

# Inequality and Corruption in the Presence of Market Imperfections\*

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## ABSTRACT

In this paper, we investigate how inequality affects corruption and provide a new insight to the possible channels through which such effect may work. We favour an explanation based on a multi-market framework where corruption in one market (or sector) arises because of imperfections exacerbated by inequality in related markets. We show that, even when an individual's ability to pay bribes and benefit from engaging in corruption are not affected by wealth, greater (wealth) inequality will lead to an increase in corruption. The multi-market orientation of our model can lead to a somewhat different focus so far as policy implications are concerned.

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# 1 Introduction

Corruption has received a lot of attention from various quarters, especially in the context of developing economies which are typically characterized by government controls and market imperfections in varying degrees. In non-market settings such as provisioning of goods and services through public officials or issuing of licenses and permits for economic activities, corruption can adversely impact the poorer section of the society (Narayan et al. 2000).<sup>1</sup> Given the important role that both corruption and distributional issues play in the development process,<sup>2</sup> it becomes imperative to investigate the interlinkages between corruption and distribution, how they effect each other, the channels through which those effects work and the magnitudes of those effects.

The object of this paper is to focus on one aspect of the link between corruption and distribution. In particular, we investigate how inequality effects corruption and provide a new insight to the possible channels through which such effects may work. The focus on the link from inequality to corruption brings to light yet another dimension through which inequality may play a crucial role in economic growth and development. Any informed policies towards lowering corruption must therefore take in to account distributional issues. The importance of inequality in understanding corruption is not new.<sup>3</sup> What is novel here, however, is the channel through which inequality may effect corruption. We eschew the explanation based on a direct role of inequality, where inequality engenders corruption by providing better opportunities for some, in favour of an explanation where corruption

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<sup>1</sup>Gupta et al. (2002), and Li et al. (2000), have shown that corruption does have substantial effects on the level and distribution of income.

<sup>2</sup>The World Bank (2005) puts corruption as the ‘single biggest obstacle to economic and social development’.

<sup>3</sup>In a theoretical context, Banerjee (1997) explores how inequality affects the level of equilibrium red tape. In a recent study, You and Khagram (2005) using a sample of 125 countries and controlling for factors such as democracy, legal origins and endogeneity issues finds strong causal links from inequality to corruption.

in one market (or sector) arises because of imperfections exacerbated by inequality in related markets.

The existing literature based on the direct role of inequality in corruption relies on the phenomena of ‘state capture’ by powerful groups, according to which, in a highly unequal society the rich will engage in corruption (or some other form of subversion of institutions) to maintain their privileged positions (Hellman et al. 2000; Glaeser et al. 2003; Do 2004). From here one may conclude that greater the inequality, higher the level of corruption needed to maintain it. However, in any explanation using ‘state capture’ it is not clear why corruption should be the only type of subversive activity that the rich may undertake.<sup>4</sup> In addition, this explanation is more about the ‘inequality of influence’ rather than wealth inequality per se, as pointed out by Hellman and Kaufman (2002) and demonstrated in Slinko et al. (2005).

We aim to provide an alternative plausible explanation where the causal link from inequality to corruption is unambiguously established. We depart from the existing literature in assuming that there are no differences between agents (differing in wealth) in terms of their benefits from corruption and in terms of their ability to pay bribes. If the poor benefits as much as the rich from corruption, and are also able to pay the required amount of bribes, it can be deduced that the level of corruption will be independent of the existing levels of wealth. Hence it is no longer obvious how inequality may effect corruption. In this context, we seek out a different route based on a multi-market framework, which so far has not been examined fully in the literature.<sup>5</sup> This is not to deny that other approaches in explaining the causality from inequality to corruption are feasible. Instead we feel the

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<sup>4</sup>For example, in modelling regulatory capture, Hoff and Stiglitz (2005) use a voting framework instead of corruption, to discuss why countries may fail to reform their legal institutions.

<sup>5</sup>Ghatak et al. (2005) have used a multi market framework with wealth inequality to analyse issues in the labour market.

multi-market framework may be of interest since corruption, till now, has mainly been studied in the context of problems in that particular market, be it informational asymmetries or incentive structure.<sup>6</sup> While there may be merit in the earlier approach, we feel that a multi-market perspective will bring fresh insights to the causes behind corruption.

We are able to show that it is possible for corruption to emerge in one market (where firms produce output and pay taxes), due to the effects of wealth inequality in a related imperfect market (where firms borrow resources to produce output). In particular, wealth inequality may create a situation where inefficient firms are able to survive in a market through corruption, although just being corrupt may not be sufficient for their existence. Further, within this multimarket framework we find that a rise in inequality can lead to an increase in corruption by effecting the entry and exit decisions of inefficient and efficient firms respectively.

The plan of the paper is as follows. In the next section we describe the characteristics of different agents and how they interact strategically in our model. Section 3 contains the results and analysis under different scenarios where we consider the case of no market imperfection as a benchmark case. We explore the link between corruption in the product market and imperfections in the credit market. We argue that they reinforce each other and it may not be sufficient to just study one market alone in this context. We discuss its implications for the relation between corruption and inequality. Lastly, section 4 concludes with a discussion of the policy implications and the limitations of our model.

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<sup>6</sup>See Bardhan (1997), Andvig and Fjeldstad (2001) and Mishra (2005) for recent surveys on corruption.

## 2 The Model

We introduce a model where households are classified in to two types: good (with high probability of success) and bad (with low probability of success).<sup>7</sup> All households must borrow a certain amount say,  $K$ , from a bank . Households staying out of the production sector do not need to borrow, and receive some fixed outside income. Firms also incur several non-input costs of running a legal business but firms can engage in bribery to avoid such costs. Inspectors are supposed to ensure compliance by the firms, but they can collude with the firm and avoid reporting. Similar to the literature on ‘state capture’, we view corruption as collusion between officials and agents, where both parties benefit.<sup>8</sup> This collusive feature of corruption is key to the present paper.

The focus is on two levels of interactions. One takes place in the credit market between the firm and the bank, and the other takes place in the product market between the firm and the inspector. A particular household’s expected payoff from undertaking production depends on its type and the outcome of these two interactions. The first interaction in the credit market determines the cost of capital and the second determines the effective non-input costs or payment.

In our framework, the inefficient firms (bad households) end up paying bribes for various illegal activities.<sup>9</sup> However this may not be sufficient to explain corruption, let alone the link from inequality to corruption, because

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<sup>7</sup>Our model can be interpreted as a model of occupational choice with corruption (see Acemoglu and Verdier 1998). The terms ‘households’ and ‘firms’ essentially refer to the same entities. Households in the production sector will be referred to as firms.

<sup>8</sup>As is well known, corruption takes various forms. Papers such as Shleifer and Vishny (1993), Bliss and di Tella (1997) and the recent firm level studies (Svensson 2003), focus on corruption as extortion, where agents pay bribes because of extortionary demand by the public officials and are not the real beneficiaries. In agency based models of corruption such as Besley and McLaren (1993), Mookherjee and Png (1995) both the briber and bribee benefit. There are also studies where both the features are present (Marjit et.al 2000, Guriev 2004). See Mishra (2005) for an analysis of the different forms of corruption.

<sup>9</sup>We also do explore other options where both efficient (good households) and inefficient firms (bad households) pay bribes.

if these firms are inefficient they may not be able to survive in a liberalized market economy. But as we will show, informational problems and wealth constraints in the credit market may contribute to these inefficient firms' existence. More specifically, we analyze how the credit market fails to screen out inefficient firms in the presence of wealth inequality and market imperfections. Since the inefficient type firms engage in corruption, it affects not just their payoffs but also the payoffs of the efficient firms and determines the overall market outcome. The inefficient firms tend to get subsidized in the credit market and benefit from corruption — thus making their operation viable and possibly profitable. Hence, corruption surfaces in the product market because of inequality and informational problems in the credit market.

