conclusions and suggestions for future research are presented in Section 5.

2 Endogenous bribes

Under many circumstances, bribes are essentially required to remove bureaucratic barriers to investment. In general, firms bribe officials either because it is the only way to get rid of these bureaucratic barriers or because bribery may significantly decrease some costs, especially the opportunity cost of time required to obtain permits or licences. Thus, we assume that firms bribe corrupt officials because of the following two reasons. First, they bribe corrupt officials to pay lower settlement fixed costs associated with those official permits or licenses. Second, firms bribe corrupt officials to benefit from an illegal preferential tax treatment. Since corruption generally requires the use of accomplices, we consider corrupt government officials as a collective entity.[2] This collective entity may fail if any of the participating corrupt officials drops out.[3]

In addition, we assume that a foreign firm undertakes FDI if the exogenously given

[2]We assume that the officials that participate in corruption will share the bribes they receive.

[3]A new collective entity can succeed in the next period by substituting a subset of officials from the previous coalition.

opportunity cost of its alternative investment is smaller than the expected return on its FDI project. More specifically, we assume that there is no competition among host countries or among different sectors or projects within the country because the impact of all these factors is included in a firm's comparison of the expected return of FDI with its best alternative. To study the influence of corruption on FDI, we will now employ a Nash dynamic bargaining model between a firm and a collective of corrupt officials to determine the bribes paid by a firm in exchange for the aforementioned cost or tax benefits.

2.1 Bribes paid to reduce settlement (fixed) costs

Suppose that a representative firm, foreign or domestic, has to pay a default (non-bribery) fixed cost of F_{NB} to obtain an official permit or license to open a plant. We assume that F_{NB} contains both charges that are avoidable if the firm bribes corrupt officials successfully and other costs that are unavoidable under any circumstances. In addition, let T_{NB} represent the representative firm's value of the opportunity cost of time spent if the firm does not bribe corrupt officials and participates legally in this bureaucratic process. Thus, $F_{NB} + T_{NB}$ is the total settlement cost for a firm that enters the market legally.

If the firm bribes officials successfully, then the firm only needs to pay a total cost of $B_F + F_B + T_B$, which includes the value of monetary and non-monetary (in-kind) bribes B_F, unavoidable charges paid to the government F_B, and the firm's opportunity cost of time spent dealing with corrupt officials, T_B, which is always smaller than T_{NB}. It is also assumed that $B_F + F_B + T_B < F_{NB} + T_{NB}$ so that bribery is cost reducing to the firm.

Since the representative firm and the corrupt officials can negotiate the value of the bribe and hence the way to split the potential mutual gain from corruption, we model this negotiation process as a dynamic bargaining game, where a firm and corrupt officials make alternating offers by choosing either to accept an offer or to make a counter-offer until they

reach an eventual agreement/equilibrium. The equilibrium bribe paid to corrupt officials is their share of the aggregate mutual gain.

After this multi-round negotiation process is completed, the firm obtains an permit or license to operate and officials receive the bribe. This illegal deal, hereafter referred to as "coalition", can still result in a loss due to one of the following two possible breakdowns. One is that the coalition is caught by law enforcement officials. The other is that participating corrupt officials become unable or unwilling to carry out their promises to the firm. For instance, this could happen due to a job relocation, uncertainties in the political environment, a loss of mutual trust, etc. As a result, the officials may want to destroy the permit or license issued illegally to cover up their misconduct and hence the coalition may self-dissolve. However, these two breakdowns are mutually exclusive and only one of them can happen in the single period after a "coalition" is established.

If the coalition is caught, we assume that corrupt officials will be prosecuted. Firms, on the other hand, will not be punished directly by the government, but will have to obtain a new permit legally.[4] Suppose the corrupt officials can be caught and prosecuted with probability ϕ_c. We assume that this probability of apprehension, ϕ_c, is exogenous.[5] Also, the prosecuted corrupt officials can be found not guilty with a fixed probability, α, or guilty with a fixed probability $(1-\alpha)$. If they are found not guilty, they will still face a loss L_{NG} that can include lawyer fees, lost of income, and lost of social reputation. If found guilty, the corrupt officials will lose L that includes L_{NG}, financial penalties and fines paid to the government, and the corrupt officials' present value of lost future wages for the rest of his

[4]Some foreign investors may also face legal penalties in countries such as the United States. In the US, the Foreign Corrupt Practices Act (1977) prohibits bribery of foreign officials by publicly held US. companies, and consequently binds American investors from paying bribes abroad.

[5]In a more realistic model, the value of ϕ_c may be determined endogenously as a function of the size of the bribe and its frequency.

career.[6] Thus, the total expected punishment if caught is $\alpha L_{NG} + (1 - \alpha) L$. For simplicity, we are assuming that when a coalition is caught, the corrupt officials are found guilty, convicted, and sentenced to pay the appropriate punishments. That is, we are assuming that $\alpha = 0$, and the loss to corrupt officials if caught is L.

In the case of self-dissolved coalition, corrupt officials suffer a cost of R. This cost can include the cost of revoking the permit or license issued, the consequences of any retaliation from the firm, and the loss of reputation as a "credible" corrupt agent, or simply, the present value of forgone future bribes. Hence in addition to the "external" risk of corrupt officials being prosecuted by law ϕ_c, a coalition also faces the risk of self-dissolving in the above fashion with probability ϕ_s, which captures a firm's "internal" risk or uncertainty in engaging in corruption.

If the coalition self-dissolves, the permit that was illegally obtained becomes invalid just as in the case where the coalition is caught. Since most firms are reluctant to accept that they have ever been involved in bribery or any other form of illegal deals, they often just suffer the loss when a coalition self-dissolves because they usually do not file and do not expect to win a legal case against the corrupt officials to retrieve their bribe payment. Also, and probably more importantly, firms do not try to retrieve their bribe payment because they have no intention to foster a hostile relationship with these government officials. Therefore, the firm loses $B_F + F_B + T_B$ and has to start an entirely new legal process to obtain a new permit in both cases. This new process produces an additional cost equal to $F_{NB} + T_{NB}$. Thus, if the coalition is caught or self-dissolves, the firm ends paying $B_F + F_B + T_B + F_{NB} + T_{NB}$.

We now turn to an examination of the range of bribes within which an illegal coalition is possible and determine the split of expected mutual gain in a Nash bargaining game. To accomplish these tasks, we first determine both the minimum bribe required by corrupt

[6] As in Sosa (2002), L_G may also include non-financial punishments ranging from the value of time of being in jail to personal humiliation.

officials and the maximum bribe that the firm is willing to pay. After that, we calculate the Nash equilibrium bargaining bribe for this cooperative game.

2.1.1 The minimum bribe required by corrupt officials

For the officials to be willing to accept a bribe B_F, their expected payoff has to be non-negative. Thus, the minimum bribe, $B_{F_{\min}}$, required by the officials is the minimum B_F that satisfies

$$B_F - \phi_c L - \phi_s R \geq 0.$$

That is,

$$B_{F_{\min}} = \phi_c L + \phi_s R. \tag{1}$$

Equation (1) shows that the minimum bribe $B_{F_{\min}}$ required by corrupt officials to engage in a coalition is the expected value of the losses that they will face if such a coalition is either apprehended or self-dissolved.

Intuitively, $B_{F_{\min}}$ is increasing in ϕ_c, ϕ_s, L and R but independent of the costs to firms F_B, T_B, F_{NB}, and T_{NB}. First, the expected value of the corrupt officials' losses increases and hence their minimum bribe required increases because of a higher probability of detection, a higher probability that a coalition self-dissolves, or simply because of higher punishments. Second, the expected value of the loss from corruption is independent of a firm's savings on the settlement costs when corruption succeeds.

2.1.2 The maximum bribe paid by a firm

From the perspective of firms, a firm is willing to engage in corruption if the expected cost via corruption is smaller than $F_{NB} + T_{NB}$, the total settlement cost for a firm that enters the

market legally. Hence, the maximum bribe a firm is willing to pay gives the upper bound of B_F that satisfies

$$\begin{aligned} & (1-\phi_c-\phi_s)(B_F+F_B+T_B)+(\phi_c+\phi_s)(B_F+F_B+T_B+F_{NB}+T_{NB}) \\ \leq \;& F_{NB}+T_{NB} \end{aligned}$$

so that

$$B_{F_{\max}} = (1-\phi_c-\phi_s)(F_{NB}+T_{NB}) - F_B - T_B. \tag{2}$$

Equation (2) shows that the maximum bribe $B_{F_{\max}}$ that a firm is willing to pay is decreasing in ϕ_c, ϕ_s, F_B and T_B, but increasing in $F_{NB}+T_{NB}$, and independent of L and R. As in the case of $B_{F_{\min}}$, these results are expected. Note that, the higher the "external" or the "internal" risk faced by the firm, the higher the firm's opportunity cost of time spent dealing with corrupt officials, and the lower the savings on the settlement costs, the lower the maximum bribe that the firm is willing to pay. Further, loses of caught corrupt officials do not have any effect on the maximum bribe.

If $B_{F_{\min}} \leq B_{F_{\max}}$, then $B_{F_{\min}}$ and $B_{F_{\max}}$ are, respectively, the lower bound and the upper bound of bribes that make corruption feasible. If a bribe lies outside interval $I = [B_{F_{\min}},\, B_{F_{\max}}]$ or if $B_{F_{\min}} > B_{F_{\max}}$, corruption does not take place. Hence, corruption is less likely to occur if the range of interval I decreases. Intuitively, these results indicate that increasing punishment L or R, a firm's opportunity cost of time spent with corrupt officials T_B, the probability that a corrupt coalition self-dissolves ϕ_s, and the probability of detection ϕ_c all reduces the range of bribe values for which corruption can occur. However, these preliminary results about the effects of policy parameters on $B_{F_{\min}}$ and $B_{F\max}$ and hence the range of possible bribes should not be used to judge the effectiveness of anti-corruption policies. This is because the exact bribe paid at equilibrium can be unaffected by a policy change although it may change the possible range of bribes. Therefore, to analyze the ultimate impact of anti-corruption policies, we need to calculate the Nash equilibrium bargaining bribe, B_F^e, and identify the sensitivity of B_F^e to each policy parameter.

2.1.3 The Nash bargaining equilibrium bribe

For corruption to occur, ϕ_c, ϕ_s, L, R, F_B, T_B, F_{NB}, and T_{NB} have to satisfy $B_{F_{\max}} \geq B_{F_{\min}}$ so that

$$(1 - \phi_c - \phi_s)(F_{NB} + T_{NB}) - F_B - T_B - \phi_c L - \phi_s R \geq 0. \tag{3}$$

We now can determine how a coalition decides to split the potential mutual gains from corruption. As discussed earlier, we model this process as a dynamic bargaining game, where a firm and corrupt officials make alternating offers until they reach an agreement. According to Binmore, Rubinstein and Wolinsky (1986), if the length of each single round period approaches zero in a dynamic game with alternating offers, then the limiting perfect equilibrium outcome of this game is the same as the Nash bargaining outcome of the corresponding static axiomatic model. Therefore, the following analysis focuses on the static Nash bargaining model between a firm and a collective of corrupt officials as a reduced form of a richer dynamic bargaining game.