We have three different agents who act in a strategic fashion: (a) households, (b) banks and (c) inspectors. We describe the characteristics of each agent below.

## 2.1 Inspectors

Inspectors are in charge of monitoring compliance by the firms. As we shall discuss later, firms have to incur various types of costs in running a legitimate business but they can choose to avoid these. These costs include various types of taxes, costs of meeting quality and other regulatory standards. A firm faces a fine,  $F$ , if its non-compliance is reported. However, inspectors are corruptible and can collude with the firm in exchange for a bribe. We assume the corruptible inspectors constitute a certain fraction  $q$  of the total population of inspectors.<sup>10</sup> Hence,  $q$  stands for the scope of corruption or corruptibility of the system.

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<sup>10</sup>We do not model the anti-corruption measures, hence  $q$  is taken as given. However, increase (or decrease) in  $q$  does not effect the main thrust of the results. It is possible to model inspector's decision to be corrupt and determine  $q$  endogenously, but we have avoided doing this to keep the analysis simple and tractable.

## 2.2 The Banks

The banks borrow funds from the public at a fixed interest factor  $r_0$ , and extend loans of fixed amount  $K$  to the firms. Project returns are stochastic. Let  $\mu_i$  be the probability of success in a project undertaken by type- $i$  household. Let  $r_i$  be the interest factor paid and  $w_i$  be the amount of collateral pledged. Various types of assets, which constitute household's wealth, can serve as collateral. We assume that the bank incurs a cost,  $\delta$ , associated with having a collateral. If the bank can observe the types of borrowers then for each type the bank chooses  $\{r_i, w_i\}$  such that the bank maximizes

$$\pi^i = \mu_i.r_i.K + (1 - \mu_i).\delta.w_i \geq \pi_0, \quad (1)$$

where  $\delta < 1$  shows the cost the banks face in keeping a collateral and  $\pi_0 = K.r_0$ . In case the bank cannot observe the different types of borrowers, but instead knows the distribution  $\theta_i$  of the different types of the borrowers, the bank maximizes

$$\pi = \sum \theta_i.\pi^i \geq \pi_0. \quad (2)$$

We assume there is perfect competition in the banking sector, so that the above condition is always satisfied with equality. We shall call it the zero-profit condition.

## 2.3 The Households

Households can either join the production sector (firms) or engage in some outside option. They differ in terms of the payoff from their outside option.

As mentioned earlier, when it comes to production, there are two different types of households, (i) households with good projects ( $g$ ) and (ii) households with bad projects ( $b$ ). The good projects have a higher probability of success, that is,  $\mu_g > \mu_b$ . Each project yields  $Y$  in the successful

state and zero in the failure state.<sup>11</sup>

Households also differ in terms of their initial wealth. We assume that some households have no wealth. Household's wealth is its private information. These wealth constrained households can have good or bad projects, but to simplify the analysis we assume that these wealth constrained households have only good projects and denote this group as  $p$ .<sup>12</sup> So effectively we have three groups, the rich households with good projects ( $g$ ), the poor households with good projects ( $p$ ) and the rich households with the bad projects ( $b$ ).

In addition to the standard input costs, households (firms) engaged in production have to incur various costs in running a legitimate business. Some of these would depend on their output or profit and some are fixed in nature. In many developing economies, these would take the form of costs of compliance with various regulatory standards, quality control, safety and labour laws. We assume that firms can avoid these costs. For example, firms can choose to disregard pollution control, use substandard inputs, substitute adult labour with child labour. In addition to all these, firms can of course hide output and sales to save on various sales taxes and profit tax. In economies with high levels of compliance, firms do not have so much of a choice and hence no strategic importance can be attached. However, these play an important role in our model. All these non-production costs of legitimate business will be denoted by  $T$ . While some components are likely to be incurred after output is realized, we assume that firms have to invest  $T$  before the true state is revealed. In some ways this discourages households from entering the market, specially those with bad projects (as the  $b$ -types). However, in presence of corruption, the households can bribe

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<sup>11</sup>It is possible to consider the case where output or profit of the  $b$ -types are lower than that of the  $g$ -types, but it does not affect our results.

<sup>12</sup>We argue in section 3.2.4 that this assumption is not restrictive and introduction of wealth constrained  $b$ -types does not affect our main result. Both these  $b$ -types behave exactly the same way in all the equilibria that we study.

the inspector and end up paying a smaller amount.

It is clear that household's expected income from entrepreneurial activity will depend on the cost of evading  $T$  and the cost of borrowing  $K$ . Depending on whether the household incurs the legitimate cost  $T$  or not, the  $j^{\text{th}}$ -household of type- $i$  will undertake production if and only if

$$V_{ij} = \mu_i \cdot (Y - r_i \cdot K) - (1 - \mu_i) \cdot w_i - T \geq V_{ij}^0, \quad (3)$$

or

$$V_{ij} = \mu_i \cdot \{(Y - r_i \cdot K) - X_i\} - (1 - \mu_i) \cdot w_i \geq V_{ij}^0, \quad (4)$$

where  $V_{ij}$  represent the expected income of the  $j^{\text{th}}$ -household within type- $i$ ,  $X_i$  is the expected cost of evading  $T$ , which includes bribes and fines, and  $V_{ij}^0$  is the outside option available to the  $j^{\text{th}}$ -household of type- $i$ . Note when households undertakes production activities  $V_{ij} = V_i, \forall j \in i$ . Also note that legitimate cost  $T$  is paid ex-ante but the cost of evasion is borne ex-post. This is an important distinction since the cost of evasion is borne ex-post, wealth constraints would not be a deterrent for corruption.

We assume that  $V_{ij}^0 \in [\underline{V}, \bar{V}]$  and all types have the same uniform distribution over  $[\underline{V}, \bar{V}]$ . So  $V_i$  will determine what fraction of the household of type- $i$  will undertake production.

## 2.4 The Game

After production has been undertaken, depending on the realization of  $Y$ , the firm makes a report of its income. The failure state can be viewed as a bankruptcy state and can always be verified. If the firm declares bankruptcy, the bank will verify the state and claim the value of collaterals  $w_i$ . As is standard in the literature, we assume that a firm will never declare bankruptcy with positive output. In the successful state, the firm makes the due repayment  $r_i \cdot K$  to the bank.

Before we begin the analysis it will be useful to summarize the sequence of moves in the model.

1. Nature chooses the different types of the household. The households decide whether to undertake entrepreneurial activity or not. This decision is denoted by  $a \in \{0, 1\}$ , where  $a = 1$  refers to production activity.

2. The bank offers a contract or a menu of contracts to the households (or firms)  $(r_i, w_i)$ .

3. The firms choose particular contracts.

4. Firms choose  $l \in \{0, 1\}$ , where  $l = 1$  refers to firm's decision to incur the cost  $T$  (and not engage in corruption). Once the output is realized, firm repays the bank according to the agreed contract.

5. Inspection is carried out by the inspectors. Corrupt inspectors can collude with the firm.

6. Following the inspector's report, all bribes or fines are paid.

For convenience, we shall label stages 2-3 as the credit market game and stages 4-6 as the bribe game. Since these are inter-linked, the outcome in the bribe game will determine the outcome in the credit market. We shall be looking at equilibria satisfying backward induction.

**Definition 1** *An equilibrium is defined as a tuple  $\{a_{ij}, l_i, (r_i, w_i)\}$  such that given households' decision, the credit market is in equilibrium and given the credit contracts  $(r_i, w_i)$  each household's decision is optimal.*

An equilibrium in the game stages 2-7 will induce a unique outcome on household's entry decisions. Household's choice of  $a$  depends on the expected payoff  $V_{ij}$  from production and the outside option  $V_{ij}^0$ . Note that within each type, households differ only in terms of their outside option  $V_{ij}^0$ . Therefore when it comes to the decision to enter or not, households within each type may behave differently, whereas when it comes to the credit market and the bribe amount they will behave identically. To distinguish this fact, in the equilibrium, we have an extra subscript  $j$  for the entry variable  $a$ .

We shall find it convenient to describe household's choice to enter, by the participation rate of each type of household — denoted by  $\lambda_i$ . It represents the fraction of households of type- $i$  entering production sector. Let  $N_i$  be the number of  $i$ -type households, then given  $\lambda_i$ , we can calculate the distribution of different types in the credit market as  $\theta_i = (N_i\lambda_i)/\sum N_i\lambda_i$  where  $N_i$  refers to the number of type- $i$  households in the population,  $i = g, b, p$ . Notice that both the total number of firms entering production and the number of firms choosing evasion and bribery will be determined in equilibrium.

### 3 Results and Analysis

#### 3.1 Bribe Game

For the purpose of tracking how wealth inequality transmits from the credit market through to corruption in the product market, we shall intentionally keep our bribe game simple. The main role of the bribe game will be to sort out those who will be corrupt and those who won't. We assume that all firms are inspected. If a firm decides not to incur the cost  $T$ , it can then be apprehended by an inspector. However, recall that  $q$  proportion of the inspectors are corrupt. We shall assume that to discourage such non-compliance the firm has to pay a fine  $F$ , where  $F \geq T$ .

A corrupt inspector can always collude with the firm and not report the non-compliance in exchange for a bribe. The bribe amount obviously will depend on the relative bargaining powers between the inspector and the firms. It is simply assumed to be  $\alpha F$ , where  $\alpha < 1$ .<sup>13</sup> If accepted, the firm is not reported. We also assume limited liability which implies that

finances can not be collected from non-successful firms and for successful firms

<sup>13</sup>This can be interpreted as the outcome of a game where the inspector makes a take-it-or-leave-it proposal with probability  $\alpha$  and the firm can accept or reject. The firm makes a similar offer with probability  $(1 - \alpha)$ .

$F \leq Y - r_i K$ . Hence, using (3) and (4), a firm will choose  $l = 0$  if and only if

$$\mu_i \cdot (q\alpha F + (1 - q)F) \leq T \quad (5)$$

which implies,

$$\mu_i \leq \frac{T}{(1 - q(1 - \alpha)) \cdot F} = \mu(T, q, F) = \bar{\mu}. \quad (6)$$

**Remark 1** *There is a critical success rate  $\bar{\mu}$ , such that all firms with  $\mu_i \leq \bar{\mu}$  will engage in corruption.*

This is a direct implication of the fixed fine and limited liabilities. Note that in this case all firms have the same amount of benefit and are able to pay the required amount of bribes. This avoids any direct role of inequality in corruption as has been our intention in this paper. But, because fines or bribes are paid ex-post, the firm with a lower successful probability faces a lower expected cost (fines and bribes) and hence is more likely to be corrupt.

However, to persuade the reader of the generality of our results we consider an alternative scenario where the fine is complete or partial loss of net profit of the firm. In such a case,  $F_i = (Y - r_i K)$ . This could be interpreted as a situation where a firm ceases to operate once its illegal behavior is detected. In that case only firms with lower expected profitability are likely to take the risk of being illegal. This argument has been used in the literature in the context of efficiency wage of the tax inspectors. An inspector is not likely to engage in bribery if the wages are high, because the inspector would not like to lose this high future stream of wage income for the present bribe. In our case it is the prospect of future profitability (not explicitly modelled) which determines a firm's willingness to engage in illegal behavior.

Using the same bargaining framework, and denoting  $(Y - r_i K)$  as  $Z_i$ , it is easy to see that the bribe  $d_i = \alpha Z_i$ . Rewriting (6), a firm will choose

$l = 0$  if and only if

$$\mu_i < \frac{T}{(1 - q(1 - \alpha)) \cdot Z_i} = \bar{\mu}_i. \quad (7)$$

Note that in this case,  $\bar{\mu}$  is type specific because it now depends on  $Z_i$ , which in turn will depend on the credit market outcome. Therefore, (7) captures a more general case compared to (6).<sup>14</sup> From (7) it is clear that for a given  $\mu_i$ , a high  $r_i$  and consequently a lower  $Z_i$ , will increase the possibility that a type will be corrupt. In the next section we discuss how the  $r_i$  is determined both under complete and incomplete information in the credit market.

An important question here would be what exactly is our indicator of corruption in equilibrium? In much of the analysis we use the number of firms that chooses  $l = 0$  as a measure of corruption. However, later in Section 3.2.4 we also consider the total amount of bribes paid as another measure of corruption and discuss how these two are linked and what the model implications are for the second measure.

### 3.2 Credit Market

In this sub-section we discuss the credit market outcome. First we consider a benchmark case where there is complete information about the type of projects.<sup>15</sup> We show that when the banks can identify the different types (good or bad) of households, wealth inequality among the households does not matter. Wealth inequality leads to a situation where some households can put up collateral and others cannot. The level of wealth does not affect

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<sup>14</sup>We can generalize further by considering both a lump sum tax  $T$  and a proportional tax on profits ( $tZ_i$ ), should not change the result. In that case (7) will be transformed to  $\mu_i < \frac{\hat{T}}{\rho(1-q(1-\alpha)) \cdot Z_i} = \hat{\mu}_i$ , where  $\hat{T} = \frac{T}{1-t}$ . However, proportional tax brings in another layer of information asymmetry between the firm and the tax inspector in addition to the existing one (between the firm and its lender). Hence for analytical ease we continue to assume just the lump sum tax in rest of the analysis.

<sup>15</sup>Recall that banks have no information about the wealth of the households, hence can not distinguish between the rich good type and poor good types. But as we shall show, it does not matter in this case.

a household's need to borrow  $K$  or income streams  $Y$ .<sup>16</sup>

### 3.2.1 Complete Information Benchmark

Under complete information there is no need for collateral. This is a direct implication of the collateral cost as can be seen in Figure 1.

[Insert Figure 1.]

Figure 1 shows the iso-profit curves and indifference curves ( $V_i$ ) of the different types of households in the  $r \times w$  plane. Given that  $\mu_b < \mu_g$ , the  $b$ -type high risk households have a steeper indifference curve. The dotted lines show the zero profit lines for the bank. It can be checked that the slopes (absolute values) of the indifference curves and the iso-profit curve are given by

$$\begin{aligned} \left. \frac{\partial r_i}{\partial w} \right|_V &= \frac{1 - \mu_i}{\mu_i \cdot K} \\ \left. \frac{\partial r_i}{\partial w} \right|_\pi &= \frac{(1 - \mu_i) \cdot \delta}{\mu_i \cdot K} \end{aligned} \quad (8)$$

Since  $1 > \delta > 0$ , the household's indifference curve is steeper than the bank's indifference curve. Under complete information, points  $D$  and  $E$ , in Figure 1, are the equilibrium contracts. Firms with a good project will be offered contract  $E$  (lower interest rate) and firms with a bad project will be offered  $D$  (higher interest rate). Since there is no collateral use in equilibrium, the wealth constrained  $p$ -type firms (who differs from the  $g$ -types only in term of their wealth) would be charged the same low interest rate as the  $g$ -types.