Under this static Nash bargaining model, the expected cost for a firm that participates in corruption is $A \doteq (B_F + F_B + T_B) + (\phi_c + \phi_s)(F_{NB} + T_{NB})$, while the expected reward to public officials is $B_F - \phi_c L - \phi_s R$. If corruption does not occur, the firm pays $F_{NB} + T_{NB}$ and officials receive no bribes. Hence, to solve for the Nash bargaining equilibrium bribe B_F^e, where there is equal bargaining power, the equilibrium bribe, B_F^e, is that which maximizes the following Nash product, i.e. the product of the firm's potential net payoff from corruption and that of the officials.

$$\begin{aligned} \max_{B_F} \quad & \{(F_{NB} + T_{NB}) - A\}\{(B_F - \phi_c L - \phi_s R) - 0\} \\ = \quad & \{F_{NB} + T_{NB} - B_F - F_B - T_B - (\phi_c + \phi_s)(F_{NB} + T_{NB})\}\{B_F - \phi_c L - \phi_s R\} \end{aligned} \tag{4}$$

The first order condition is

$$-2B_F^e + F_{NB} + T_{NB} - F_B - T_B - (\phi_c + \phi_s)(F_{NB} + T_{NB}) + \phi_c L + \phi_s R = 0,$$

so that the second order condition is satisfied and

$$B_F^e = \frac{\phi_c L + \phi_s R + (1 - \phi_c - \phi_s)(F_{NB} + T_{NB}) - F_B - T_B}{2}. \tag{5}$$

Note that B_F^e is exactly midway between $B_{F_{\min}}$ and $B_{F_{\max}}$. In a more general cooperation game, B_F^e is equal to

$$B_F^e = \gamma \left[\phi_c L + \phi_s R + (1 - \phi_c - \phi_s)(F_{NB} + T_{NB}) - F_B - T_B\right], \tag{6}$$

where γ captures the corrupt officials' bargaining power. In general, γ ranges from 0 to 1, and the higher the γ, the more bargaining power corrupt officials have. In extremes, the corrupt officials receive all the gain if $\gamma = 1$ and receive nothing if $\gamma = 0$. Clearly, the Nash bargaining equilibrium bribe increases as γ increases.

2.1.4 Anti-corruption policies

From equation (6), we can derive the effects of anti-corruption policies on the size of the equilibrium bribe as bargaining outcomes. These effects can be obtained by determining the comparative statics on the corresponding policy parameters.

$$\text{i. } \frac{\partial B_F^e}{\partial L} > 0, \text{ ii. } \frac{\partial B_F^e}{\partial R} > 0, \text{ iii. } \frac{\partial B_F^e}{\partial F_{NB}} = \frac{\partial B_F^e}{\partial T_{NB}} > 0, \text{ iv. } \frac{\partial B_F^e}{\partial F_B} = \frac{\partial B_F^e}{\partial T_B} < 0, \tag{7}$$

$$\text{v. } \frac{\partial B_F^e}{\partial \phi_c} = \gamma (L - F_{NB} - T_{NB}) \gtreqless 0, \text{ vi. } \frac{\partial B_F^e}{\partial \phi_s} = \gamma (R - F_{NB} - T_{NB}) \gtreqless 0. \tag{8}$$

The first four results (i)-(iv) are very intuitive. *Ceteris paribus*, the equilibrium bribe B_F^e increases: (1) as the penalty (either "external" L or "internal" R) increases so that corrupt officials demand a higher bribe, or (2) as the default cost F_{NB} and time T_{NB} of obtaining a permit/license legally increases while the illegal settlement cost F_B and time T_B decreases so that a firm is willing to pay a higher bribe. Therefore, anti-corruption policies aimed at increasing punishments and reducing potential gains from corruption reduce the range

of profitable bribes, and hence the likelihood for corruption to occur. However, if these policies do not impede corruption completely, then the negotiated bribe accepted by firms and corrupt officials actually increases with the higher expected mutual gain from bribery.

The last two results (v) and (vi) are ambiguous. Hence, a higher probability of detection ϕ_c and a higher probability of self-dissolution ϕ_s have an ambiguous effect on the equilibrium bribe B_F^e, although both of them reduce the range of potential bribes and make bribery less likely to occur. The equilibrium bribe B_F^e decreases in ϕ_c if $L < F_{NB} + T_{NB}$, increases in ϕ_c if $L > F_{NB} + T_{NB}$, and remains unchanged if $L = F_{NB} + T_{NB}$. The intuition behind this ambiguity is that the minimum bribe required by corrupt officials increases by L while the maximum bribe that a firm is willing to pay decreases by $F_{NB} + T_{NB}$ as the probability of detection ϕ_c increases. Thus, the negotiated bribe at equilibrium B_F^e depends upon the relative magnitudes of L and $F_{NB} + T_{NB}$. If the increase in $B_{F_{\min}}$ is smaller than the decrease in $B_{F_{\max}}$, B_F^e decreases. B_F^e increases if $B_{F_{\min}}$ increases more than the decrease in $B_{F_{\max}}$. Finally, B_F^e remains unchanged if the changes of $B_{F_{\min}}$ and $B_{F_{\max}}$ offset each other. Similar logic applies to the impact of ϕ_s, except replacing R for L.

So far, we have referred to an anti-corruption policy as one that reduces the range of possible bribes, i.e. the length of the interval $I = [B_{F_{\min}},\ B_{F_{\max}}]$, so as to make bribery less feasible. However, the above analysis shows that such an anti-corruption policy may not decrease and may indeed increase the final bribe B_F^e paid at equilibrium. In the real world, the effectiveness of an anti-corruption policy cannot be solely evaluated by its impact on either the size of the equilibrium bribe or the likelihood of bribery alone. It is necessary to consider both. Hence, it requires that we know the effect of the specific anti-corruption policy on the exact number of corrupt coalitions that take place in each period N.

This distinction among the occurrence of corruption N, the size of the bribe at each incidence B_F^e, and the total expenditure on corruption has been largely overlooked in the existing literature on evaluating the effectiveness of anti-corruption policies. Ideally, we should define

an anti-corruption policy as one that reduces the total expenditure on corruption (bribery), TEC, defined as $TEC = \sum_{i=1}^{N} (B_F^e)_i$.[7]

However, our analysis cannot determine the exact number of occurrences, N, took place before and after a policy change, although N is negatively related to the well-defined change in the length of interval I. Therefore, without further complicating the analysis of the impact of anti-corruption policies on FDI, we hereafter simply consider an anti-corruption policy as a change in parameter(s) that makes bribery less feasible, or more specifically, reduces the difference of $B_{F_{\max}} - B_{F_{\min}}$ even though it may increase the bribe paid at each incidence. Such policies include a higher probability of detection ϕ_c, a higher probability of self-dissolving ϕ_s, a higher punishment either "external" L or "internal" R, a higher cost F_B and opportunity cost of time T_B for each firm to engage in corruption, and a lower default cost F_{NB} and time T_{NB} of obtaining a permit/license legally.