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<sup>16</sup>A natural interpretation of this wealth would be various assets which can not be substituted directly for capital in the production process but households could borrow money against these. For instance, it is unlikely that one with more land would need less capital and borrow less.

Let  $r_g^c$  and  $r_b^c$  denote the corresponding interest factors. The superscript  $c$  denote the outcome under complete information. The net income  $Z_i^c$  of the different types in the successful state would be  $(Y - r_i^c.K)$ . Clearly,  $Z_b^c < Z_g^c = Z_p^c$ . Hence, from (7), one can show that for the bribe game, the critical success rates of the  $b$ -types are higher than the  $g$ -types, that is,  $\bar{\mu}_g^c < \bar{\mu}_b^c$ . Therefore, if  $\mu_g < \bar{\mu}_g^c$ , all firms choose the illegal course of action. On the other hand if  $\bar{\mu}_b^c < \mu_b$  then none of firms will be corrupt. Although such extreme cases may be plausible, our focus is on the in between scenario where only the  $b$ -types engage in corruption, which will be the case if,<sup>17</sup>

$$\mu_b < \bar{\mu}_g^c < \bar{\mu}_b^c < \mu_g. \quad (9)$$

However, this does not guarantee that corruption will take place in equilibrium. That depends on whether the  $b$ -types will enter production in the first place, that is, whether

$$V_b^c = \max \{ \mu_b(Z_b^c) - T, \mu_b(Z_b^c - X_b^c) \} > \underline{V}, \quad (10)$$

where  $X_b^c = [(1 - q)Z_b^c + q\alpha Z_b^c]$  using  $(F = Z_i)$ . Similarly,  $g$ -types enter whenever

$$V_g^c = \mu_g(Z_g^c) - T > \underline{V}. \quad (11)$$

We shall assume that  $\underline{V} < V_g^c$ , so that some  $g$ -types always enter. The participation rates for the complete information case will be given by

$$\lambda_b^c = \max \left\{ 0, \frac{V_b^c - \underline{V}}{\Delta V} \right\}, \quad \lambda_g^c = \lambda_p^c = \min \left\{ 1, \frac{V_g^c - \underline{V}}{\Delta V} \right\}, \quad (12)$$

where  $\Delta V = \bar{V} - \underline{V}$ . This completes the description of the equilibrium under complete information. It is clear that wealth inequality does not

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<sup>17</sup>Note that this is a sufficient condition for the case where only the  $b$ -types engage in corruption.

play any role in this simple setting.

Suppose  $V_b^c = \underline{V}$  and  $\bar{\mu}_b^c > \mu_b$ , then a rise in the number of corrupt inspectors (rise in  $q$ ) would facilitate entry by the  $b$ -types by reducing  $X_b^c$ . The number of bribe paying firms will rise as the  $b$ -types are going to avoid  $T$ . Here the entry of  $b$ -type firms has no effect on the entry or exit decisions of the  $g$ -type or  $p$ -type firms. Hence, along with corruption, the total number of firms, will increase.

We can summarize these in the following proposition.

**Proposition 1** *In the complete information case, wealth inequality does not matter and  $1 \geq \lambda_g^c = \lambda_p^c > \lambda_b^c \geq 0$ . Corruption facilitates the entry of  $b$ -types without any distorting effects on the  $g$ -types.*

### 3.2.2 Incomplete Information and Wealth Inequality

Next, we study the case where the banks can not identify the different types. Banks, however, have (common) belief about the distribution of the three types. The treatment of the credit market is standard except that (i) there are some  $p$ -type households who are wealth constrained and hence cannot put up any collateral and (ii) the distribution of different types in the credit market is not exogenously given.

Since the banks cannot a priori distinguish between the different types, they use the two instruments,  $r$  and  $w$ , at their disposal to screen the different types.<sup>18</sup> It is clear from Figure 1, that the complete information pair  $D$  and  $E$  would not be incentive compatible because the  $b$ -type could always get a higher payoff by choosing  $E$ . Due to the presence of  $p$ -type firms the standard screening outcome of the credit market, where the different types are completely separated, is not feasible. This is because in any separating outcome, the  $g$ -type will have to put up some collateral, but since the  $p$ -types are collateral constrained, the bank is forced to offer them a contract

<sup>18</sup>See Bester (1985) for an early model of screening with collateral.

with no collateral.<sup>19</sup> In that case, it is easy for the high risk  $b$ -types to act as the  $p$ -types. Similarly, it is easy to show that a pooling outcome is also not possible. In Figure 1 the pooled contract satisfying the zero profit condition is given by  $G$ . Drawing the  $V_b, V_g$  passing through point  $G$ , it can be seen that a bank can always offer a contract like point  $F$ . The  $b$ -types will not choose but the  $g$ -types will prefer to choose  $F$ . Since this point lies above the zero profit line for the  $g$ -types, the bank can earn positive profit by offering such a contract. Hence  $G$  cannot be the equilibrium outcome.

However, as seen in Figure 2, a semi-separating equilibrium is possible, where the  $g$ -types are separated out and the  $b$  and  $p$ -types pool.

[Insert Figure 2.]

Contract pair  $(r_g^*, w_g^*)$  and  $(\bar{r}^*, 0)$  (represented by  $B$  and  $A$  respectively), is offered. The  $g$ -types chooses contract  $B$  and the  $p$  and  $b$ -types pool at  $A$ . Note that the  $b$ -types have no incentive to deviate from  $A$  to  $B$ . The  $p$ -types cannot deviate to any contract with  $w > 0$ . Moreover, the  $g$ -types also have no incentive to deviate to  $A$ . Using superscript  $s$  to denote the outcome under semi-separating equilibrium under incomplete information, let  $V_i^s$  represent the expected income of type- $i$ . From these expected payoffs we can find the participation rates  $\lambda_i^s = (V_i^s - V_0)/\Delta V$ . The probability that a borrower belongs to type- $i$  household undertaking entrepreneurial activity, when the credit market outcome is a semi-separating one is given by  $\theta_i$  where

$$\theta_i = \frac{\lambda_i^s N_i}{\sum_i \lambda_i^s N_i}. \quad (13)$$

The semi-separating contract pair,  $(r_g^*, w_g^*)$  and  $(\bar{r}^*, 0)$ , will indeed be an equilibrium if a bank can not deviate and offer a pooled contract fetching non-negative profit. Such deviations can be ruled out if the pooled interest

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<sup>19</sup>Recall the  $p$ -types are the same as the  $g$ -types, except that they cannot put forth any collateral.

rate  $G$  lies above the point  $H$ , since in that case the  $g$ -types will not prefer the pooled contract. We broadly characterize the result below.

Let  $\bar{r}$  be the interest rate where all three types are pooled and the bank's zero profit condition is met (point  $G$ ). It is given by the following

$$\bar{r} = \frac{\pi_0}{[(\theta_g + \theta_p) \cdot \mu_g + \theta_b \cdot \mu_b] K}. \quad (14)$$

Likewise, under the semi-separating equilibrium the pooled interest rate (partial pooling of  $b$  and  $p$ -types) is given by

$$\bar{r}^* = \frac{\pi_0}{(\phi_p \cdot \mu_g + \phi_b \cdot \mu_b) K}, \quad (15)$$

where  $\phi_i$  represents the proportion of type- $i$  engaged in production and accepting the pooled contract under the semi-separating equilibrium;  $\phi_i = \theta_i / (\theta_b + \theta_p)$ ,  $i = b, p$ . Comparing (14) and (15), it is easy to see that  $\bar{r}^* > \bar{r}$ .