2.2 Bribes paid to reduce per unit tax

Since no tax law is perfect, especially in countries undergoing institutional changes such as those moving from a central planned system toward a comprehensive tax-based system, another incentive for a firm to bribe corrupt officials is to obtain a more favorable tax treatment. One way to accomplish this is to reduce a firm's marginal tax rate (unit production tax). As the total amount of such tax saving is higher as more units are sold, the corrupt officials will demand a per unit bribe B_τ in each period of operation to receive a fixed share of this potential tax saving.

Suppose ϕ_c and ϕ_s are the same as above and each firm has to pay a default (standard non-corrupted) per unit tax τ_d. If the corrupt "coalition" is caught, the corrupt officials face

[7]Note that although we use this TCB as a measure of total corruption, it does not include all the other various types of corruption activities that exist and are studied in Sosa (2002).

a per unit loss of L_τ while, as before, we assume that the firm is not directly penalized, but has to pay the legal tax thereafter. If the corrupt "coalition" self-dissolves, the corrupt officials face a per unit loss of R_τ while the firm again has to pay the legal tax.

If the representative firm's equilibrium production is x and if corruption is successful, total gains from the corrupt preferential tax treatment equal to $(\tau_d - \tau - B_\tau)\, x$, where τ is the actual per unit tax paid after paying the per unit bribe B_τ. The minimum per unit bribe $B_{\tau_{\min}}$ required by corrupt officials to engage in a "coalition" is the expected value of the loss that they will face if such a "coalition" is apprehended or self-dissolves, that is, $B_{\tau_{\min}} = \phi_c L_\tau + \phi_s R_\tau$. Also, the maximum bribe a firm is willing to pay is $B_{\tau_{\max}} = (1 - \phi_c - \phi_s)\,(\tau_d - \tau)$.

As in the previous subsection, the Nash bargaining equilibrium bribe B_τ^e is determined by the following maximization problem:

$$\begin{aligned} \max_{B_\tau} \quad & \left\{\tau_d x - \left[(1 - \phi_c - \phi_s)\,\tau + (\phi_c + \phi_s)\,\tau_d + B_\tau\right] x\right\} \left\{\left(B_\tau - \phi_c L_\tau - \phi_s R_\tau\right) x - 0\right\} \\ = \quad & x^2 \left\{(1 - \phi_c - \phi_s)\,(\tau_d - \tau) - B_\tau\right\} \left\{B_\tau - \phi_c L - \phi_s R_\tau\right\}. \end{aligned} \tag{9}$$

The first order condition for maximization is

$$-2B_\tau^e + \phi_c L_\tau + \phi_s R_\tau + (1 - \phi_c - \phi_s)\,(\tau_d - \tau) = 0$$

so that the second order condition is satisfied and the equilibrium bribe is

$$B_\tau^e = \frac{\phi_c L_\tau + \phi_s R_\tau + (1 - \phi_c - \phi_s)\,(\tau_d - \tau)}{2}. \tag{10}$$

As before, B_τ^e is exactly midway between $B_{\tau_{\min}}$ and $B_{\tau_{\max}}$. Also, in a more general cooperation game, B_τ^e is equal to

$$B_\tau^e = \gamma\left[\phi_c L_\tau + \phi_s R_\tau + (1 - \phi_c - \phi_s)\,(\tau_d - \tau)\right]. \tag{11}$$

Again, the Nash bargaining equilibrium bribe increases as the bargaining power of corrupt officials γ increases. Also, the equilibrium bribe B_τ^e increases as penalty L_τ or R_τ and per

unit tax savings $\tau_d - \tau$ increase. Once again, the impact of increasing the external risk of detection ϕ_c and the internal risk of self termination ϕ_s on the equilibrium per unit bribe B_τ^e depends on $L_\tau - (\tau_d - \tau)$ and $R_\tau - (\tau_d - \tau)$, respectively. That is, B_τ^e decreases in ϕ_c if $L_\tau < \tau_d - \tau$, in ϕ_s if $R_\tau < \tau_d - \tau$, and increases in ϕ_c or ϕ_s if otherwise. The intuition behind these results is exactly the same as those discussed in the previous subsection. Again, a rise in ϕ_c or ϕ_s always decreases $B_{\tau_{\max}} - B_{\tau_{\min}}$ and hence represents an anti-corruption policy as for the case to reduce fixed cost.

Applying the same definition as discussed in the previous section, an anti-corruption policy also includes a higher per unit penalty L_τ if caught or R_τ if self-dissolved, a higher per unit tax when corruption is successful τ, and a lower default per unit tax τ_d in addition to those discussed in the previous subsection. Again, these anti-corruption policies are aimed at reducing the occurrence of corruption, but can actually increase the bribe paid at equilibrium if bribery still exists.[8] In the next section, we will analyze the impact of these alternative anti-corruption policies on FDI, which indeed depends on whether such a policy increases or decreases the equilibrium bribe paid after negotiation.

3 Foreign direct investment

To determine the effects of corruption on a foreign firm's choice between direct exports and FDI, we assume that the whole economy is constituted by a Bertrand monopolistic competition model. Before deriving the equilibrium prices and profits in this market with differentiated products, we first discuss several ways in which foreign and domestic firms can differ in their ability to deal with corrupt officials. First, foreign firms are disadvantaged

[8]The total amount of bribes will depend on the "elasticity of demand" for corruption, which is not explicitly model here as it does not affect the main results in this paper.

relative to domestic firms in the process of knowing the right networks to facilitate corruption. Therefore, the internal risk ϕ_s^* for a foreign firm is higher than that for a local firm ϕ_s.

Second, there are start-up cost advantages or tax holidays offered to multinational firms to encourage FDI inflow in some developing countries. Consequently, a foreign firm's non-corrupt start-up cost F_{NB}^* can be lower than that of a local firm F_{NB}. Also, the legal tax rate τ_d^* for a foreign firm can be lower than that for a local firm, τ_d. These can also lead to different fees, F_B^* verse F_B, different time spent in bribing officials, T_B^* verse T_B, and tax rates, τ^* verse τ, when corruption is successful. Also, the time spent in obtaining a permit legally can also differ for a foreign firm than for a local firm so that T_{NB}^* can be bigger than T_{NB}.

Third, corrupt officials can have less bargaining power over foreign firms than over local firms. This is either because foreign firms are more mobile in choosing their locations, or because they can use laws in their own countries as a binding constraint of the bribe they can offer.[9] Hence, γ^* reflecting the bargaining power of corrupt officials when they deal with a foreign firm is smaller than γ reflecting the corrupt officials' bargaining power when they negotiate with a domestic firm.

Finally, anti-corruption agencies may be aware that foreign firms are, in general, more willing to participate in bribery abroad to expedite their settlement process and minimize their oversea tax burden.[10] As a result, the anti-corruption agencies may choose to audit these foreign firms more often than their local competitors so that $\phi_c^* > \phi_c$. In sum, all the values of the Nash equilibrium bargaining game can be different for foreign and domestic firms for each of the two types of corruption included. In the next subsection, we analyze the domestic market equilibrium under Bertrand competition before a foreign firm enters.

[9] As the aforementioned US Foreign Corrupt Practices Act of 1977.

[10] Again, this may not be the case for US investors because of the Foreign Corrupt Practices Act (1977).

3.1 Market equilibrium with all domestic firms

If the fixed cost of producing each variety, including both a sunk cost to obtain a permit and/or bribes paid to receive a possible concession, is greater than zero, then it does not pay a firm to produce a variety of good that is identical to those of the existing firms. Hence, each firm produces a different variety i and charges a different price p_i, for varieties i from 1 to n. Because of the existence of corruption in the process of a firm settlement, we assume that entry is not free so that the number of firms, n, is exogenously determined.

Assume that the representative domestic consumer has the Dixit-Stiglitz utility function over differentiated varieties 1 to n.

$$U = \left[\sum_{i=1}^{n} x_i^{\alpha}\right]^{1/\alpha}, \quad 0 < \alpha < 1, \tag{12}$$

where x_i represents the consumption of units of variety i, and the elasticity of substitution between varieties is $\varepsilon = \frac{1}{1-\alpha} > 1$.

If each firm is small relative to the market, then the aggregate price stays the same as the price of one particular variety changes. Under this standard assumption of monopolistic competition, the equilibrium demand x for the jth representative firm that produces variety j is derived from the representative consumer's maximization problem, $\max_{x_1,\ldots,x_n} U = [\sum_{i=1}^{n} x_i^{\alpha}]^{1/\alpha}$ subject to the budget constraint, $\sum_{i=1}^{n} p_i x_i = Y$, where Y is a representative consumer's income. This equilibrium demand for variety j is

$$x_j = \frac{Y p_j^{-\varepsilon}}{\sum_{i=1}^{n} p_i^{1-\varepsilon}}. \tag{13}$$

Given this demand x_j, firm j chooses p_j to maximize its profits

$$\pi_j = (p_j - AVC_j)\, x_j - S, \tag{14}$$

where AVC_j is firm j's average variable cost of production including a constant average operation cost c_j, bribes, and taxes; and S is the fixed/sunk cost including both setup costs

and bribes paid to reduce the setup cost. We assumed that these costs are identical for all domestic firms. Taking the aggregate price level $P \doteq \sum_{i=1}^{n} p_i^{1-\varepsilon}$ as given, the equilibrium price and profits of a local firm j is:

$$p_j = \frac{AVC_j}{\alpha}, \tag{15}$$

$$\pi_j = (1-\alpha)p_j x_j - S. \tag{16}$$

Firm j's average variable cost is $AVC_j = c_j + \tau + B_\tau^e$ if corruption is successful, $AVC_j = c_j + \tau_d + B_\tau^e$ if corruption fails, or $AVC_j = c_j + \tau_d$ if firm j does not engage in corruption at all. The following analysis will focus on the more interesting case where bribery is mutually beneficial to both firms and corrupt officials so that the firm does engage in corruption, and the equilibrium bribes are given by equations (6) and (11).

Let $E[p_j]$ be the expected price charged by firm j, and $E[P] \doteq E\left[\sum_{i=1}^{n} p_i^{1-\varepsilon}\right]$ be the expected aggregate price level. Also, let $E[x_j]$ be the expected production derived from equation (13). In addition, we use $E[S]$ to denote the expected settlement costs and $E[\pi_j]$ to denote the expected profit when corruption occurs. Hence,

$$E[p_j] = \frac{1}{\alpha}\left(c_j + (1-\phi_c-\phi_s)\tau + (\phi_c+\phi_s)\tau_d + B_\tau^e\right), \tag{17}$$

$$E[S] = B_F^e + F_B + T_B + (\phi_c+\phi_s)(F_{NB}+T_{NB}), \tag{18}$$

$$E[x_j] = Y \cdot E\left[\frac{p_j^{-\varepsilon}}{P}\right], \tag{19}$$

$$E[\pi_j] = (1-\alpha)YE\left[\frac{p_j^{1-\varepsilon}}{P}\right] - E[S] = (1-\alpha)YE\left[\frac{1}{\sum_{i=1}^{n}\left(\frac{p_i}{p_j}\right)^{1-\varepsilon}}\right] - E[S]. \tag{20}$$

Since monopolistic competitive firms always operate on the elastic part of their demand curves ($\varepsilon > 1$), a firm's expected profit decreases when its price p_j increases. Also, a firm's expected profit decreases when the aggregate price level P increases, i.e. the prices of other competing varieties fall. These results are derived directly from equation (20).