Define  $r'$  as the interest rate such that the  $g$ -types are indifferent between the equilibrium contract  $(r_g^*, w_g^*)$  and  $(r', 0)$  (point  $H$ ), that is,

$$\mu_g(Y - r_g^*K) - (1 - \mu_g)w_g^* = \mu_g(Y - r'K). \quad (16)$$

Moreover,  $(r_g^*, w_g^*)$  is given by the incentive compatible condition for  $b$ -type,

$$w_g^* = \frac{\mu_b(\bar{r}^* - r_g^*)K}{1 - \mu_b}, \quad (17)$$

and the zero profit condition of the bank,

$$\mu_g r_g^* K + (1 - \mu_g) \delta w_g^* = \pi_0. \quad (18)$$

The equilibrium requirement ( $G$  lying above  $H$ ) is reduced to  $r' < \bar{r}$ . This condition will depend on various model parameters  $\mu_i$ ,  $N_i$  and  $\delta$ . Intuitively, if  $N_g$  is not too large relative to  $N_b$  and  $N_p$ ; and  $\mu_b$  is not too small,

$r' < \bar{r}$  will be satisfied. Suppose, there are very few  $b$ -type households and their success probability is also very low, then one would expect very few of them in the credit market. On the other hand if there are many  $g$ -types in the credit market the pooled interest rate will be lower and closer to the complete information interest rate for the  $g$ -types. Given that screening is costly, the  $g$ -types would prefer the pooling outcome.<sup>20</sup>

It is easy to compare the semi-separating outcome with the complete information case;  $V_p^s < V_p^c$ ,  $V_b^s > V_b^c$  and  $V_g^s < V_g^c$ . However, note that  $V_p^c - V_p^s > V_g^c - V_g^s$ . In other words, the loss in income is much higher for the  $p$ -types compared to the  $g$ -types. More  $b$ -types will enter the market at the cost of mostly  $p$ -types. Hence we have  $\lambda_b^s > \lambda_b^c$ ,  $\lambda_g^s \leq \lambda_g^c$ ,  $\lambda_p^c \leq \lambda_p^s$ . If we have  $V_g^s > \bar{V}$ ,  $V_p^s > \bar{V}$  then despite the fall in expected payoff, the participation rates (of  $g$  and  $p$ -types respectively) can remain the same at  $\lambda_g^s = \lambda_p^s = 1$ .

Which of the groups will engage in corruption, will depend on what happens to  $\bar{\mu}_b^s$ ,  $\bar{\mu}_g^s$  and  $\bar{\mu}_p^s$ . For the  $g$ -types, since  $Z_g^s > Z_g^c$ , we have  $\bar{\mu}_g^s < \bar{\mu}_g^c$  and they will not engage in corruption since they were not doing so in the complete information case. On the other hand, for the  $p$ -types since  $Z_p^s < Z_p^c$ , (7) implies that  $\bar{\mu}_p^s > \bar{\mu}_p^c = \bar{\mu}_g^c$ . Although in the complete information case the  $p$ -types were not paying any bribes, now there is a possibility they might do so if,  $\bar{\mu}_p^s > \mu_p > \bar{\mu}_p^c$ . This condition, however, will fail to hold in presence of (9), which is  $\mu_b < \bar{\mu}_g^c < \bar{\mu}_b^c < \mu_g$ . This is because the lowest possible income is earned by the  $b$ -types under complete information, that is  $Z_b^c < Z_p^s < Z_g^s$  which using (7) leads to  $\bar{\mu}_b^c > \bar{\mu}_p^s > \bar{\mu}_g^s$ . Given (9), it must then be the case that  $\mu_g = \mu_p > \bar{\mu}_b^c > \bar{\mu}_p^s > \bar{\mu}_g^s$ . Hence, in our framework the  $p$ -types and the  $g$ -types do not engage in corruption under the incomplete information scenario.

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<sup>20</sup>Since the distribution of types itself is equilibrium determined (through  $\lambda$ ), the analytical conditions are very messy. We have chosen to present a numerical example (later in this section) to show the equilibrium construct and its properties.

For the  $b$ -types,  $Z_b^s > Z_b^c$  implies, from (7), that  $\bar{\mu}_b^s < \bar{\mu}_b^c$ . Hence there could arise a possibility that  $b$ -types do not engage in corruption if  $\bar{\mu}_b^s < \mu_b < \bar{\mu}_b^c$ . As before, this case can be ruled out since (9) holds. We know that since  $Z_g^c$ , the  $g$ -types income under the complete information scenario, is the highest possible income that firms in this economy can achieve, therefore  $Z_b^s < Z_g^c$ . Hence, using (7), it must be the case that  $\bar{\mu}_b^s > \bar{\mu}_g^c > \mu_b$ . Therefore the  $b$ -types will continue to choose  $l = 0$ .

Since more  $b$ -types enter the market the number of firms in equilibrium opting for the illegal route, and as a consequence bribery, will rise. This would imply that the level of corruption as measured by the ratio of corrupt firms to the total number of firms could be higher. We summarize the previous discussion in the following proposition.

**Proposition 2** *Under incomplete information and wealth inequality, there exists a semi-separating screening equilibrium  $[\{r_g^*, w_g^*\}, \{\bar{r}^*, 0\}]$  where the  $b$  and  $p$  types pool at  $\bar{r}^*$  and  $g$  type separates at  $\{r_g^*, w_g^*\}$ . We have  $\lambda_b^s > \lambda_b^c$ ,  $\lambda_g^s \leq \lambda_g^c$ ,  $\lambda_p^c \leq \lambda_p^s$ . In addition, if  $\mu_b < \bar{\mu}_g^c < \bar{\mu}_b^c < \mu_g$ , there is a rise in corruption in the sense that a larger fraction of the total firms in the market will engage in bribery.*

**An Example.** Consider an economy with a large number of  $b$ -types.  $N_b = 6000$ ,  $N_p = 1200$ ,  $N_g = 517$ . Let  $K = 20$ ,  $\pi_0 = 20$ ,  $\delta = 1/2$ ,  $\mu_b = 1/4$ ,  $\mu_g = 1/2$ ,  $Y = 200$ ,  $T = 20$ . For the bribe game, let  $q = 1/2$ ,  $\alpha = 1/7$  and  $F = 70$ . For simplicity we are considering the fixed penalty case (see (6)). Using (6) it is clear that  $\bar{\mu} = 1/2$ , hence only  $b$ -types will find it profitable to evade  $T$ . The expected payments (bribe with probability  $q$  and fine  $F$  with probability  $(1 - q)$ ) is 40. Recall that these payments are made only in the successful state. The support of the outside options is given by  $\underline{V} = 20$ ,  $\bar{V} = 60$ . For the complete information case, using (1), (10), and (11) it is easy to check that  $r_g^c = 2$ ,  $r_b^c = 4$  and  $V_g^c = 60$ ,  $V_b^c = 20$ . Using the

expressions for  $\lambda$  (12), we can show that  $\lambda_g^c = \lambda_p^c = 1$  and  $\lambda_b^c = 0$ . Hence, despite the presence of corruption prone firms there will be no corruption in equilibrium.