3.2 Market equilibrium with a foreign firm

We now analyze the market equilibrium after a foreign variety enters the market. The number of varieties now increases from n to $n+1$. Label the foreign firm's variety as the $(n+1)th$ variety and let its output/demand be x_{n+1}. After adjusting for this index increase in the aggregate price level P, the demand/output for domestic variety x_j, its price p_j, and the profits of domestic firm j are still determined by equations (13), (15), and (16), respectively, except that the total number of varieties is now $n+1$. For the foreign variety, the $(n+1)th$ variety, the equations that determine its output/demand, price and profits are also the same except for the index and the values of the parameters related to taxes and corruption.

In particular, the price is

$$p_{n+1} = \frac{AVC^{fdi}}{\alpha}, \tag{21}$$

where $AVC^{fdi} = c^* + \tau^* + B_\tau^{e*}$ if corruption is successful, $AVC^{fdi} = c^* + \tau_d^* + B_\tau^{e*}$ if corruption fails, and $AVC^{fdi} = c^* + \tau_d^*$ if the foreign firm does not participate in corruption. Here, we also assumed that the marginal cost of a foreign firm c^* can be different from that of a local firm c, for example, if a foreign firm has to pay a higher wage to attract local workers to work in a less familiar environment. Also, B_τ^{e*} denotes the Nash bargaining equilibrium bribe paid by the foreign firm to reduce the per unit tax from τ_d^* to τ_d, while B_F^{e*} denotes the bribe to get a reduction of fixed cost from F_{NB}^* to F_B^*.

Substituting ϕ_c^* for ϕ_c, ϕ_s^* for ϕ_s, F_B^* for F_B, F_{NB}^* for F_{NB}, τ^* for τ, and τ_d^* for τ_d in equations (6), (11) (17), and (18) gives the Nash bargaining equilibrium bribes for the foreign firm, its expected price $E[p_{n+1}]$, and its expected sunk/fixed cost $E[S^*]$. Finally, if a foreign firm participates in corruption, then its expected profits $E[\pi^*]$ is obtained by substituting p_{n+1} into equation (20). Therefore, we have

$$E[\pi^*] = (1-\alpha)Y \cdot E\left[\frac{p_{n+1}^{1-\varepsilon}}{P}\right] - E[S^*], \tag{22}$$

where

$$E\left[p_{n+1}\right] = \frac{1}{\alpha}\left(c^* + \left(1 - \phi_c^* - \phi_s^*\right)\tau^* + \left(\phi_c^* + \phi_s^*\right)\tau_d^* + B_\tau^{e*}\right), \tag{23}$$

and

$$E\left[S^*\right] = B_F^{e*} + F_B^* + T_B^* + \left(\phi_c^* + \phi_s^*\right)\left(F_{NB}^* + T_{NB}^*\right). \tag{24}$$

3.3 The impact of corruption on FDI

Now, we discuss the impact of anti-corruption policies defined in Section 2.1.4 on a foreign firm's choice between FDI and an alternative investment with a known expected return. In this section, we focus on the case where corruption occurs both before and after a policy change. Hence, the default sunk cost and the default average variable cost without corruption are always higher than the expected sunk cost and the expected average variable cost under corruption. This is a more realistic case as most policies do not stop corruption completely.

As discussed in Section 2, a foreign firm chooses FDI if $E\left[\pi^*\right]$ is greater than the known expected return from an alternative investment. Since $E\left[\pi^*\right]$ are affected by corruption, an anti-corruption policy discourages FDI if such a policy reduces $E\left[\pi^*\right]$.

3.3.1 Effects of anti-corruption policies targeting a foreign firm

There are two ways that an anti-corruption policy can affect the expected profit of FDI: one through changing the fixed cost and the other through changing the price. Using expression (6) to substitute out B_F^{*e} in equation (24), $E\left[S^*\right]$ becomes

$$E\left[S^*\right] = \gamma^*\left[\phi_c^* L + \phi_s^* R\right] + \left(\gamma^* + \left(1 - \gamma^*\right)\left(\phi_c^* + \phi_s^*\right)\right)\left(F_{NB}^* + T_{NB}^*\right) + \left(1 - \gamma^*\right)\left(F_B^* + T_B^*\right) \tag{25}$$

Hence, a fall in the default sunk cost for a foreign firm to open a plant F_{NB}^* and time T_{NB}^*, decreases the size of the equilibrium bribe and the expected sunk cost. On the other hand,

a rise in the sunk cost, F_B^*, and time, T_B^*, when corruption is successful also decreases the equilibrium bribe but increases the expected sunk cost. A rise in penalty L if caught and R if self dissolved increases the equilibrium bribe as well as the expected sunk cost. Since these policies do not affect the expected relative price charged by the foreign firm and local firms, we have the following proposition.

Proposition 1 *Anti-corruption policies targeted at decreasing a foreign firm's legal fixed cost and time will indeed encourage FDI by increasing its expected profit. But, anti-corruption policies targeted at increasing a foreign firm's fixed cost and time if corruption is successful or increasing either external or internal penalties to officials will actually discourage FDI by reducing its expected profit.*

Similar to the above case, there are anti-corruption policies that will only affect the expected relative price of FDI but not its expected suck cost. Substituting expression (11) into equation (23) gives

$$\begin{aligned} E\left[p_{n+1}\right] &= \frac{1}{\alpha}\left[c^* + \left(1-\gamma^*\right)\left(1-\phi_c^*-\phi_s^*\right)\tau^* + \left(\gamma^* + \left(1-\gamma^*\right)\left(\phi_c^*+\phi_s^*\right)\right)\tau_d^*\right. \\ &\quad \left. +\gamma^*\left(\phi_c^* L_\tau + \phi_s^* R_\tau\right)\right]. \end{aligned} \tag{26}$$