Now consider the semi-separating outcome. It is given by  $r_g^* = 28/15$ ,  $w_g^* = 16/3$  and  $\bar{r}^* = 8/3$ . This leads to  $\lambda_g^s = (5.8/6)$ ,  $\lambda_p^s = 5/6$  and  $\lambda_b^s = 1/6$ . As expected, the  $p$ -type's participation rate falls by  $1/6$ . Using (15)-(18), it can be checked that this constitutes an equilibrium. From (13), the participation rates imply the following distribution of types  $\theta_p = \theta_b = 2/5$  and  $\theta_g = 1/5$ . The zero profit condition (2), and (18) for the banks is satisfied. If a bank were to deviate and offer a completely pooled contract (while still earning zero profit), the corresponding interest factor (as in 14) will be  $5/2$ . However, at this interest factor, the  $g$ -types earn an expected payoff of 55 which is lower than their equilibrium payoff of 58.66. Hence such a deviation will not be successful. In this equilibrium, 40 percent of the firms will be engaging in evasion and bribery. Therefore, compared to the complete information case, there is an increase in corrupt activities.

### 3.2.3 Changes in Inequality

Consider a redistribution of wealth such that  $N_b$  stays the same,  $N_g$  falls and  $N_p$  rises. It is clear that changes in inequality matters in our model context to the extent it affects the proportion of wealth constrained households.<sup>21</sup> The pooled interest rate in the semi-separating equilibrium will fall (as  $N_p$  increases). At the pre-redistribution participation rates, rise in  $N_p$  will lead to a rise in  $\theta_p$  and fall in  $\theta_b$ . Since  $\mu_g > \mu_b$ , it is clear that (using (15))  $\bar{r}^*$  will fall. Consequently,  $\{r_g^*, w_g^*\}$  will also change. Following a fall in  $\bar{r}^*$

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<sup>21</sup>This feature is likely to be present whenever cash or wealth constraints are the main drivers of imperfections. In Banerjee (1997), the proportion of cash constrained individuals play a similar role.

payoffs to all the three types ( $V_g^s, V_p^s, V_b^s$ ) will rise. It can be verified that

$$\begin{aligned}\frac{dV_b^s}{d\bar{r}^*} &= -\mu_b K, \\ \frac{dV_p^s}{d\bar{r}^*} &= -\mu_g K, \\ \frac{dV_g^s}{d\bar{r}^*} &= -K \left[ \frac{(1-\delta)(1-\mu_g)\mu_b\mu_g}{(1-\mu_b)\mu_g - \delta(1-\mu_g)\mu_b} \right].\end{aligned}\tag{19}$$

Hence,

$$\frac{dV_i^s}{d\bar{r}^*} < 0, \quad i = g, p, b \text{ and } \left| \frac{dV_g^s}{d\bar{r}^*} \right| < \left| \frac{dV_b^s}{d\bar{r}^*} \right|.\tag{20}$$

So there will be an increase in the participation rates for each type. However, as we explain in the following paragraph, the post-distribution participation rate of the  $p$ -type will always be lower than the pre-distribution participation rate of the  $g$ -type. Hence some of the erstwhile  $g$ -type will exit the market as a result of this redistribution. The rise in  $V_b^s$  leads to more  $b$ -type households in the market. The rise in  $\lambda_b$  will in fact be the equilibrating force as this would lead to a rise in  $\theta_b$  and arrest the fall in the pooled interest rate  $\bar{r}^*$ .

The effect on the market outcome depends on the pre-distribution participation rates. Suppose, prior to redistribution,  $\lambda_g^s = 1$ ,  $\lambda_p^s = 1$  and  $\lambda_b^s > 0$ . In such case, there will be no change in the participation rates of entrepreneurs with good projects and only the number of bad projects increases in equilibrium. The result will be an increase in the total number of firms in the production sector and a rise in the number of corrupt firms.

On the other hand, consider a case where prior to redistribution  $1 \geq \lambda_g^s > \lambda_p^s > \lambda_b^s > 0$ . Let  $\tilde{\lambda}$  denote the participation rates in the new equilibrium and  $\tilde{N}$  be the post-distribution numbers of different households in the economy. Let  $N_g - \tilde{N}_g = \tilde{N}_p - N_p = \Delta n$ . The change in the total number of good projects ( $\Delta n_g + \Delta n_p$ ) entering production will be given by

$$\Delta n_g + \Delta n_p = (\tilde{N}_g)(\tilde{\lambda}_g - \lambda_g^s) + (N_p)(\tilde{\lambda}_p - \lambda_p^s) - \Delta n(\lambda_g^s - \tilde{\lambda}_p), \quad (21)$$

where the first term shows the increase in the number number of  $g$ -types who remained rich; the second term indicates the increase in the number of  $p$ -types and the last term accounts for the  $g$ -types who had exited once they became poor. It can be shown that  $\lambda_g^s - \tilde{\lambda}_p > 0$ . Suppose it is not true. Then, from Figure 2, it follows that for the new pooled rate (for  $p$  and  $b$  types)  $A$  shifts down and lies below  $G$ . But this implies the existence of a common pooled interest rate with all  $g$ -types that lies below  $G$ . This, however, violates the initial equilibrium condition that no bank can offer a pooled rate and attract the  $g$ -types. Since the first two terms are positive, the total number of good projects will be reduced if the third term dominates the first two terms. From (20) it is clear that  $(\tilde{\lambda}_g - \lambda_g^s)$  is always likely to be small. Hence, a large  $(\lambda_g^s - \tilde{\lambda}_p)$  would lead to  $\Delta n_g < 0$ . The difference between the participation rates of the  $g$ -types and the wealth constrained  $p$ -types is likely to be higher if there are too many  $b$ -types in the market. With more  $b$ -types in the market, the distance  $AH$  (in Figure 2) is also greater implying a higher value for  $(V_g^s - V_p^s)$ . Hence if we start from a situation where there are lot of bad projects and the fraction of wealth constrained households with good projects is not very large, the rise in inequality leads to a fall in the number of good projects. However, the number of bad projects can never go down. But will the  $b$ -types continue to be corrupt? Since  $Z_b^s$  increases following the redistribution,  $\bar{\mu}_b^s$  will fall and it is possible that the  $b$ -types prefer to stop evading. In that case corruption will be driven down to zero. However, since the highest possible profit a firm could make is  $Z_g^c$ , from (7) we can show  $\bar{\mu}_g^c < \bar{\mu}_b^s$ . This along with  $\mu_b < \bar{\mu}_g^c < \bar{\mu}_b^c < \mu_g$  (from (9)), implies that it can not be the case that  $\mu_b > \bar{\mu}_b^s$ . Hence  $b$ -types will continue to be corrupt. Following the previous

discussion we can state the following proposition.

**Proposition 3** *As the fraction of poor households increases following a rise in wealth inequality, more  $b$ -type firms enter the production sector and some  $g$ -type firms leave. This leads to a rise in the proportion of corrupt firms in the market.*

The proposition can be interpreted as a case of more corrupt firms entering the market at the expense of some non-corrupt firms. However, note that the adverse effects of this rise in inequality have greater bite when there are more  $b$ -types in the market. This is where the environmental parameter  $q$  (fraction of corruptible inspectors) comes into play. As discussed earlier, a high value of  $q$  induces greater participation by the  $b$ -types. Hence inequality matters more in a corruption prone environment.

It is clear from the previous discussion that wealth inequality does not directly affect the level of corruption, rather it affects the credit market outcome which in turn affects the participation rates of different types. Hence the nature of the link depends on several factors. So far we have considered one plausible and tractable scenario. In the remainder of the section we discuss how the link is likely to be affected in other alternative scenarios.