From the above equation, a fall in the per unit tax without corruption, τ_d^*, decreases the equilibrium per unit bribe and the expected price. Again, we assume that a change in p_{n+1} alone does not affect the aggregate price level P and hence $E\left[P\right]$ changes only if all prices are affected. Thus, considering a change in the expected profit of FDI due to a change in τ_d^*, we can rewrite equation (22) as

$$E\left[\pi^*\right] = (1-\alpha)Y\frac{E\left[p_{n+1}^{1-\varepsilon}\right]}{E\left[P\right]} - E\left[S^*\right]. \tag{27}$$

Applying the Delta Method, the first order approximation to $E\left[p_{n+1}^{1-\varepsilon}\right]$ is just $\left(E\left[p_{n+1}\right]\right)^{1-\varepsilon}$. Hence, the expected profit increases because $E\left[p_{n+1}\right]$ falls and $\varepsilon > 1$.[11]

[11]This result and the later results in this paper hold even if we use a second order approximation by calculating the corresponding variance and second order derivatives. The derivation here does not include

Similarly, a rise in per unit tax τ^* once corruption is successful also decreases the equilibrium per unit bribe, but increases the expected price of FDI by increasing its per unit cost. Moreover, a rise in the per unit penalty, L_τ if corruption is apprehended or R_τ if coalition self dissolves, increases the equilibrium per unit bribe as well as the price of FDI and the aggregate price level P regardless of whether corruption is successful or not. Since $\phi_c^* > \phi_c$ and $\phi_s^* > \phi_s$, the expected impact on p_{n+1} is going to dominate that on P so that the expect profit of FDI falls. Thus,

Proposition 2 *Anti-corruption policies targeted at reducing a foreign firm's legal per unit tax will indeed encourage FDI by reducing its average variable cost and increasing its expected profit. However, anti-corruption policies targeted at increasing a foreign firm's per unit tax if corruption is successful or the per unit external or internal penalties to officials will actually discourage FDI by increasing its average variable cost and reducing its expected profit.*

We now consider the case of a rise in either internal risk or external risk of corruption where both the expected suck cost and the expected price of FDI are affected. First, a rise in the internal risk of corruption, ϕ_s^*, increases the expected sunk cost as $\partial E[S^*]/\partial\phi_s^* = \gamma^* R + (1-\gamma^*)(F_{NB}^* + T_{NB}^*) > 0$. A rise in ϕ_s^* also increases the equilibrium price $E[p_{n+1}]$ as $\partial E[p_{n+1}]/\partial\phi_s^* = (1-\gamma^*)(\tau_d^* - \tau^*) + \gamma^* R_\tau$. Both of these effects decrease the expected profit and thus discourage foreign direct investment although the size of the bribe paid at equilibrium may either rise or fall as discussed in Section 2.1.3.

Second, we consider the impact of an external risk, a rise in the probability of being apprehended ϕ_c^*. Although this impact on the size of the equilibrium bribe is also ambiguous as discussed in Section 2.1.3, it unambiguously decreases the expected profit, $E[\pi^*]$. This is because the expected sunk cost increases as $\partial E[S^*]/\partial\phi_c^* = \gamma^* L + (1-\gamma^*)(F_{NB}^* + T_{NB}^*) > 0$ and the expected price also increases as $\partial E[p_{n+1}]/\partial\phi_c^* = (1-\gamma^*)(\tau_d^* - \tau^*) + \gamma^* L_\tau > 0$.

these more accurate calculations as they are tedious and do not contribute much to the underlying intuition.

Thus, a higher ϕ_c^* also discourages FDI if it does not stop a foreign firm's incentive to engaging in corruption.

Proposition 3 *Anti-corruption policies targeted at increasing either the external risk of being caught or the internal risk of self dissolving when officials take bribes from a foreign firm will actually discourage FDI by increasing its average variable cost and reducing its expected profit.*

Finally, we analyze the impact of bargaining power between foreign firms and corrupt officials γ^*. A higher bargaining power of the officials increases the expected sunk cost as $\partial E\left[S^*\right]/\partial\gamma^* = \phi_c^* L + \phi_s^* R + \left(1-\phi_c^*-\phi_s^*\right)\left(F_{NB}^* + T_{NB}^*\right) - F_B^* - T_B^* > 0$. The expected price also rises as $\partial E\left[p_{n+1}\right]/\partial\gamma^* = \left(1-\phi_c^*-\phi_s^*\right)\left(\tau_d^*-\tau^*\right) + \phi_c^* L_\tau + \phi_s^* R_\tau > 0$. Thus, not surprisingly, a rise in bargaining power of corrupt officials discourages FDI.

3.3.2 Effects of anti-corruption policies targeting local firms only

We now turn to consider the impact of anti-corruption policies targeting to reduce the occurrence of corruption of local firms rather than foreign firms. Since corruption involving local firms is far more common than corruption involving foreign firms, these impacts can dominate those discussed above if the effort to curtail corruption is indiscriminate. Except for the anti-corruption policies that increase the penalties, L_τ and R_τ, discussed in the previous section, all the other anti-corruption policies affecting only the local firms do not change p_{n+1} and $E\left[p_{n+1}\right]$. Thus, we can again rewrite the expected profit of FDI as equation (27). Now, using the first order approximation of $E\left[P\right]$, we have

$$\begin{aligned} E\left[P\right] &\approx \sum_{i=1}^{n}\left(E\left[p_i\right]\right)^{1-\varepsilon} = n\left(E\left[p\right]\right)^{1-\varepsilon} \quad (\text{if} \quad c_i = c \quad \text{so that} \quad p_i = p) \\ &= n\alpha^{\varepsilon-1}\left[c + \left(1-\gamma\right)\left(1-\phi_c-\phi_s\right)\tau + \left(\gamma + \left(1-\gamma\right)\left(\phi_c+\phi_s\right)\right)\tau_d\right. \\ &\quad \left. +\gamma\left(\phi_c L_\tau + \phi_s R_\tau\right)\right]^{1-\varepsilon}. \end{aligned} \tag{28}$$

By similar logic, all the relative price impacts in the previous section are reversed if the same anti-corruption policy is applied to local firms rather than foreign firms. A decrease in a local firm's legal tax τ_d increases the expected aggregate price level and hence decreases the expected profit of FDI. These are reversed if a local firm's tax τ after successful corruption increases. So do increases in external risk ϕ_c and internal risk ϕ_s as well as a higher bargaining power to corrupt officials. On the other hand, those policies that only affect the sunk costs of local firms, such as the legal cost and time to obtain a permit, F_{NB} and T_{NB}, and the illegal cost and time to obtain a permit if corruption is successful, F_B and T_B, will have no effect on the expected relative price of a foreign variety versus a local variety and hence on FDI. Increases in external and external penalties, L and R, affect the sunk cost of both local and foreign firms, but only the latter affects FDI as discussed in the previous section.

Proposition 4 *Anti-corruption policies targeted at increasing a local firm's per unit tax if corruption is successful or at increasing either the external risk of being caught or the internal risk of self dissolving when officials take bribes from a local firm will indeed encourage FDI by increasing its local competitors' average variable cost and hence increasing the expected profit of FDI. However, anti-corruption policies targeted at reducing a local firm's legal per unit tax will do just the opposite and discourage FDI. Anti-corruption policies targeted at increasing a local firm's fixed cost and time if corruption is successful or at decreasing its legal fixed cost and time will all have no effect on FDI as they only affect a local firm's sunk/fixed cost.*

4 Policy implications

The above analysis shows that corruption in a host country distorts a foreign firm's decision of becoming multinational by affecting not only its own cost but also its local competitors' cost; both affect the foreign firm's competitiveness in the local market and hence its expected profit of FDI. Different anti-corruption policies can affect the foreign and local firms inconsistently

and hence have different effects on their relative cost and price and finally the volume of FDI. By defining an anti-corruption policy as one that reduces the occurrence of corruption, our analysis has the following policy implications.

First, the impact of an anti-corruption policy targeting foreign firms alone does not depend on whether it changes the lump-sum tax or the per unit tax structure. All anti-corruption policies targeted at reducing a foreign firm's legal fees or taxes encourage FDI, while those targeted at increasing either external or internal penalties of officials receiving bribes from a foreign firm or reducing the fee or tax concessions that the officials can offer to a foreign firm all discourage FDI.

Second, in cases where fees and taxes differ between local and foreign firms, anti-corruption policies can affect local and foreign firms in an inconsistent manor. For anti-corruption policies that affect the cost of both local firms and foreign firms but with opposite effects on FDI, the net impact on a foreign firm's competitiveness and hence the volume of FDI is likely to be the dominant effect due to changes in local firms' cost as foreign firms are usually out numbered by local firms. Thus, an anti-corruption policy that reduces a firm's per unit legal tax discourages FDI. On the other hand, policies that reduce per unit tax concession from corruption, or increase the external or internal risk, i.e. the probability of being caught or self dissolved, all encourage FDI.

Third, the impact of the other anti-corruption policies to curtail both foreign and local corruption is more straight forward. An increase in officials' lump-sum or per unit external penalty if caught or internal penalty in case of a voluntarily exit, or an decrease in legal fees and time of obtaining a permit or the illegal fees and time concession in getting a permit by corruption, all hurt a foreign firm's competitiveness and hence discourage FDI.

Finally, these anti-corruption policies can actually increase the bribe paid at equilibrium as long as corruption exits. The total amount of bribes paid can either increase or decrease

depending on the "elasticity of corruption" demand and supply which are not explicitly model in this paper. However, the size of the equilibrium bribe and the total amount of bribe paid do not affect whether an anti-corruption policy encourages or discourages FDI, but may affect the size of this impact.

In sum, our results suggest that anti-corruption policies that prevent foreign firms from participating in corruption may discourage FDI by reducing the expected profits of a firm that undertakes FDI. On the other hand, anti-corruption policies that prevent domestic firms from participating in corruption may encourage FDI. These apparently contradictory results also imply that the biggest hurdle that corruption imposes on FDI may not be the absolute degree of corruption by itself, but rather be the disadvantages that foreign firms have when participating in corruption compared with their local competitors. It is important to note that the effects of the advantages and disadvantages of firms dealing with corruption has not been considered by most of the current empirical studies on corruption and FDI. Hence, it is possible that FDI increases although a country's level of corruption also increases, for example China's case during the late 1990s.

5 Concluding remarks (preliminary)

In this paper, we utilized a static reduced form of a Nash dynamic bargaining model between a firm and a collective of corrupt officials to study the influence of bribery on a firm's decision to invest abroad. The study includes two types of bribery; first, those resulting in foreign and domestic firms paying lower settlement costs than those established by law, and second, bribery resulting in illegal preferential tax treatment that generates net tax savings. We find that these two types of bribery, by affecting profits, influence a firm's decision of whether to invest abroad as opposed to alternative investment opportunities with a given expected return. Further, we demonstrate the following.

Changes in the equilibrium bribe are not sufficient to judge anti-corruption policies. The evaluation of any anti-corruption policy requires a precise definition of total corruption **...**

Under some circumstances, anti-corruption policies are totally effective... However, ambiguous results about the effectiveness of anti-corruption policies may occur when**...**

We conclude that the influence of corruption on FDI and trade**....** Again, these results suggest that anti-corruption policies oriented toward increasing**....** may not be effective at all, and therefore FDI**...**

In addition to the conclusions about the influence of corruption on FDI and trade, we provide additional interesting considerations for the design of anti-corruption policies. These considerations are derived from the relationships among . A higher MMMM do not necessarily prevent corruption. Again, these results suggest that anti-corruption policies oriented toward increasing NNNNN may not be effective at all. Furthermore, our work proves the commonsense intuition that making participation in corruption more costly is an effective anti-corruption tool

Moreover, ...

Finally,....

Further research...

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