### 3.2.4 Discussion

First, it must be pointed out that not all forms of redistributions will lead to a similar outcome. We are considering redistribution amongst households with same project types. Recall that the  $p$ -types are essentially wealth constrained  $g$ -types, hence the redistribution discussed in the previous paragraph refers to a redistribution within the households with good projects. By introducing another type — wealth constrained  $b$ -types (say  $pb$ ) — we can consider similar redistribution within the  $b$ -types. But it is not going to affect the equilibrium outcome in any significant manner, because in

both the case of complete separation of the types and the semi-separation of the types in the credit market the  $b$ -types always chooses a contract which does not include any collateral.<sup>22</sup> Hence following any such redistribution  $(N_b + N_{pb})$  and  $(N_g + N_p)$  stay the same. This means that any redistribution that leaves the number of wealth constrained households,  $N_p$ , unaffected will not have any impact on the market outcome. Therefore, inequality in such cases will not have any impact on corruption. We can allow for redistribution of wealth across the different types without affecting the total number of good and bad projects. For example, if we transfer some wealth from the rich households with bad projects to the wealth constrained households with good projects, the end result will be a fall in  $N_p$  and a rise in  $N_g$  without affecting  $(N_b + N_{pb})$ . This will have exactly the same effect as a reduction in inequality of the type of redistribution (from rich  $g$ -type to the  $p$ -type) that we discussed earlier.

Second, (9) always ensured that only the inefficient firms are always corrupt. Since (7) shows that whether firms are corruptible or not depend on  $q$ , depending upon the values of  $q$  we can consider two other cases: (a) where both efficient and inefficient firms are corrupt and (b) where none of the firms are corrupt. When both type of firms are corrupt, that is  $\mu_b < \mu_g < \bar{\mu}_g^c \leq \bar{\mu}_b^c$ , our results shall still hold. The efficient firms being corrupt does not prevent the inefficient firms from bribing too and engaging in production. When there is inequality (where only the  $g$ -types are wealth constrained) some of the wealth constrained  $g$ -types will exit the market and the inefficient types will enter the market. So long as the total number of firms increase, corruption will increase with the rise in inequality. When  $q$  is such that both types of firms are honest, that is,  $\bar{\mu}_g^c \leq \bar{\mu}_b^c < \mu_b < \mu_g$ , under both complete and incomplete information then obviously inequality

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<sup>22</sup>Note that the  $b$ -types and  $pb$ -types are similar in all respects except wealth. In the credit market, it is only the sum of these two types which will affect the equilibrium outcome. Both these types will have the same benefit from being corrupt and same participation rates.

shall make no difference to corruption.

A third possibility is where only the efficient firms are corrupt. In our model context, this can be ruled out because, from (7) we know that the firm will engage in corruption if  $\mu_i < \bar{\mu}_i(Z_i)$ , where  $\bar{\mu}'_i < 0$ . Since the efficient firms profits (taking the credit market outcome in to consideration) are at least as high as the inefficient firms profits (under both complete and incomplete information),  $Z_g \geq Z_b$ , and  $\bar{\mu}_g \leq \bar{\mu}_b$ . Further, by definition  $\mu_b \leq \mu_g$ . Hence it is not possible to satisfy  $\mu_g < \bar{\mu}_g$  and  $\bar{\mu}_b < \mu_b$  simultaneously, which is what is required for the case when only the efficient firms are corrupt. In a completely different model set up where penalty for bribery is fixed and gain from bribery is higher for the good types (no non-production costs but only proportional taxes), one can get a situation where the  $g$ -type engages in bribery but the  $b$ -type does not. However note that in this case, the participation rate of the  $b$ -type will be low and as argued earlier, if there are very few  $b$ -types in the market, changes in inequality is unlikely to have significant effect on the equilibrium outcome. Additionally, if the  $p$ -types are non-corrupt (but  $g$ -types are,  $Z_p^s < Z_g^s$ ), the fact that  $b$ -types enter at the expense of some  $p$ -types will not have significant implications for corruption.

Third, we have considered only the proportion of corrupt firms as a measure of corruption. As mentioned earlier, we could use ‘the total amount of bribes paid’ as another measure. To the extent (9) holds and only  $b$ -type firms are always corrupt, both the measures move in the same direction in all the previous propositions. Since the participation of  $b$ -types can only increase following a rise in  $Z_b$  (or more precisely  $V_b$ ), and the size of bribe is given by  $d_i = \alpha Z_i$ , this implies that the total amount of bribes paid also goes up. On the other hand, if more than one type of firms pay bribe in equilibrium, then a rise in the number of corrupt firms will again imply a rise in the total amount of bribes. For example, if the  $p$ -types also engage in bribery (in addition to the  $b$ -types) in a semi separating equilibrium,

the  $p$ -types also pay same bribe (ex-post) to the inspector. Following a redistribution, as more  $b$ -types enter the market ( $\Delta n_b < 0$ ) and some  $p$ -types exit ( $\Delta n_p > 0$ ), total number of corrupt firms will rise if  $(-\Delta n_b / \Delta n_p) > 1$ , but then total bribes paid will also rise. Hence, rise in inequality will lead to a rise in corruption measured in terms of number of corrupt firms as well as the amount of bribe paid.

## 4 Conclusion

Our objective was to provide a rationale for the causal link from inequality to corruption. We have done that using a multi-market framework where the presence of wealth inequality in the credit market prevents the screening of the efficient firms from the inefficient firms, thus allowing inefficient firms to enter the market, bringing corruption in its wake. We do not wish to claim that our approach provides the only explanation linking inequality to corruption. Although there may exist other possibilities, our approach, provides a plausible explanation of how corruption is affected by wealth inequality even when an individual's ability and willingness to engage in corruption is not directly affected by the person's wealth. Since bribe are paid ex post (after the project returns are realized) a poor household can also afford to pay bribes and the benefit from corruption to the household depends on its efficiency type but not the level of wealth. We feel that this makes our analysis more interesting since there is no obvious reason why the wealthy inequality should matter so far as corruption is concerned.

The explicit role of wealth in the credit market allows us to avoid criticism related to interpretation such as whether the causal link to corruption was about 'inequality of influence' or 'inequality of wealth'. In the credit market, when it comes to collaterals, 'wealth' rather than 'influence' is of use. Therefore, in our model wealth inequality is the primary source that leads to corruption. In addition, we are able to explain the causality within

a given set of institutional rules, which in our context implies the existence of a regulatory authority that cannot always be bought, irrespective of the level of wealth.

Our model can be extended in couple of other directions. First, an obvious question is how the poor households are affected by the presence of corruption. Even though poor households can benefit and can engage in corruption to the same extent as the rich, our model shows that some of these poor households (the wealth constrained households with good projects) are adversely affected because of credit market imperfections. Recall that as more households with bad projects enter- these poor households are most adversely affected. Second, one can also address the issue of the link between corruption and competition in the presence of wealth inequality and market imperfections.<sup>23</sup> We have left these issues for future research.

The multi-market orientation of our model can lead to a somewhat different focus so far as policy implications are concerned. It shows that policy intervention crucially depends on the nature of outcomes in related markets: for instance, intervention in the credit market, will depend on the extent of corruption. Likewise, anti-corruption policies have to be evaluated in the light of the credit market outcomes. In general, anti-corruption policy analysis takes a partial equilibrium approach and focuses on the same market where corruption takes place. In the present case that would mean raising inspection probability or the fine, and reduce the incentive for inspectors to be corrupt. Our paper, complementary to this approach, would point also in the direction of the credit market. As seen in our numerical example, elimination of imperfections in the credit market can eliminate corruption by preventing the entry of the corruption prone firms. This, we consider, is an important point to bear in mind while designing policies especially in developing countries where more than one market exhibit var-

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<sup>23</sup>See Ades and Di Tella (1999), Bliss and di Tella (1997), Laffont and N'Guessan 91999) for studies focusing on this issue.

ious kinds of imperfections. This view in a wider context is not new, but is worth emphasizing in the context of corruption.

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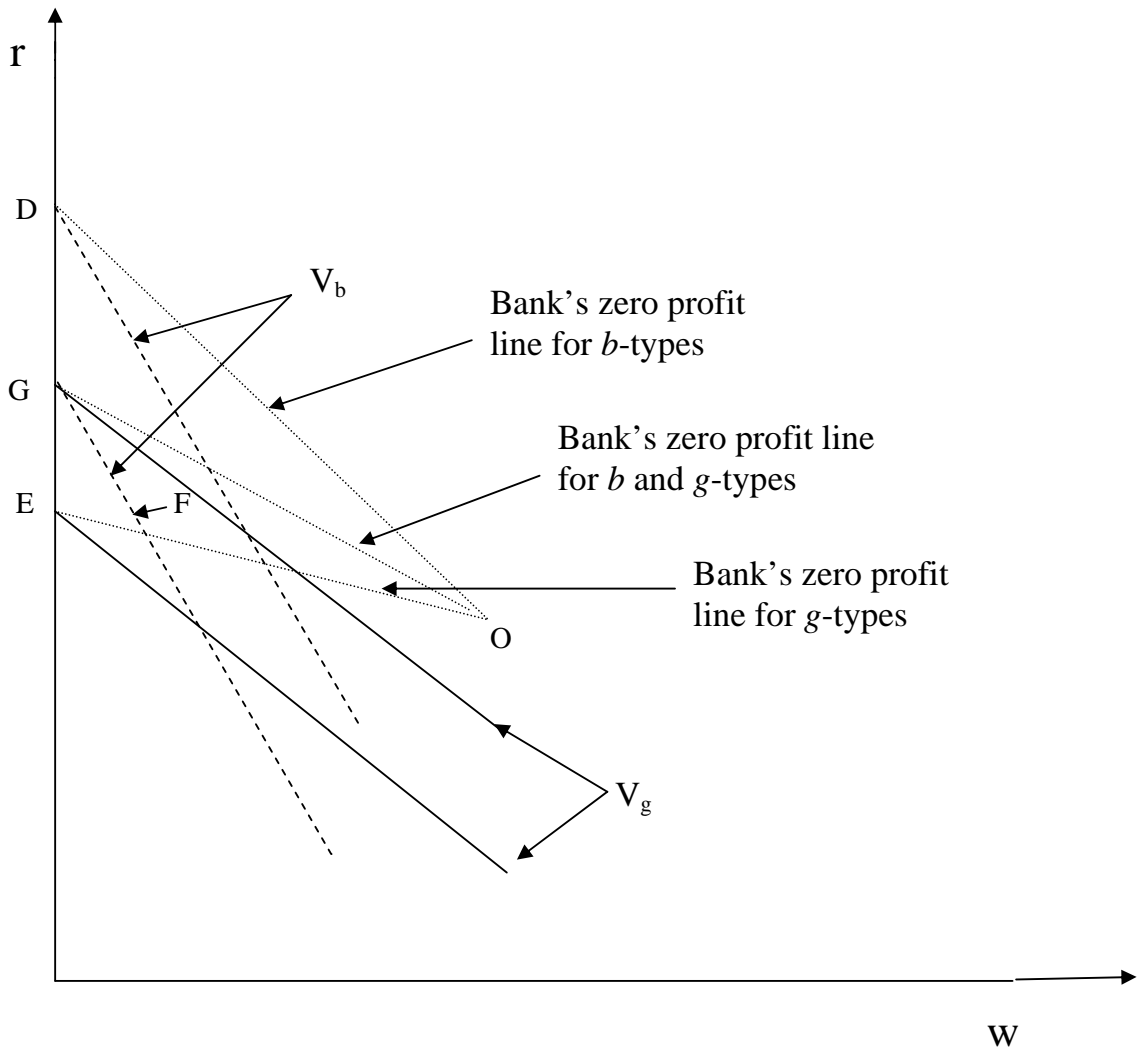


Figure 1: Separating equilibrium with two types.

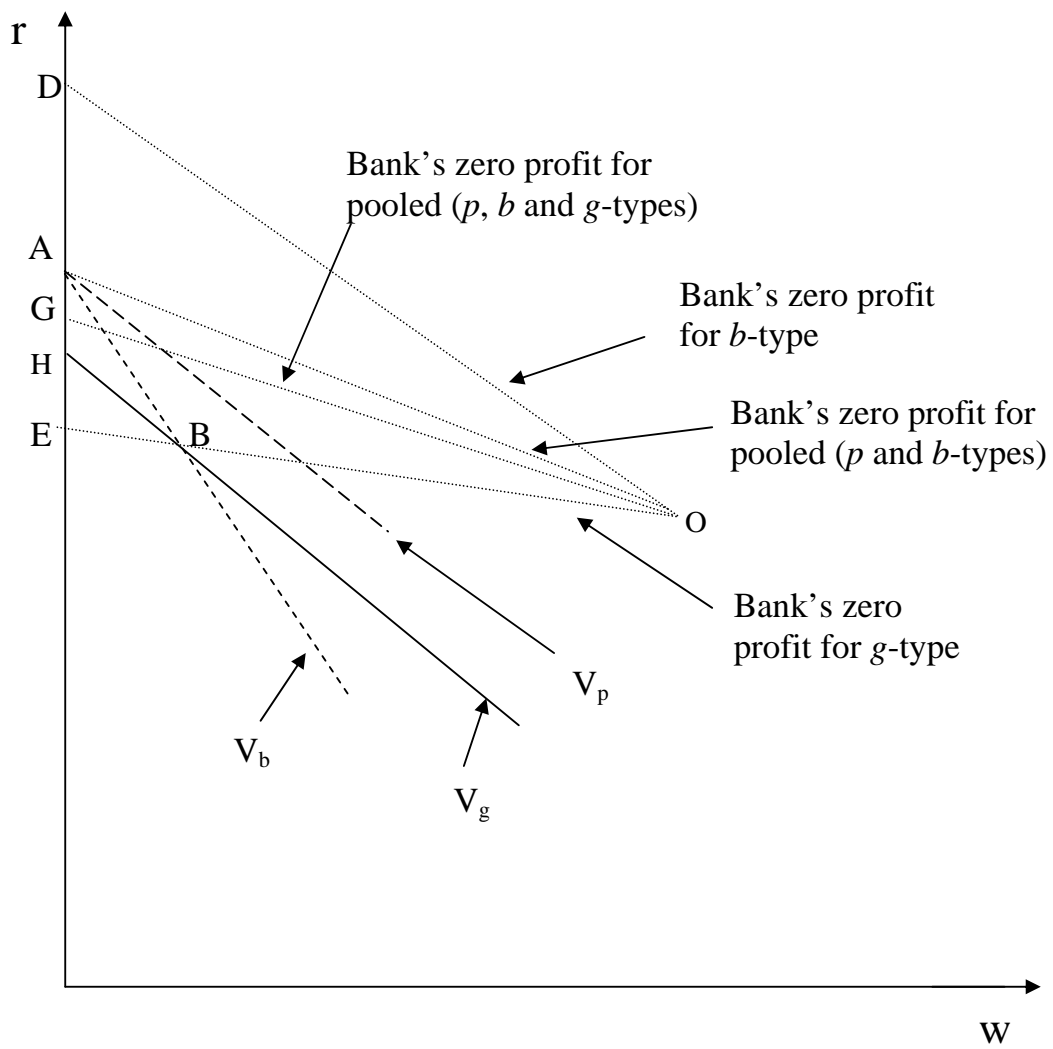


Figure 2: Semi-separating equilibrium under wealth inequality.